Alexandria University
Faculty of Dentistry
Department of Pediatric Dentistry and Dental Public Health

Effect of Preschool Children's Intelligence on Dental Fear and Their Behavior in the Dental Clinic using Parental Active/ Passive Presence Technique

Thesis submitted to Department of Pediatric Dentistry and Dental Public Health
Faculty of Dentistry Alexandria University
In partial fulfillment of the requirements for the

Doctorate Degree
In
Pediatric Dentistry

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2014

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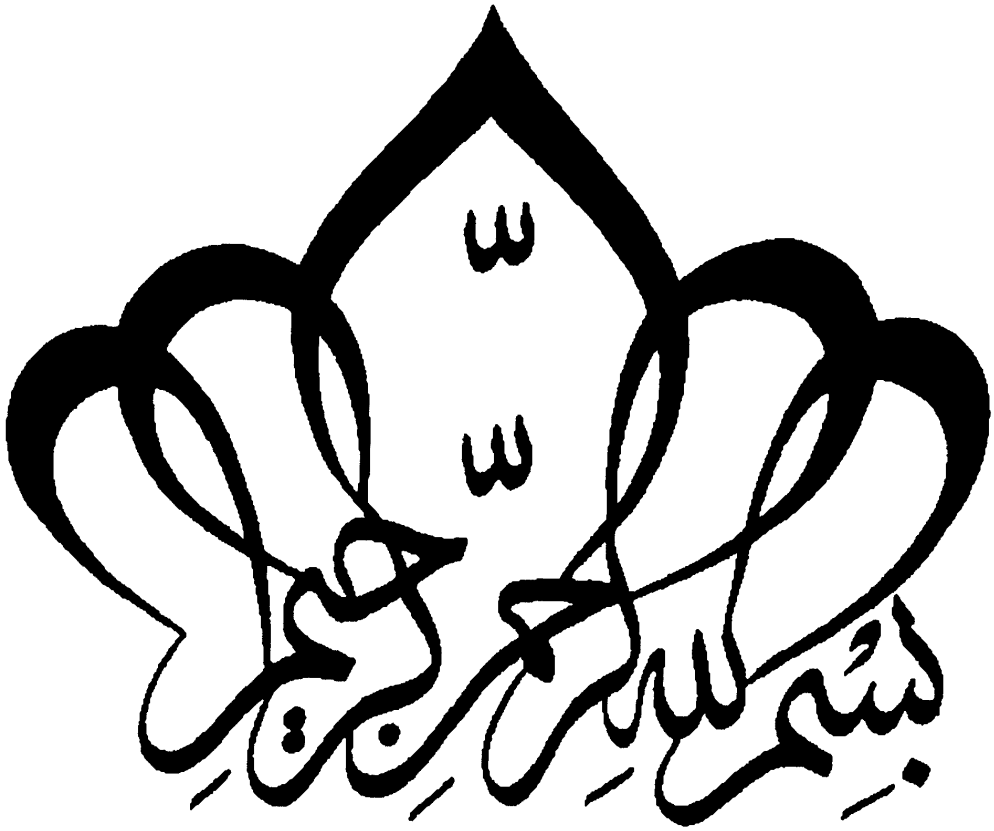

قَالُوا۟ سُبْحَٰنَكَ لَا عِلْمَ لَنَآ إِلَّا مَا عَلَّمْتَنَآ ۖ إِنَّكَ أَنتَ ٱلْعَلِيمُ ٱلْحَكِيمُ ﴿٣٢﴾

ACKNOWLEDGEMENT

First and foremost, all praises be to **Almighty Allah**, the most gracious, the most merciful, for endowing me with health, patience, knowledge, power, guidance and hope to accomplish this thesis .

With my greatest appreciation, I would like to express and record my profoundest gratitude and indebtedness to my principle supervisor, **Prof. Dr. Amani Mohamed Khalil**, Professor of Pediatric Dentistry and Dental Public Health and Vice Dean for Graduate Studies and Research in the Faculty of Dentistry, Alexandria University. Actually, this work wouldn't have been possible without her patient guidance, enthusiastic encouragement, invaluable comments and instructions. Under her guidance and collaboration, I took the first step towards the actual beginning of this study that has been developed from a mere simple idea into a reality on the ground. Despite of her great commitments, she has always devoted so much of her time and effort to review my thesis progress step by step providing me with her useful insights and important corrections in all the stages of this thesis. As such, I am seriously thankful to her for the inspiration, encouragement, support and everything.

I would also like to offer my special thanks and sincere gratitude to my second supervisor, Prof. **Dr. Karin Mohamed Lotfy Dowidar,** Professor of Pediatric Dentistry, Faculty of Dentistry, Alexandria University, for her kind support, great tolerance, untiring help, constructive suggestions and accurate comments. Gratefully, She put in great effort and endeavors in revising my work and introducing many helpful amendments into it. Her willingness to give her time generously for the success completion of this thesis has been very much appreciated.

For that, I owe her a considerable part of this success and a special sense of respect and gratefulness

I am particularly and sincerely grateful for the great assistance and encouragement given by **Prof. Dr. Mahmoud Abdel Halim Mansy**, Professor of Psychological Measurement and Evaluation, Faculty of Education, Alexandria University. I have greatly benefited from his ample knowledge in regard of the children Psychological side and their Intelligence .

Words cannot express my deep sense of indebtedness to **Dr. Maha Tantwy,** Lecturer of Dental Public health Faculty of Dentistry, Alexandria University, for her tremendous support in conducting the statistical part of my thesis. Her precious ideas, advices and remarks have been a great help during the course of this study. Her assistance is highly appreciated .

Sincere thanks and appreciation goes to my **Department** including all the professors, assistant professors, lectures, colleagues and friends for their help, encouragement, and kindness. My special thanks is also extended to the stuff nursing of the department and for all the children involved in my study with my great respect to their families as well.

I also take this opportunity to specially thank **Ibb University** for the financial support they provided me with throughout my studying journey.

Furthermore, at this moment of accomplishment, I would like to acknowledge my heartfelt appreciation to my **beloved parents** for their unfading love, enormous support, patience, sacrifice, caring, and prayers. To whom my success is gratefully deducted and for whom I would be forever indebted .

My cordial gratitude is also acknowledged to my **dear wife** who has sacrificed much of her time, effort, comfort and happiness just to

stand by my side and to sincerely support my steps sharing me all the moments of smiles and tears throughout my academic journey. My deep love and gratitude goes further to my **sons** who have always been my real source of happiness that has abated the pressure of this work .

Moreover, my acknowledgment is extended to my **brother and sisters**. Their enormous love, constant cooperation and encouragement gave me the power to continue .

At the end, it is seriously a pleasant task to express my gratitude to all those who contributed in many ways to the success of this study and made it an unforgettable experience for me .

Dedication

To those who give me everything for nothing
To those who never stop believing in me at all the moments
To those who have deepen my footprints in the sand leading me towards the land
Without them nothing of my success would be possible

To
My Dear Parents,
My Wonderful Wife,
My Brother, Sisters,
And My Beloved Sons,
Saif and Islam

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LIST OF ABBREVIATIONS

A/VR	Abstract/Visual Reasoning
AAPD	American Academy of Pediatric Dentistry
Ab	Absurdities
AIQ	Average Intelligence Quotient group
APA	American Psychiatric Association
BES	Behavior Evaluation Scale
BM	Bead Memory
BMT	Behavior management techniques
BSQ	Behavioral Style Questionnaire
C	Control Group
CDFP	Children's Dental Fear Picture Test
CDFS	Corah's Dental Fear Survey
CFSS	Children`s Fear Survey Schedule
CFSS-DS	Dental Subscale of the Children's Fear Survey Schedule
Com	Comprehension
Cop	Copy
C-S	Compound Score
DA	Dental Anxiety
DAS	Dental Anxiety Scale
DAS II	Differential Ability Scales II
DF	Dental Fear
DFA	Dental Fear Anxiety
DFS	Dental Fear Survey
ECBI	Eyberg Child Behavior Inventory
EQ	Emotional Quotient
FBRS	Frankl Behavioral Rating Scale

FIS	Facial Image Scale
HIQ	High Intelligence Quotient group
HOME	Hand-Over-Mouth Exercises
IQ	Intelligence Quotient
K-ABC	Kaufman Assessment Battery for Children
KAIT	Kaufman Adolescent and Adult Intelligence Test
LIQ	Low Intelligence Quotient group
MCDFS	Modified Child Dental Fear Survey
MS	Memory for Sentence
MSCA	McCarthy Scales of Children's Abilities
MSEL	Mullen Scales of Early Learning
OHQoL	Oral Health-related Quality of Life
P	Pattern
PA/PPT	Parental Active/Passive Presence Technique
PAP	Parental Active Presence Technique
PMT	Porteus Maze Test
PPA	Parental Presence/Absence Technique
PPP	Parental Passive Presence Technique
PPVT	Peabody Picture Vocabulary Test
PPVT-4	Peabody Picture Vocabulary Test, Fourth Edition
Q	Quantitative
QR	Quantitative Reasoning
RCPM	Raven's Colored Progressive Matrices
RPM	Raven's Progressive Matrices
RS	Raw Score
R-S-S	Reasoning Standardized Score
S	Study Group
SAS	Standard Age Score
SB5	Stanford-Binet Intelligence Scale: Fifth Edition
SB-IV	Stanford-Binet Intelligence Scale: Fourth Edition

STMR	Short-Term Memory Reasoning
TSD	Tell-show-do Technique
V	Vocabulary
VPT	Venham Picture Test
VR	Verbal Reasoning
WAIS- IV	Wechsler Adult Intelligence Scale-IV
WISC- IV	Wechsler Intelligence Scale for Children-IV
WJ III ACH	Woodcock-Johnson Tests of Achievement
WJ III COG	Woodcock-Johnson Tests of Cognitive Abilities
WJ-R COG	Woodcock-Johnson Psycho-Educational Battery-Revised: Tests of Cognitive Ability
WMS-IV	Wechsler Memory Scale- IV
WPPSI-IV	Wechsler Preschool and Primary Scale of Intelligence-IV

INTRODUCTION
AND
LITERATURE REVIEW

Introduction

From the moment of conception, human beings undergo many processes of development. The field of child development is the scientific study of those processes (Papalia, Gross, and Feldman, 2003). As such, child development is an important determinant of health over the life course. (Anderson, and Fielding, 2003)

Scientists have divided children's development into separate domains or areas so as to make the study of children development much easier. The major domains of human development are: *physical*, *social/emotional*, and *cognitive or intellectual* domains. Such developmental domains are interconnected with each other; thus, any development in one area influences another (Ayoub, and Fischer, 2006).

Understanding child development is an important issue to all practitioners in pediatric dentistry field. Dental health can be improved if dental treatment is not neglected, especially with young patients (Melamed, 1986a). In dental practice, it has been experienced that most of the children do not cooperate during dental procedures. Sometimes it becomes very difficult to manage a child in a dental clinic (Brill, 2002). Indeed, if a child's behavior in the dental office cannot be managed then it is difficult if not impossible to carry out any dental care that is needed (Roberts, Curzon, Koch, and Martens, 2010).

The social domain of many children during a dentist visit is often characterized by uncooperative behavior. Behavior management for children is an integral component of any pediatric dental practice (Baghdadi, 2002). Therefore, it's one of the corner-stones for such specialty.

The difficulties of management are not only related to technical procedures of treatment which often implies a stressful situation for the child, but also with the different emotional upsets of him. The most common upset exhibited during dental treatment are anxiety and fear in which they belong to the emotional domain (Brill, 2002). While there is no doubt that anxiety and fear play a major role in the dental behavior of many children, there may be other causes for the uncooperative behavior observed in the dental setting (Forehand and Long ,1999).

Some factors that may influence a child's response to the dental setting are cognitive abilities that are the abilities to draw on different coping strategies to help with anxious feelings and social adaptive abilities, which are those behaviors that children use to respond to usually or daily experiences. So child intelligence may have an effect on the child's behavior in the dental clinic (Kain, Mayes, Weisman and Hofstadter, 2000).

Dental Anxiety and Dental Fear:

Many practicing dentists have considered the fearful uncooperative child patient to be among the most troublesome of problems in their clinical works (Ingersoll, Nash, Blount, and Gamber, 1984).

Children with both dental anxiety and fear of dental treatment have been recognized as a source of problems in patient management and have a significant clinical complication in dental practice for many years (Kleiman, 1982; Chellappah, Vignesha, Milgrom and Lam, 1990; Oosterink, De Jongh, and Aartman, 2008; Hägglin, Carlsson, and Hakeberg, 2013).

It seems that anxiety, fear, and phobias are strongly related. In that the three concepts may lead to one another, but actually they are different

(King, Hamilton, and Ollendick, 1988). Although the basic emotion of fear is strongly related to anxiety, some authors identify these states as distinct from one another (Lang, 1971; Barlow, 1988; Antony & Barlow, 1996; Klinberg, 2008; Roy, 2011) whereas others consider them synonymous (Clark, 1986; Rapee, 1996; Gustafsson, 2010).

Anxiety and fear have been defined in many ways in the literature. *Anxiety* involves apprehension and arousal regarding a future situation. Anxiety is a future-oriented emotional state characterized by high negative effect, a sense that upcoming events are uncontrollable and unpredictable, difficulty concentrating, and a tendency to worry (Antony, Orsillo, and Roemer, 2001). It is a generalized mood state that occurs without an identifiable triggering stimulus. As such, it is distinguished from fear. *Fear* occurs as a result of exposure to situations (external threat) that are either real or imagined. Reactions to these situations are often considered an integral and adaptive aspect of normal development. It is common for children to be afraid of things such as darkness, animals, and dentists. Additionally, fear is a focused, all-or-nothing, alarm reaction in which there is an intense motivation to escape from a potential danger, and in which the individual is ready (both physically and cognitively) for action. In summary, anxiety is the result of threats that are perceived to be uncontrollable or unavoidable, whereas fear is related to the specific behaviors of escape and avoidance (King, Hamilton, and Ollendick, 1988; Ohman, 2000). Anxiety and fear are distinct from *phobia*, which is traditionally defined as an irrational severe, persistent and unreasonable fear associated with an anxiety response that cannot be controlled voluntarily (King, Hamilton, and Ollendick, 1988; American Psychiatric Association -APA, 2000).

In dentistry, the terms dental anxiety (DA) and dental fear (DF) are often used synonymously (Gustafsson, 2010). *Dental anxiety* represents

a general state in which the child experiences a level of apprehension and is prepared for something negative to happen during dental visit. *Dental fear* represents a normal emotional reaction to a specific threatening external dental stimulus (Klingberg, 2008). It has been recommended by Klingberg and Broberg to use *Dental fear anxiety* (DFA) for strong negative feelings associated with dental treatment among children and adolescents (Klingberg and Broberg , 2007). In extreme form with severe dental fear anxiety, it takes phobia-like proportions "*Dental phobia*", which may result in avoidance or endurance of the dental experience with significant discomfort (Porritt, Marshman and Rodd, 2012).

The most frequent causes of DFA especially in childhood include: the sight, sensation, and fear of pain from the needle and dental drill. These have been frequently shown to be the most fear-evoking stimuli for dentally anxious children (Rantavuori, et.al., 2004; Taani, El-Qaderi, and Abu Alhaija, 2005). Fear is related to the anticipation of being deceived/betrayed and losing control, fearing of the unknown, fear of invasive procedures and fear of the repeating of negative past experiences. Along with fear of meeting unfriendly medical staff and of being confined in small places are important determinants of dental fear (Chapman and Kirby-Turner, 1999; Chapman and Kirby-Turner, 2002; Crossley and Joshi, 2002; Armfield, Stewart and Spencer, 2007; Klaassen, Veerkamp and Hoogstraten, 2007; Rãducanu, Feraru, Herteliu and Anghelescu, 2009).

Whereas children sometimes attend with fears of specific treatments, other children report a more general anxiety associated with the dental setting / treatment (Ashkenazi, Faibish and Sarnat, 2002). However, it is also to be expected that a proportion of children will display anxious behaviors that are not the result of 'dental anxiety' (e.g., generalized anxiety). Therefore, assessing the nature of a child's anxiety

is extremely important in determining the most appropriate and effective management strategy (Porritt, Marshman and Rodd, 2012).

In spite of the improvements in pain control and treatment modalities, dental fear and anxiety have remained relatively constant during the last 50 years (Salem, Kousha, Anissian, and Shahabi, 2012).

Nature of Dental Fear Anxiety:

An important conceptual development in exploration of the phenomenon of anxiety can be attributed to the work of Spielberger. He has made a distinction between the more temporary condition of '*State Anxiety*' and the more general and longstanding quality of '*Trait Anxiety*'. *State anxiety* (A-state) reflects a 'transitory unpleasant emotional state or condition of the human organism while coping with threatening or dangerous situations. It is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity' (Spielberger, 1983). In general, states refer to any reliably measured characteristic, but typically, state variables refer to conscious, verbally reportable qualities such as moods (Matthews, Deary and Whiteman, 2003).

On the other hand *Trait anxiety* (A-trait) relatively refers to stable individual differences in a tendency to respond with an increase in state anxiety while anticipating a threatening situation in the environment' (Spielberger, 1983). Spielberger characterized trait anxiety as a general disposition to experience transient states of anxiety, suggesting that these two constructs are inter-related (Spielberger, Sydeman, Owen, and Marsh, 1999).

The main assumption of the state-trait models is that the effects of traits on behavior are mediated by states, i.e., that states influence more directly internal processing activities and have a more direct effect on

behavior than traits can do (Tovilović, Novović, Mihić, and Jovanović, 2009). Both aspects of A-state and A-trait have been combined in dental fear and anxiety DFA (Chapman and Kirby-Turner, 1999).

Age and Dental Fear Anxiety:

Dental fear is recognized as one of the most common fears and phobias (Fiset, Milgrom, Weinstein, and Melnick, 1989; Oosterink, De Jongh and Hoogstraten, 2009). Dental fear has been prevalent among children younger than three years, but it also appears among older children and adolescents (Chapman and Kirby-Turner, 1999). Dental fear and anxiety DFA have been reported to be relatively common in children and to affect 5.7– 6.7% of all children (Klingberg, Berggren, and Noren, 1994; Wogelius, Poulsen, and Toft Sörensen, 2003). Moreover, it reaches 6-20% among both children and adolescents. However, as children grow older, they may develop their own methods to control it (Klingberg, and Broberg, 2007).

Gender and Dental Fear Anxiety:

It has been found that, girls appear more secure than boys and exhibit more exploratory behavior; for example, they are curious and touch things (Rousset, Lambin, and Manas, 1997). However, in relation to dental treatment, there is no consensus. Some studies have indicated that it was boys and not girls for whom fear is more likely to be the factor hindering dental visiting (Kleiman, 1982; Udoye, Oginni and Oginni, 2005). Other studies claimed that girls showed higher levels of dental fear anxiety than boys (Chellappah, Vignesha, Milgrom and Lam, 1990; Peretz, and Efrat, 2000; Chapman and Kirby-Turner, 1999; Heft, Meng, Bradley, and Lang, 2007; Klingberg and Broberg, 2007; Hittner and Hemmo, 2009). On the other hand, few studies did not find any direct

effect of gender on childhood dental fear (Milgrom, Mancel, and King, 1995; Schwarz and Birn, 1995). Recently, Carrillo-Diaz and her colleagues have found that girls have a high level of DFA that has been associated with low levels of oral health-related emotional well-being. In contrast, dental fear and anxiety do not influence oral health related emotional well-being in boys (Carrillo- Diaz, Crego, and Romero-Maroto, 2013).

Types of Dental Fear Anxiety:

Although mild fear is a normal expectation during the child's development, but when the extent is disproportionate to a natural threat, the problems are evolved. Fearful patients, based on the origin of their fear fall into two broad distinctions: exogenous and endogenous. In the ***endogenous fear*** (fear from unknown) any experience that is new and unknown to the child will produce fear until the child has proof that there is no threat to his well-being. It is believed that the ***exogenous*** (acquired) type of fear is related to a direct or indirect traumatic experience (objective or subjective fear). *Objective fear* is produced by direct physical stimulation of the sense organs and is generally not of parental origin. Therefore, when a child has had previous contact with a dentist and has been managed so poorly, he necessarily develops a fear of future dental treatment (Chapman and Kirby-Turner, 1999; Gustafsson, et. al., 2007; Gustafsson, 2010). On the other hand, *subjective fear* is that based on feeling and attitudes that have been suggested to the child by others about him without the child having had the experience personally. Thus, it may be a component of a constitutional vulnerability to anxiety disorders (Locker, Poulton, and Thomson, 2001).

Impact of Dental Fear Anxiety on Dentistry:

Dental fear anxiety is a widespread problem that has significant impact on the individual's health and psychological well-being as well as on the dentist's level of stress (Kleiman, 1982: Abrahamsson, Berggren, Hallberg, and Carlsson, 2002; Oosterink, De Jongh, and Aartman, 2008; Diercke, et.al., 2012).

Children and adolescents with DFA are often uncooperative during dental visits, thus rendering treatment is difficult or impossible (Klingberg, and Broberg, 2007). Such behavior compromises the treatment outcome, creates occupational stress among dental staff, and it is often a cause of discord between dental professionals and patients or their parents. Moreover, dental fear anxiety may have major and long-lasting implications for the child and their family. Fearful children and adolescents may try all the possible means to avoid or delay treatment, resulting in a deterioration of their oral health (Rantavuori, et.al., 2004; Armfield, Slade, and Spencer, 2009).

Dental fear anxiety, treatments, and frequency of attendance for the dentist seem to be connected. Child with dental fear has been found to be associated with a lower use of dental care services (Milgrom, et.al., 1998). Therefore, DFA is not only a psychological problem but also a dental health problem. In contrast, regular check-ups, providing children with multiple safe and positive dental experiences could contribute to a progressive familiarity with dental care events and inoculate young children against the future development of dental anxiety (De Jongh, Muris, Horst, and Duyx, 1995; Quteish Taani, 2002; Ten Berge, Veerkamp, and Hoogstraten, 2002).

Children who fear from going to the dentist have been found to present with a higher caries experience, a worse periodontal condition, and a higher number and probability of missing teeth leading to poorer

oral health (Bedi, et.al., 1992; Klingberg, Berggren, Carlsson, and Noren,1995 ;Townend, Dimigen, and Fung,2000; Ten Berge, Veerkamp, and Hoogstraten, 2002; Rantavuori, et.al., 2004; Versloot, Veerkamp, Hoogstraten, and Martens, 2004; Taani, El-Qaderi, and Abu Alhaija,2005; Armfield, Slade, and Spencer, 2009; Nicolas, et.al., 2010; Pramila, Krishna-Murty, Chandrakala,and Ranganath, 2010).

There is a great relation between DFA and *oral health-related quality of life* (OHQoL). McGrath and Bedi have suggested assessing the negative impacts of dental disease on quality of life to appreciate the very positive contribution that healthy dentition makes to everyday life (McGrath and Bedi, 2004). DFA significantly have a bad influences on the oral health-related quality of life OHQoL (McGrath, and Bedi, 2004; Mehrstedt, John, Tonnies, and Micheelis, 2007). Similarly, Kumar et.al has investigated the effect of dental anxiety, on oral health-related quality of life (OHQoL) using the Corah Dental anxiety scale and the OHQoL-UK (W) © questionnaire. As a result, dental anxiety has a significant impact on oral health-related quality that might lead to a very bad OHQoL (Kumar, et.al, 2009).

One explanation for the relationship between DFA and poor oral health outcomes is the *vicious cycle*, according to *Berggren model* which describe it as an avoidance, increased dental problems and symptomatic treatment needs, as well as feelings of guilt, embarrassment, shame and inferiority (Berggren, Meynert, 1984 cited in Moore, Brødsgaard, and Rosenberg, 2004) .Vicious cycle develops whereby the individual's fear which leads them to avoid dental encounters. Resulting in neglected dental care and causing a worsening of the oral condition. That in return will lead to the need for more invasive and traumatic treatment causing maintenance or exacerbation of the dental fear (Berggren, and Odont, 2001; Armfield, Stewart, and Spencer, 2007; Oosterink, De Jongh, and

Aartman, 2008; De Jongh, Schutjes, and Aartman, 2011, Armfield, 2012). The development of this cycle according to *Hakeberg model* is sometimes conceived of as a spiraling, escalating process over time in which time considered as a major dimension. Thus, vicious spiral continue in development unless it is broken at any given time for any reason like referral for specialist, or major social support from family (Fig. 1) (Hakeberg, 1992 cited in Hägglin, Carlsson and Hakeberg, 2013).

Armfield in a recent study on the associations subsumed by a vicious-cycle model found that while dental fear had a strong association with both dental visiting and subsequent treatment need, the association between visiting frequency and perceived treatment need was strong across all levels of dental fear. Thus, anyone who avoided going to the dentist, irrespective of their level of dental fear, was more likely to have greater treatment need and to visit the dentist for a dental problem (Armfield, 2012).

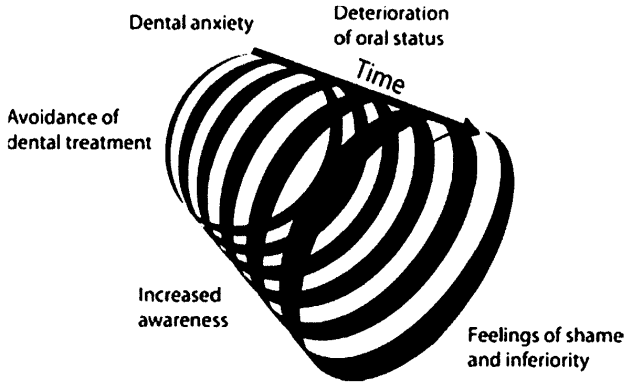

Fig. 1. The vicious spiral of dental anxiety (Hakeberg model).
(Hägglin, Carlsson and Hakeberg, 2013).

Beyond the impacts of DFA on dental care, it may also cause sleep disorders, affecting one's daily life which includes: physiological, cognitive, behavioral, health and social activities (Cohen, Fiske, Newton,

2000; Doebling and Rowe, 2000). Furthermore, it has a negative impact on one's psychosocial functioning (Mehrstedt, Tönnies and Eisentraut, 2004).

Caring for children with dental anxiety can also have a real impact on dental practitioners and dental service provision as it can be time consuming and stressful for the clinician (Moore and Brødsgaard, 2001). Indeed, anxious children are one of the key groups that make general dental practitioners refer them to secondary care services (Harris, Pender, Merry, and Leo, 2008).

DFA acquired in childhood may persist to adulthood and is a significant predictor for avoidance of dental visits in adulthood (Milgrom and Weinstein, 1993). Interestingly, Poulton et.al research has found that there may be long-term oral health implications resulting from children's dental anxiety, as dentally anxious children are more likely to be symptomatic, rather than proactive, users of dental services in adulthood (Poulton, Waldie, Thomson, and Locker, 2001). This pinpoints childhood as a critical stage for preventing and intercepting DFA, and thereby assists people to protect their oral health in the long term. Thus, prevention of fear development through the use of effective behavioral child management techniques combined with preventive dentistry should be a fundamental part of general dental practice throughout the world (Crocombe, et. al., 2011).

Measurement of Dental Fear Anxiety:

Due to the importance of dental fear anxiety, various measures have been developed in a bid to develop a uniform method of assessing and grading dental fear in children. Many of these measures quantify dental fear by measuring, scoring and summarizing the results (Folayan and Kolawole, 2004).

The currently existing measures for dental fear are numerous. Past classifications have been based on the type of the tools used for measurement. They were classified as: (1) Physiological and Hormonal measures, (2) Projective techniques (questionnaire with continuous response scale), (3) Behavioral rating scales (direct observation of the behavior during dental treatment) and (4) Psychometric scales (self-report of anxiety by child or accompanying parent) (Klingberg, Vannas Löfqvist, and Hwang, 1995).

These four types of measurement techniques have been categorized into two broad types of measurement which are used most frequently in research: (i) *Observations* by the dental staff or an independent observer of the child's behavior and physiological and hormonal functions during dental treatment, and (ii) the *child's self/own reports* of anxiety, or reports from the accompanying parent, using psychometric and projection scales. (Aartman, Van Everdingen, Hoogstraten and Schuurs, 1996, 1998). There was another reclassification for these measurements based on their possible use for assessments rather than their type. They include two main categories; epidemiological measures which are equal to self-reporting method and diagnostic tools which are equal to observational tools (Folayan and Kolawole, 2004).

(1) Physiological and hormonal measures: they are descriptive measures that can be used for diagnostic purposes. These indirect measures of dental fear have been used to assess heart rate, pulse rate, skin conductance, muscles tension, blood pressure, palmer sweating and decreased salivary secretion (Melamed, 1986a; Freeman, 1999a; Irwin and Hauger, 2002). Several investigators have measured children's physiological reactions to dental settings. Physiological and hormonal measures proved that they have some sort of ability to measure DFA

(Melamed, et. al., 1975, cited in Folayan and Kolawole, 2004; Tuutti, 1986, cited in Folayan and Kolawole, 2004).

There were a limitations of using these tests include the fact that such techniques are restricted to specific test situations requiring special equipment. This in itself could affect results because the equipment could provoke anxiety (Klingberg, 1995; Alwin, Murray and Britton, 1999). Physiological methods often require experience in using and interpreting results from the specialized equipment not used in the normal remit of practice. In addition, these methods are time consuming involving some interruption to the normal running of the dental clinic (Buchanan and Niven, 2002).

The measurement of *free cortisol* in saliva has been found to be a reliable method of measuring stress and fear in children in dental and non-dental studies (Benjamins, Asscheman, and Schuurs, 1992; Kirschbaum and Hellhammer, 1994; Krueger et.al., 2005). Stress activates the production of adrenal hormones and the amount of salivary cortisol is equal to free cortisol in serum Thus the measurement of free salivary cortisol offers a convenient way to monitor the systemic adrenocortisol response to stimuli (Chrousos and Kino, 2007). Hellhammer, Wüst and Kudielka have investigated the validity and psychobiological significance of salivary cortisol showing that salivary cortisol is a useful marker in stress researches (Hellhammer, Wüst and Kudielka, 2009).

(2) Projective techniques: they are of special interest as they enable information to be obtained about the child's personal feelings and thoughts about dental care. This kind of information is very hard to obtain through the other methods. The technique includes, for example, the child's interpretation of picture stories, the child's drawing of a person, the child being asked to tell a story about something or someone. These

measures are used commonly in clinical child psychology (Klingberg, Vannas Löfqvist, and Hwang, 1995).

The most famous types of the projective technique are *Children's Dental Fear Picture test* (CDFP) which has been developed by Klingberg and Hwang. It contains three different subtests, two of which are projective. One subtest contains pictures showing animals in dental care-related situations. The other subtest is constructed of pictures where the child can point out answers to questions. The final subtest is a sentence completion task (Klingberg and Hwang, 1994). Klingberg and his coworkers have ascertained the validity of this measurement which showed a high value of sensitivity and specificity for the measurement of dental fear (Klingberg, Vannas Löfqvist, and Hwang, 1995). The projection technique however, suffers from questionable reliability and validity due to difficulties in the interpretation of stories and the standardization of scoring (Buchanan and Niven, 2002).

(3) Behavioral rating scales: These are the most frequently used measures for diagnosing dental fear with children. The advantages of behavioral rating scales include ease of administration, non-intrusive and conceptualization (Venham, Gaulin-Kremer, Munster, Bengston - Audia, 1980). Assessment of children based on their behavior is one of the most important skills for pediatric dentists. Rating scales which employ independent observations of children's' behavior during treatment are available for children as young as 36 months of age, till school-aged youngsters (Melamed, 1986b).

Leventhal and Sharp have documented that child behavior can be observed in facial expression during dental treatment and proposed classification criteria for observations of facial expression (Leventhal and Sharp, 1965, cited in Shinohara, et.al., 2005). However, difficulties are also encountered during detailed observation of facial expression during

dental treatment. Tsuchiya, and others, have proposed a classification of child behavior during dental treatment that does provide 37 detailed items for observation (Tsuchiya, et.al., 1975, cited in Shinohara, et.al., 2005). In spite of this advantage, this classification, which is also well known in Japan as the *Behavior Evaluation Scale* (BES), does not provide an easy observation of the 37 items in daily clinical practice (Shinohara, et.al., 2005).

Furthermore, American Academy of Pediatric Dentistry (AAPD) have demonstrated assessment tools that have some efficacy in the pediatric dental setting, along with a brief description of their purpose; *Toddler Temperament Scale* (Fullard, McDevitt , and Carey, 1984, cited in AAPD, 2013a; Lochary, Wilson, Griffen, and Coury, 1993) *Eyberg Child Behavior Inventory* (ECBI)(Eyberg and Pincus,1999) and , *Behavioral Style Questionnaire* (BSQ) (Radis, Wilson, Griffen, and Coury, 1994) . These scales comprise a series of questionnaires designed to assess temperament in infancy and childhood in a range of (1-7 years). Eyberg Child Behavior Inventory has measured Frequency and intensity of 36 common problem behaviors.

According to American Academy of Pediatric Dentistry (AAPD), one of the most reliable and frequently used behaviors rating systems in both clinical dentistry and research is the *Frankl Behavioral Rating Scale* (FBRS) (AAPD, 2013a). This scale separates the observed behaviors into 4 categories according to the child's attitude and cooperation or lack of cooperation during dental treatment, ranging from definitely negative to definitely positive (Frankl, Shiere, and Fogels, 1962). Wright in 1975 has added symbolic modification (+, −) to the Frankl's rating scale and made it more applicable and easier to understand child behavior which was rated before using numbers (Wright, 1975). Frankl method lends itself a shorthand form that can be used for recording children's behavior in the

dental office. One can identify those children displaying a positive cooperative behavior by jotting down "+" or "++". Conversely, uncooperative behavior can be noted by "–" or "– –" (Wright, 1975). Although the Frankl method of classification has been a popular research tool, it does not provide definite items for clinical observation (McDonald, Avery and Dean, 2011).

(4) Self-report Psychometric scales: they are measures used to determine the prevalence of dental fear in populations. They are valuable for research, manpower and resource planning (Folayan and Kolawole, 2004). These measures are inexpensive, flexible, and easy to administer in the clinical setting. They often result in continuous score ranges that can easily be compiled and processed statistically. It is the most common method of assessing dental anxiety and their use is well-documented. However, potential problems may still exist; this is due to the significant difference of their measures in terms of administration, scoring and interpretation (Aartman, Van Everdingen, Hoogstraten and Schuurs, 1998).

Newton and Buck published a review of the different measures of fear and anxiety in dentistry. The review identified the reliability, validity and usefulness of the measures. The questionnaires were grouped into four categories according to the age and uses: (1) adult dental scales, (2) scales for children and adolescents, (3) general anxiety adult scales and (4) measures of dental pain (Newton and Buck, 2000). The second category included the *Children's Fear Survey Schedule* (CFSS) (Scherer and Nakamura, 1968), the *Venham Picture Test* (VPT)(Venham, 1979), *Dental Subscale of the Children's Fear Survey Schedule* (CFSS-DS)(Cuthbert and Melamed,1982) , *Facial Image Scale* (FIS)(Buchanan and Niven, 2002).

In a search of PubMed, it has been found that Dental Anxiety Scale (DAS) (Corah, 1969), and the Dental Fear Survey (DFS) (Kleinknecht, Klepac, and Alexander, 1973) were the most commonly cited measure of fear and anxiety in dentistry for adult. On the other hand, Dental Subscale of the Children's Fear Survey Schedule (CFSS-DS) was the most wildly used scale for children (Armfield, 2010).

The Dental Anxiety Scale (DAS) is also called *Corah's Dental Anxiety Scale* (CDAS) (Corah, 1969). It consists of a questionnaire that can be used for adults or children and provides a useful and short measure of dental anxiety (APA, 2000). It consists of four multiple choice questions, each with five alternative responses ranging in value from 1 to 5, with 1 being the calmest choice and 5 being the most anxious choice. Corah considered anxious patients to score 13 or higher on the scale (Corah, 1969).This questionnaire has been criticized as exhibiting a range scores that are too narrow to be used effectively in clinical studies and for not covering all aspects of dental fear (Newton & Buck, 2000).

To overcome the shortcomings of the DAS, the original questionnaire has been modified by the addition of a fifth item that asks about responses to the administration of local anesthetic and by a change in the response format (Newton & Buck, 2000). The scale called *Modified Child Dental Anxiety Scale* (MCDAS) (Humphris, Morrison and Lindsay, 1995). The scale has shown advantageous psychometric properties in comparison with the original DAS. Its reliability and validity have also been proven to be adequate (Haugejorden and Klock, 2000; Ilguy, Ilguy, Dinçer and Bayirli, 2005; Humphris, and Hull, 2007; Mărginean and Filimon, 2012).

Children's Fear Survey Schedule (CFSS) has been developed by Scherer and Nakamura. It consists of eighty items on a 5-point respond scale (Scherer and Nakamura, 1968). It has been demonstrated to have a

good reliability and validity for measuring dental fear in children (Milgrom, Jie, Yang, and Tay, 1994). The cumbersome nature of the questionnaire, designed to be filled by the child patient, has limited its use despite establishing of a validity report (Scherer and Nakamura, 1968; Carson and Freeman, 1997). As a result, CFSS was revised and shortened to reach fifteen items with a 5-point response scale. It was initially presented by Cuthbert and Melamed and called *Dental Subscale of Children's Fear Survey Schedule* (CFSS-DS) (Cuthbert and Melamed, 1982). The schedule was tested for reliability and validity by Folayan and Otuyemi. It was found to be highly reliable and had moderate significant validity (Folayan and Otuyemi, 2002). CFSS-DS has been considered the most commonly used questionnaire to assess DFA among children and adolescents. This instrument has been translated into several languages, and it is available in two versions, one for parents and one for the children and adolescents themselves (Chellappah, Vignehsa, Milgrom, and Lam, 1990; Ten Berge,et. al., 2002; Lee, Chang, and Huang. 2007).

In the previous measurements, parents are supposed to fill the questionnaire for evaluation of dental anxiety levels in young children because of the child's inability to comprehend the content of the questionnaire (Klingberg, 1994). Although parents are required to fill the schedule for their children, older children can also fill the questionnaire for self-evaluation. The inability of young patients to fill these questionnaires themselves is a limiting factor as the opinion of the very young child cannot be obtained directly (Folayan, Idehen, and Ojo, 2004).

It remains unclear, however, whether parents are able to accurately estimate dental fear on behalf of their child. Based on the researches regarding psychological problems in general, the agreement between informants (parent and child) with regard to the child's level of dental anxiety can be expected to be far from perfect (De Los and Kazdin,

2004). Only few studies have revealed that explicitly in the agreement between parental rating of child anxiety and their child's own rating, and all of them have shown that there is a questionable agreement between informants (Folayan, Idehen, and Ojo, 2004; Gustafsson, et. al., 2010; Luoto, et. al., 2010). Moreover, Krikken and his colleagues have investigated the parent-child agreement on child dental fear using DFSS-SD and have concluded that parents tend to estimate the dental fear of their children slightly higher than their children (Krikken , Krikken 2013).

Children may not have fully developed the ability to recognize and interpret the physiological and cognitive manifestations of fear and anxiety, therefore measures of dental fear in children have tended to concentrate on the behavioral component of fear or have used non-verbal tools such as picture. Accordingly, various techniques have been developed to circumvent this problem. The child level of fear and anxiety can be indicated when he/she picks out or points to a picture that illustrates his/her perceived emotion. These picture scales allow for limited cognitive and linguistic skills. They can be easily administered and scored in a clinical context (Venham, et.al., 1980; Klingberg, 1995).

One of the few picture scales available is the *Venham Picture Test* (VPT). In this test, children are presented with eight pairs of pictures, each depicting cartoon boys in contrasting moods. They are asked to choose the picture from each pair that they most feel like at that time. The advantage of this measure is that it is relatively easy to administer and score (Venham, 1979). Validity has been demonstrated by showing that the VPT distinguishes between children referred to a dental hospital for specific anxiety/cooperation problems, and those referred for other reasons (Alwin, Murray, and Niven, 1994). However, The VPT does have some limitations. First of all, the figures on the cards are all male; this

may present problems when the young patient is a girl. In addition, some of the figures are ambiguous in what they are portraying. Finally, the scale still takes some time to complete; this is a salient issue when considering very young patients (Buchanan, and Niven, 2002).

Facial Image Scale:

Indeed, the most developed picture tests are the *Facial Image Scale* (FIS). FIS has been developed by Buchanan and Niven and can be used as an indicator of fear. It is a visual analogue scale comprising of a row of five faces ranging from very happy to very unhappy. The tool has found to show a high correlation with the Venham Picture Test (VPT) when tested for validity. The FIS has a fixed number of faces (not a continuous line) for the children to choose from, thus making it easier to score in a clinical situation, and easier for very young children to understand (Buchanan, and Niven, 2002). Buchanan and Niven have tried to provide further evidence for the validity of the FIS, in which it has obtained FIS ratings from the parent and child in the waiting room of a dental hospital and the same child and their dentist's ratings in the dental chair. It has reported a good correlation with clinically noticeable dental fear in children (Buchanan and Niven, 2003). To conclude, it is constructed to measure situational dental fear especially for young pediatric children, therefore, AAPD had recommended using this measure for very young children in particular (AAPD, 2013a).

Psychological Development of Preschool Children:

Child development involves more than physical growth, which often implies only an increase in size. It implies a sequential unfolding development in general that may involve changes in size, shape, function, structure, or skill (McDonald, Avery, and Dean, 2011). There are four

stages of psychological development which include: Infants (birth - 3 years), preschoolers (3 - 6 years), schoolers (6 -12 years) and finally adolescents (12 -19 years). Psychological development of preschoolers children consists of 3 important categories of development; emotional, social, and cognitive developments (Pinkham, Casamassimo, and McTigue, 2005).

Emotional Development:

The contemporary description of emotional development is based on *Sigmund Freud's psychoanalytic theory* of *personality development* (1939). He stressed the importance of childhood events and experiences, but he almost exclusively focused on mental disorders rather than normal functioning. According to Freud, child development is described as a series of 'psychosexual stages'. Freud has outlined the preschooler children as *phallic stage*. In this stage, children sexual identity emerges and a certain degree of masculine or feminine qualities adopted by child. Besides, their stereotypical sex roles emerge, the children instincts or wishes (id) and his means to satisfy his wishes (ego) become controlled by a moral value (superego) like feeling shame, guilt, pride, etc. In the phallic stage, psychosexual development of boys and girls is equal, that each initially experiences sexual desire (libido) for mother, and aggression towards father "*Oedipus complex*" (Boeree, 2006a; Cherry, 2013a). In the contrary, student--collaborator Carl Jung proposed that girls experienced desire for father and aggression towards mother via the "*Electra complex*" (Cherry, 2013b).

Personality development has been greatly extended beyond Freud's theory by Erik Erikson. *Erikson's Theory of Psychosocial Development* (1963, 1982) is based on how people learn to interact with others based on their personal experiences. His "*eight ages of man*" illustrate a progression through a series of personality development stages (Robbie,

1993; Boeree, 2006b). Erikson called the preschooler children as *development of initiative vs. guilt*. In this stage, the child continues to develop greater autonomy, but now he adds planning and vigorous pursuit of various activities to it. Children also began to assert his power and self-control. The initiative is usually shown by physical activity and motion. At this stage, a child is inherently teachable. One part of initiative is the eager modeling of behavior of those whom he respects. The opposite of initiative is feeling guilt or anxious when their activities have unhappy end for them. This is due to their conscience development (Boeree, 2006b; Cherry, 2013a).

Another important emotional factor in this stage is aggression. Aggression is caused by child's inability to exert self-control. There are two kinds of aggression; instrumental and hostile types. Instrumental aggression is designed for achieving goal such as taking a piece of Kandy from a sibling. The other hostile aggression is intended to cause hurt or pain to another person (Pinkham, Casamassimo, and McTigue, 2005).

Social Development:

One of the areas that have received great attention from psychologists is the socialization of children. Socialization of children takes into accounts both interpersonal relationships and independent functioning skills (McDonald, Avery and Dean, 2011).

Alfred Adler was the first to emphasize the importance of the social element in child development. In 1912 he founded the society of *Individual Psychology*. Adler's theory suggested that every person has a sense of inferiority. From childhood, people work toward overcoming this inferiority and asserting their superiority over others "striving for superiority" (Boeree, 2006c; Cherry, 2013c).

Another important theory in this field is *Social Learning theory* by Albert Bandura (1969). According to this theory of child development, children learn new behaviors from observing the actions of others including parents and peers, and they develop new more skills and acquire new information (Cherry, 2013a).

Preschooler stage is the time for enormous social growth in the child development. By age three, a child can understand, take turn, and by age four, he may cooperate in play as well. By age six, a child is capable of simple team game. During this stage, a value system develops and self-discipline is imposed on basic argues. The social transformations of preschooler ensure that their life will never be the same (Pinkham, Casamassimo, and McTigue, 2005).

Cognitive Development:

It refers to the progressive and continuous growth of perception, memory, imagination, conception, judgment, and reasoning. It is the intellectual counterpart of one's biological adaptation to the environment (Nicolosi, Harryman, and Kresheck, 1989). Cognition also involves the mental activities of comprehending information and the processes of acquiring, organizing, remembering, and using knowledge. This knowledge is subsequently used for problem solving and generalization to novel situations (Owens, 2008)..

Many theories have been proposed regarding how children learn about their environment and how cognitive development proceeds. One of the significant theorists in this area was a Swiss psychologist Jean Piaget (1896-1980). Piaget has been one of the most influential figures in the history of psychology (Diessner and Tiegs, 2001). He developed his cognitive theory by actually observing children (some of them were his own children) (Piaget, 1954).

There are four cognitive developmental stages categorized by Piaget, which are sensori-motor stage, preoperational stage, concrete operations stage, and, formal operations stage (Piaget, 1954; 1966). The preschooler children are classified into the *preoperational stage*. In this stage, which is ranging from 2 -7 years, the child is able to represent action through thought and language. His intellectual development at this stage is called *prelogical* (magical). Children attribute life to inanimate objects, so they believe that anything that moves is alive. This is called "*animism*"(Piaget, 1954; 1964; 1966).

As the child matures, his mental representations are able to pretend, it is a short step to the use of *symbols*. A symbol is a thing that represents something else. Another good example of symbol use is *creative play*, wherein checkers are cookies, and so on. Along with symbolization, there is a clear understanding of past and future. On the other hand, the child is quite *egocentric* during this stage, that is, he sees things pretty much from one point of view (his own!). Thus, child may hold up a picture, so only he can see it and expects you to see it too (mountains study) (Piaget, 1954; 1964; 1966; Boeree, 2006d). Perhaps, the most famous example of the preoperational child's centrism is what Piaget refers to as their inability to conserve liquid volume. It is the development of the child's ability to *decenter* that marks him as having moved to the next stage (Piaget, 1954; 1964; 1966; Boeree, 2006d).

Piaget's cognitive development theory has strongly influenced the way we view how individuals learn and the processes that people go through while constructing their own knowledge (Reedal, 2010; Singleton and Shulman, 2014).

There was another influential cognitive developmental theory made by a Russian psychologist, Lev Vygotsky which is *sociocultural theory* (1896-1934). He argued that all intellectual abilities are social in origin.

Language and thought first appear in early interactions with parents, and continue to develop through contact with teachers and others. In conclusion, interactions with other people are essential for maximum cognitive development to occur (Vygotsky, 1978). Traditional intelligence tests ignore what Vygotsky called the "*zone of proximal development* (ZPD)" i.e., the level of performance that a child might reach with an appropriate help from a supportive adult. Such tests are "static" measuring only the intelligence that is already fully developed (Robbie, 1993; Neisser, et.al., 1996). So during preschooler stage, children engage in much verbal thought, in which language and thinking are integrated and mutually supportive. Verbal thought allows the acquisition of complex concept. Self-directed speech is a behavior that shows that young children are using language to guide learning (Cook and Cook, 2005).

Intelligence:

In the lay literature, one often hears about the testing of intelligence rather than cognition. The two terms, however, are often considered synonymous. The term cognition refers to the highest levels of various mental processes such as perception, memory, abstract thinking and reasoning, and problem solving (Boring, 1929, cited in Sparrow and Davis, 2000). To summarize, cognitive process is the process of using knowledge and being driven by knowledge (Kagono, 2006).

Wechsler defined intelligence as the overall capacity of an individual to understand and cope with the world around him, and assumed one general component of intelligence and several additional mental abilities. In another word, he described intelligence as a global intellectual capacity and specific abilities and that "intelligence is not the mere sum of these abilities" (Wechsler, 1939 cited in Georgas, Weiss,

van de Vijer, and Saklofske ,2003; Wechsler, 1958 cited in Blomqvist, et.al., 2013). Experts have defined intelligence according to two themes. The first theme focused on the individual learning from experience. The second theme focused on the individual's ability to adapt to the environment (Williams, 1996).

Sternberg proposed three types of intelligence: analytical, creative, and practical. However, most of the intelligence tests measure primarily the analytical one which is the type of thinking emphasized in school learning (Sternberg, 1985 cited in Georgas, Weiss, van de Vijer, and Saklofske, 2003). The point is that intelligence is not only the type of cognitive activity manifested in educational settings but also includes any cognitive activities involved in every day settings (Williams, 1996).

Although there are many different definitions and theories about cognition and intelligence, almost all of them are concern with the existence of multiple cognitive component processes (Sternberg and Kaufman, 1998). Regardless of the careful thought on the definition of intelligence, there is no unique definition of intelligence (Cohen and Swerdlik, 2004).

It is generally accepted that intelligence is inherited but can also be related to the environment. While some studies showed that heredity is an important factor in determining intelligence, it was also suggested that environment is a critical factor in determining the extent of its expression. In short, our genes determine the quality of our intelligence, our ability to integrate and the process information. The level of our intelligence determines how well we cope with changes in our environment (Neisser, et.al., 1996; Brain Matrix, 2013).

Intelligence Quotient:

During the application of intelligence test, test-takers may be asked to give the meanings of words, to complete a' series of pictures, to indicate which of the several words does not belong with the others. Their performance can then be scored to yield several sub-scores as well as an overall score. By convention, overall intelligence test scores are usually converted to a scale in which the mean is 100 and the standard deviation is 15. Approximately 95% of the population has scores within two standard deviations of the mean, i.e., between 70 and 130. For historical reasons, the term "IQ" is often used to describe scores on tests of intelligence. It is originally referred to as "*Intelligence Quotient*" or the general index of cognitive ability that has been formed by dividing a so-called mental age by a chronological age, but this procedure is no longer used (Neisser, et.al., 1996).

In fact, individuals rarely perform equally well on all the different kinds of items included in a test of intelligence. Nevertheless, subtests measuring different abilities tend to be positively correlated, for instance, people who score high on one such subtest are likely to be above average on others as well. These complex patterns of correlation can be clarified by factor analysis, but the results of such analyses are often controversial themselves. Today, there are two major schools of thought on the nature of intelligence. The first one, supported by such psychologists believes that all intelligence comes from one *general factor*, known as **g**, which has been emphasized by Spearman (1927). The proponents of the other school of thought think that there is more than one general type of intelligence, or in other words, there are different types of intelligences (Paik, 1998). In fact, both of Gardner's theory (1983) and Sternberg's theory (1985) have been considered the two major theories that describe a

multiple forms of intelligence or what has called "*multiple intelligences*" (Neisser, et.al., 1996).

Tests of Intelligence:

Intelligence test interpretation remains one of the most controversial and divisive issues in psychological assessment. Tests of intelligence itself (in the psychometric sense) come in many forms. Some use only a single type of item or question while other use a multiple item test (Neisser, et.al., 1996).

Single Item Intelligence Tests: these tests aim to examine single specific purposes intelligence from the cognitive index such as verbal intelligence. Examples of single item tests include the *Peabody Picture Vocabulary Test* (PPVT) by Lloyd Dunn (1959) and the *standard Raven's Progressive Matrices* (RPM) by Raven (1960).

The Peabody Picture Vocabulary Test (PPVT) scale (1959) measures verbal intelligence. It is a multiple-choice test designed to evaluate the receptive vocabulary (assessed through hearing and by indicating "yes" or "no") of children and adults. The test is administered to individuals from age 2.5 years through adulthood. It requires no reading skills, and it is untimed (Dunn and Dunn, 1981, cited in Grigorenko, and Stemnberg, 1999). The PPVT have been revised to *Peabody Picture Vocabulary Test, Fourth Edition* (PPVT-4) (Dunn and Dunn, 2007).

Raven's Progressive Matrices (RPM) is a nonverbal, untimed test (Raven, 1960 cited in Gudjonsson, 1995). A separate test, referred to as *Colored Progressive Matrices* (RCPM) (Raven, 1965, cited in Wright, Taylor and Ruggiero, 1996), has been developed for children in the (5-11) age range. The latest edition of the tests has been published in 1995. This test series is not generally appropriate for preschoolers (Fields,

1997). The RPM test is a commonly used test of general human intelligence. It is somewhat unique as a general intelligence test, as it focuses on visual problem solving (Kunda, McGreggor, and Goel, 2009).

Multiple Item Intelligence Tests: Although the previous instruments are useful for specific purposes, there are more familiar measures of general intelligence with multiple items such as the *Stanford-Binet tests* (1905-1915) , the *Wechsler tests* (1967) ,*McCarthy Scales of Children's Abilities* (1972) , The *Kaufman Assessment Battery for Children* (K-ABC) (1983), *Woodcock-Johnson Psycho-Educational Battery-Revised: Tests of Cognitive Ability* (WJ-R COG) (1989), *Differential Ability Scales* (DAS) (Elliot, 1990) and the *Mullen Scales of Early Learning* (MSEL) (Mullen, 1995) have included many different types of items, both verbal and nonverbal (Grigorenko, and Stemnberg, 1999).

Wechsler Intelligence Scales measure intellectual performance as a multidimensional construct. Wechsler created the Intelligence Scales in 1939. Since 1939, four scales have been developed and subsequently revised, to measure intellectual functioning of children and adults. *The Wechsler Memory Scale- IV* (WMS-IV) (Wechsler, 2009), *Wechsler Adult Intelligence Scale-IV* (WAIS- IV) (Wechsler, 2008) which has been intended for use with adults, The *Wechsler Preschool and Primary Scale of Intelligence-IV* (WPPSI-IV) (Wechsler, 2012) which has been designed for children age (4-6.5 years), and Finally, *Wechsler Intelligence Scale for Children-IV* (WISC- IV) (Wechsler, 2003) which has been designed for children ages (6-16 years). The Wechsler's scales include both verbal and performance subtests to compute verbal and performance IQs. Verbal subtests generally require knowledge of verbal concepts whereas performance subtests rely more on spatial relations skills. Wechsler's scales has adequate validity, researchers conducted several factor-analytic studies on the different version of Wechsler's

scales (Gyurke, 1991; Kaplan, Fox, and Paxton, 1991; Wechsler, 1991; Kaplan, 1992; Kaufman and Lichtenberger, 1999; Wechsler, 2002; Georgas, Weiss, van de Vijer, and Saklofske, 2003; Grant, 2010).

However, the Wechsler's scales in general have a number of drawbacks. The major one is the length of the test: Many young children cannot remain focused and attentive during the entire administration of the test. The Wechsler's scales do not provide an alternative stopping rule, which makes the test rather frustrating for young children. In addition, many subtests rely heavily on extensive expressive language skills (e.g., comprehension and vocabulary) (Whitten, Slate, Jones, and Shine, 1994; Frazier and Youngstrom 2007; Bowden, et. al., 2008).

The *McCarthy Scales of Children's Abilities* (MSCA) (McCarthy, 1972, cited in Sattler, 1992), it forms a well standardized and psychometrically sound measure of the cognitive abilities of young children (ages 2.5- 8.5 years). The test is individually administered and takes about 45 to 60 minutes to administer, depending on the age of the child. Construct validity; however, appears to be questionable, with different numbers of factors revealed in different studies and for boys and girls (Grigorenko, and Stemnberg, 1999; Kaplan and Sacuzzo, 2010).

Kaufman Assessment Battery for Children (K-ABC) (Kaufman and Kaufman, 1983 cited in Glutting, McGrath, Kamphaus and McDermott, 1992) measures both intelligence and achievement. It was designed to assess functioning in both normal and exceptional children of the ages (2.5 - 12.5) years. Functioning is assessed through four global indicators: sequential processing, simultaneous processing, nonverbal performance, and achievement. It has been revised to the *Kaufman Adolescent and Adult Intelligence Test* (KAIT) (Kaufman & Kaufman 1993). However, the K-ABC/KAIT is not recommended for use as the primary instrument for identifying the intellectual abilities of normal or special children

either in research or in clinical settings (Rust and Yates, 1997; Grigorenko, and Stemnberg, 1999).

Woodcock-Johnson Psycho-Educational Battery-Revised: Tests of Cognitive Ability (WJ-R COG) (Woodcock and Johnson, 1989, cited in Evans, Tannehill, and Martin, 1995) is designed for individuals aged 24 months through 95 years. The battery contains 21 tests of cognitive ability divided into standard and supplemental batteries. WJ-R COG has been revised to *the Woodcock-Johnson® III Tests of Cognitive Abilities* (WJ III COG) (Woodcock, McGrew, and Mather, 2001a, 2001b, 2001c, 2007a, 2007b). This battery comprises a wide age-range, comprehensive system for measuring general intellectual ability **g** (Schrank, McGrew, and Woodcock, 2001). Unfortunately, these abilities are underrepresented in the WJ-R COG variant for young children (McGrew and Hessler, 1995; McGrew and Murphy, 1995). Moreover, due primarily to the limited attractiveness of the stimuli for younger children, the lack of discontinuation rules, and a certain dependency on verbal responses, the WJ III COG test is rarely used in early-child assessment (Schrank, and Wendling, 2009)

The *Differential Ability Scales* (DAS) (Elliott, 1990a) form an individually administered battery of cognitive and achievement tests for children and adolescents from ages (2.5 - 17 years). The Cognitive Battery is organized into a set of core subtests and a set of diagnostic subtests that provide additional information on specific abilities (Elliott, 1990b). It has been shown to produce reliable and valid indicators of cognitive ability (Aylward, 1992; Reinehr, 1992; Alfonso and Flanagan, 1999). The main limitation of the test is the length of direction and the high number of basic concepts (Di Cerbo and Barona, 2000; Elliott, 2005). Currently it is revised into its second edition (DAS-II) (Elliott, 2006) and it has also been validated later (Fiorello, et.al., 2008).

The *Mullen Scales of Early Learning* (MSEL) (Mullen, 1995) are designed to assess children's development from birth to the age of 68 months. The child should be assessed in five different domains: gross motor, visual reception, fine motor, receptive language, and expressive language. The domain data can be combined into the overall early learning composite score which represent the so-called general intellectual ability. The information related to content validity presented in the MSEL manual is inadequate. No evidence of MSEL's ability to identify children with learning disabilities or mental retardation is presented in the test manual (Byrnes and Fox, 1998).

Stanford-Binet Intelligence Test:

In late 1901, the French research psychologist Alfred Binet (1857-1911) revealed to his colleagues his intention to measure intelligence using specially developed tests and measures (Thorndike, Hagen, and Sattler, 1986). At a conference in Rome in April 1905, a paper prepared by Binet and a physician Theodore Simon that announced the development of an objective measure capable of diagnosing different degrees of mental retardation(Wolf, 1973, cited in Becker, 2003). This announcement was followed 2 months later by the publication of the *Binet-Simon Intelligence Test* in L'Anée Psychologique (Binet & Simon, 1905, cited in Becker, 2003). The 1905 Binet-Simon scale differed greatly from the scale that we use today. The original scale consisted of 30 pass/fail items/tasks. The tasks were also different from today's items and required a combination of mental and physical strategies to complete each task (Thorndike, Hagen, and Sattler, 1986; Roid, 2003a; Chase, 2005).

The first revision of the Binet scale was developed in 1908; however, the majority of the scale was left unchanged. By 1911, the scale

was in its second revision and the age range had been extended through adulthood. The scale has been rebalanced, by including five items for each age level, which were language, auditory processing, visual processing, learning and memory, and problem solving (Roid, 2003a; Chase, 2005).

In 1916, Lewis Terman of Stanford University authored Stanford revision and extension of the Binet-Simon Intelligence Scale (Terman, 1916, cited in Becker, 2003). This manual presented translations and adaptations of the French items, as well as new items that Terman had developed and tested between 1904 and 1915 that was published in the United States. After publication of his changes, a revised version of the Binet-Simon scale was published in 1916 and was entitled the *Stanford-Binet Intelligence Scale* which was the most comprehensive revision of Binet's original scale. (Minton, 1988 cited in Becker, 2003; Roid, 2003a; Chase, 2005).

By 1937 Terman had revised the Stanford Binet, with the help of Maud Merrill, into the *Revised Stanford-Binet Intelligence Scale*. The revision included two alternate forms, the *L form* (for Lewis) and *M Form* (for Maud) Stanford-Binet Intelligence Scales, each with 129 items (Terman and Merrill, 1937, cited in Becker, 2003). In the 1950s, Merrill took the lead in revising the Stanford-Binet, selecting the best items from Forms L and M to be included in a new version of the test. The two forms from 1937 were combined to create the *Stanford-Binet Intelligence Scale, Form L-M* (Terman and Merrill, 1960 cited in Becker, 2003). It was different from its predecessor in that it included a deviation intelligence quotient with a normative mean of 100 and a standard deviation of 16 (Silverman and Kearney,1992).

The fourth revision of the Stanford-Binet was *The Stanford-Binet Intelligence Scale: Fourth Edition* (SB-IV) (Thorndike, Hagen, and

Sattler, 1986). It administered intelligence test used to assess the cognitive abilities of individuals from age 2 years to adulthood. It has retained much of the content of the Form L-M edition: similar items were grouped together into point scales. The fourth edition was based on a hierarchical model of intelligence. The four main areas assessed were verbal reasoning, abstract/visual reasoning, quantitative reasoning, and short-term memory derived from a total of 15 subtests (full battery test). It did provide an overall score that appraises general cognitive functioning, it is called *composited score* (overall IQ). SB-IV permits also calculation of any combination of subtests psychologists wish to regroup-promoting flexibility in administration and interpretation. Therefore, the full battery test is not necessarily used to measure the intelligent Quotient (IQ); an item-reduction short form (*Abbreviated test battery*) is proved to be a more comparable estimate of the full battery composite (Nagle, and Bell, 1995; Youngstrom, Glutiing, and Watkins, 2003).

To establish the starting point (basal level), the Vocabulary subtest of the fourth edition was used as a routing subtest, along with the subject's chronological age (Grigorenko and Stemnberg, 1999; Roid, 2003a). SB-IV subtest scores had a mean of 50 and a standard deviation of 8. The SB-IV was standardized on 5000 individuals with somewhat under-represented low socioeconomic statues (SES) and over-represented high SES participants (Thorndike, Hagen, and Sattler, 1986; Roid, 2003a).

Overall, the validity of the SB-IV is considered adequate. However, there is a general consensus regarding the two factor structure of the SB-IV for preschoolers; verbal and nonverbal factors (Molfese, et. al., 1992). The vocabulary, comprehension, absurdities, and memory for sentences are forming a verbal comprehension factor. On the other hand, pattern analysis, copying, quantitative, and bead memory forming a

nonverbal reasoning/ visualization factor (Sattler, 1992). As for validity, dozens of studies have been carried out comparing the SB-IV with other major intelligence tests, such as the Wechsler's scales (Brown and Morgan, 1991; McCrowell and Nagle, 1994). K-ABC (Lamp and Krohn, 1990; Rothlisberg, and McIntosh, 1991), and others. In general, correlations between the total scores of the SB-IV and other instruments have been moderated to be high (McGrew and Flanagan, 1996; Simpson, et.al., 2002) and test scores for exceptional groups (e.g., learning disabled, gifted) have been essentially similar (Sattler, 1992; Cornelius, et.al., 2010). Therefore, the SB-IV appears to be a valid measure of many aspects of intellectual functioning for children of most ages and for a variety of exceptional subpopulations (Grigorenko and Stemnberg, 1999; Youngstrom, Glutiing, and Watkins, 2003; Chase, 2005).

In fact, SB-IV has been translated to Arabic language, and then it has been standardized and normalized to meet the Egyptian people norms by Lewis Malika in Ain Shams University. Because of that, we can apply this test to Arabic children easily and make many researches about their cognitive behavior and to study their impact in many applications (Malika, 1998a; 1998b; 1998c).

Finally in 2003, the Fifth Edition (SB5) (Roid, 2003a; 2003b) was published. This edition attempts to carry on the tradition of the prior editions while taking advantage of current research in measurement and cognitive abilities. Like the Fourth Edition, the SB5 includes multiple factors. These factors are modified from those on the Fourth Edition, but they represent abilities assessed by all former versions of the test. The use of routing subtests continues, with a nonverbal routing test added to complement vocabulary (Becker, 2003). The Fifth Edition reintroduces the age-scale format for the body of the test, presenting a variety of items at each level of the test. It covers the widest age range of any Stanford-

Binet (2 through 85+ years) and addresses the criticism about verbal content, norms, and the standard deviation (Roid, 2003a; 2003b). Recently it has also been translated to Arabic language but it still needs many training to be applied correctly (Faraj, 2010).

Impact of Intelligence on Child Behavior in Dental Clinic:

It is still unclear why some children get anxious in the dental situation while others, with a comparable dental history, do not (Krikken, Ten Cate, and Veerkamp, 2010). Cognitive elements play a key role in dental anxiety, and might have an influence on the child's response to the dental setting (Kain, Mayes, Weisman, and Hofstadter, 2000; Carrillo-Diaz, Crego, Armfield, and Romero-Maroto, 2012a).

Many psychologists believe the general index of cognitive ability (IQ) to be the best single predictor of child success in his life (Schmidt and Hunter, 1992). The link between low IQ and childhood psychopathology has been registered in many studies (Carlson, Lahey, and Neeper, 1986; Greenberg, Kusche, Cooke, and Quamma, 1995). Hodges and Plow further showed that children with anxiety had a lower level of IQ than children without anxiety based on examination of the Full Scale IQ from the WISC-R (Hodges and Plow, 1990).

Some researchers have tried to assess and evaluate the correlation between child's intelligence and dental fear, beside that they correlate between child's intelligence and their behavior in the dental clinic. Di Bona has found in his research that a more intelligent child may show more fear in the dental situation that can be ascribed to their overactive imagination (Di Bona, 1973). On the contrary, Rud and Kisling have investigated the influence of mental development on children acceptance of dental treatment on 108 individuals with age of 3-9 years. They have reported that children with lower IQ (< 68) showed more fearful behavior

and needed a significantly longer time (25%-30% more) to accept the dental treatment situation (Rud and Kisling, 1973). In another study by Toledano and his colleagues, they have reported that high intelligence quotients (IQ) were related to a lower level of dental anxiety. Their study group comprised 40 children, 8-16 years of age with no previous experience of dental treatment (Toledano, Osorio, Agullera, and Pegalajar, 1995).

Cognitive research on the antecedents of adult dental fear has taken into account some cognitive variables, such as negative thoughts and the dentist's performance during treatments (De Jongh and ter Horst 1993; 1995; De Jongh, Muris, Schoenmakers, and ter Horst, 1995). Another variable of dental fear is the belief about the dentist's professional skills (Milgrom, Weinstein, and Getz, 1995). In addition, patients' expectations of the probability that a negative event will occur during the dental treatment, and the perceived aversiveness of negative dental events has been found to be associated with their levels of dental fear and anxiety (Kent, 1985 , cited in Carrillo-Diaz, Crego, Armfield, and Romero-Maroto, 2013; Arntz, van Eck, and Heumans, 1990).

As result, some researches have highlighted the influence of cognitive factors as determinants of dental anxiety. The *Cognitive Vulnerability Model* (Armfield, 2006) proposes that the key point is the automatic activation of a vulnerability schema when the fearful patient is exposed to dental stimuli. The vulnerability schema comprises appraisals of the dental event as being uncontrollable, unpredictable, potentially dangerous or harmful, and disgusting (Armfield, Slade, and Spencer, 2008). In other words, the role of cognitions in the etiology of children's anxiety-related pathology has been established by Muris and Field. Furthermore, Muris and his colleagues measured cognitive development of children between 4-13 years. They have found that the cognitive

development has influenced children's anxiety and emotional reasoning (Muris and Field, 2008; Muris,Vermeerb, and Horselenberg, 2008).

Moreover, Savin, and Maxim have carried out a study on 88 Children aged 6-8 years using complex assortment of investigations. The results of all the tests showed that there was a significant correlation between the IQ level and the behavioral response manifested by the child. The subjects with higher IQ level presented a normal conduct (Savin, and Maxim, 2008).

However, Ali investigated the relation between child intelligence and behavior in the dental office at Mansura University, Egypt. One hundred and eighty children (4-7 years) have been subjected to *Porteus Maze Test* (PMT) which is a single nonverbal type of IQ test. She concluded that the child IQ had no effect on his behavior during examination, local anesthesia, and cavity preparation (Ali, 2010).

Aminabadi and his colleagues have tried to evaluate the impact of IQ and emotional intelligence quotient (EQ) on 107 children's anxiety and behavior in the dental setting. Their age was between7-12 years. It was found there was an absence of significant relationship between IQ score and child behavior or IQ score and anxiety. But they concluded that, early identification of intellectual abilities could allow for the possibility of early interventions in management of behavioral problems. (Aminabadi, et.al., 2011).

In an effort to deepen knowledge regarding the etiology of dental fear, Carrillo-Diaz and his colleagues have compared the relative predictive power of a set of cognitive and non-cognitive factors (such as experienced a negative dental event, being exposed to fearful relatives, and trait-based negative mood) in accounting for dental anxiety scores. Cognitive factors were found to be the best individual predictors of dental fear. Furthermore, the analysis of cognitive mechanisms involved in

dental anxiety was revealed as a potentially important point in a better understanding of this problem (Carrillo-Diaz, Carrillo- Diaz, Crego, Armfield, and Romero-Maroto, 2012b).

Carrillo-Diaz and his colleagues in another study have provided an empirical evidence of the association between cognitive vulnerability scheme and dental anxiety in children. They examined 160 children in a questionnaire about their oral health status. In particular, the study results have been consistent with the idea that children's negative perceptions about their oral health status might activate the cognitive vulnerability schema, which would be associated with a higher level of dental fear. This result has also been supported in a child population. Thus, children who think that negative dental events are more likely and more horrible or who appraise the dental treatment situation more negatively exhibit higher levels of dental fear (Carrillo- Diaz, Crego, Armfield, and Romero-Maroto, 2012c).

Regular dental visits, as well as dental treatments, can influence, in different ways, cognitive elements associated with dental anxiety in children (Carrillo- Diaz, Crego, Armfield, and Romero-Maroto, 2012a). Dental fear was associated with an irregular pattern of dental visits. Thus, cognitive vulnerability was strongly linked to dental anxiety. For those children who expected a lower likelihood of negative dental events or appraised them in a less aversive way, the relationship between cognitive vulnerability and fear was attenuate (Carrillo-Diaz, Crego, Armfield, and Romero-Maroto, 2013).

Recently, Blomqvist and others have investigated the relationship between cognitive ability and DFA in a population-based group of children with identified behavior and learning problems. Seventy children in 11 years old were assessed with regard to DFA using the Children's Fear Survey Schedule Dental Subscale (CFSS-DS). Children cognitive

ability was assessed using the Wechsler Intelligence Scale for Children (WISC- II). The results reveal that DFA are significantly correlated to the verbal intelligence quotient (IQ) but not to any other cognitive index. In brief, such results indicate that the child's verbal capacity may be one factor of importance in explaining dental fear and negative behavior in children (Blomqvist, et.al., 2013).

Child Management in Dentistry:

Child dental management is defined as the means by which the dental health team effectively and efficiently performs treatment for a child and at the same time instills a positive dental attitude (Wright, 1975). According to AAPD the behavior management was rephrased into "*Behavior guidance*" which is a continuum of interaction involving the dentist and dental team, the patient, and the parent directed toward communication and education. Its goal is to ease fear and anxiety while promoting an understanding of the need for a good oral health and the process by which it's achieved (AAPD, 1990, 2013a).

The term behavior is broadly used to include the entire complex of observable and potentially measurable activities including motor, cognitive and physiological classes of responses (Wright, 1975).

The label "uncooperative" is frequently applied to children who have experienced difficulty in the dental clinic, sometimes on only one occasion (Freeman, 1999b). The child's behavior on every dental visit depends on variables like age (McKnight-Hanes, Myers, Dushku, and Davi, 1993) , parental behavior, and anxiety (Klingberg, Berggren, Carlsson, and Noren, 1995; Peretz, Nazarian, and Bimstein, 2004) , awareness of their dental problem (Radis, Wilson, Griffen, and Coury, 1994 ; Jensen and Stjernqvist, 2002), past medical / dental history (Brill,2002; Baier, et.al., 2004), behavior management, and procedural

techniques performed by the dentist (Klingberg and Broberg, 1998; Arnup, Broberg, Berggren, and Bodin, 2002; Sheller ,2004).

Classifications of Children Behavior in Dental Clinic:

The dentist should include an evaluation of the child's cooperative potential as a part of a treatment planning (Do, 2004). Numerous systems have been developed for classifying the behavior of children in the dental environment. An understanding of them holds more than academic interest. The knowledge of these systems can be an asset to the dentist in several ways: it can assist in directing the behavior guidance approach, it can provide a means for systematically recording behaviors, and it can assist in evaluating the validity of current research. (McDonald, Avery and Dean, 2011).

There are many different classification of child behavior in dental clinic such as *Wilson's classification* (1933) *Lampshire classification* (1970) and *Wright's clinical classification* (1975). Wilson's classification includes four categories; Normal or bold, tasteful or timid, hysterical or rebellious, and nervous or fearful. Lampshire classifies the behavior of child patients in a spectrum from cooperative, tense cooperative, outwardly apprehensive, fearful, stubborn/defiant, hyperemotive, and finally , Handicapped (Sachdeva and Dutta, 2012).

Wright places children in three main categories; Cooperative, Lacking cooperative ability, and potentially cooperative (Wright, 1975). Cooperative children are reasonably relaxed, they have minimal apprehension, and they are likely enthusiastic. In contrast the child lacking cooperative ability includes very young children with whom communication cannot be established, and children who are with specific debilitating or disabling conditions (Wright, 1975). Children considered potentially cooperative when their behavior can be modified; that is, the

child can become cooperative. The dental literature is usually filled with descriptions of potentially cooperative patients as uncontrolled, defiant, timid, tense-cooperative, whining, and stoic child. Dentists often use these labels because they convey, in as few words as possible, the essence of the clinical problem (Wright, 1975; Sachdeva and Dutta, 2012).

Behavioral Management Techniques:

Behavior management techniques (BMT) are numerous, sometimes controversial, and likely to be varied in terms of style of delivery due to the variety of practitioners who use the techniques (Allen, Stanley, and McPherson, 1990; McKnight-Hanes, Myers, Dushku, and Davi, 1993; Abushal and Adenubi, 2000; Casamassimo, Wilson, and Gross, 2002; Wilson and Cody, 2005). Because there are many views as to what is acceptable, the techniques that most if not all pediatric dentists would accept are limited in number (Roberts, Curzon, Koch, and Martens, 2010).

According to Folayan and Idehen , behavior management strategies range from informal and common sense techniques to formal relaxation techniques. Formal relaxation varied from pre-appointment preparations to modeling procedures during the dental visit (Folayan and Idehen, 2004). Management of children in the dental office is an intricate balancing act involving the triad of child, parent/caregiver, and dentist. Good communication skills (both verbal and nonverbal) are necessary to provide dental care for children. Proper communication ensures that dentists can safely deliver treatment to their child patients (Boynton, Johnson, Nainar, and Hu, 2007). Practitioners agree that good communication is important among the dentist, patient, and parent in building trust and confidence (Feigal, 2001; Freeman, 2008).

Communicative management is a basic behavior guidance which has been used in the early period of pediatric dentistry (Roberts, Curzon, Koch, and Martens, 2010). Communication is the process of interchange thoughts, opinions, or information. But, in the dental setting, it is affected primarily through dialogue, tone of voice, facial expression, and body language (AAPD, 2013a).

According to AAPD communicative management is an ongoing subjective process that becomes an extension of the personality of the dentist. Associating with this process, there are specific *communicative guidance* techniques like (AAPD, 2013a): *Tell-Show-Do Technique* (TSD) (Addleston, 1959), *Positive reinforcement* (Skinner, 1938 cited in Roberts, Curzon, Koch, and Martens, 2010), *Distraction* (Ingersoll, Nash, Blount, and Gamber, 1984), *Modeling* (Bandura 1967 cited in cited in Baghdadi, 2002; Stokes, and Kennedy,1980), *Voice control* (Brauer,1964 cited in Greenbaum, Turner, Cook, and Melamed, 1990; Pinkham, and Paterson 1985), *Parental Presence/Absence Technique* (PPA)(Lewis and Law, 1958 cited in Afshar, et.al., 2011 ; Frankl, Shiere, and Fogels, 1962) and *Hand-Over-Mouth Exercises* (HOME). All of these techniques are valid and effective tell now. In the contrary, Hand-Over-Mouth Exercises was removed lately from the AAPD clinical guidelines (AAPD, 2006).

More than four decades ago, Addelston formalized a technique that encompasses several concepts from learning theory. It was called the ***Tell-Show-Do*** (TSD) technique. Since its introduction in 1959, it has remained a cornerstone of behavior management (Addleston, 1959). TSD is a series of successive approximations of introducing child patients to a procedure in a stepwise fashion. The technique involves verbal explanations of procedures *by telling* phrases that are appropriate to the developmental level of the patient; *by showing* demonstrations for the patient of the visual, auditory، olfactory, and tactile aspects of the

procedure in a carefully defined, nonthreatening setting ; and then, without deviating from the explanation and demonstration, the *doing* of the procedure . The tell-show-do technique is used with communication skills (verbal and nonverbal) like body contact and eye contact (Baghdadi, 2002; Feigal, 2001; Klingberg and Raadal, 2001; Law and Blain, 2003).

Tell-show-do technique is the basic, most common behavioral management technique for pediatric dental patients which are used by many pediatric professionals. Thus, it can be used with any patient with no contraindication. It is a technique of behavior shaping which has been found efficient, non-invasive, relatively easy to implement, and effective. It informs the child of the procedure to reduce anticipatory anxiety and avoid subsequent behavioral problems (Kantaputra, et.al., 2007; Sharath, et.al., 2009; Bhatia and Chadwick, 2010; Sharma and Tyagi, 2011). Furthermore, many studies have shown that TSD is the most parental acceptable technique (Lawrence, et.al., 1991; Peretz and Zadik, 1999; Eaton, McTique, Fields, and Beck, 2005; Alammouri, 2006).

Parental Presence/Absence Technique:

From the moment of the children's birth, their behavior will start to follow a pattern that is built up through its relationship with the mother. The attitudes and the emotions of parents have profound effects on the emotional development of children (Denham, Blair, Schmidt, and DeMulder, 2002). As we know in pediatric dentistry, we do have patient-parent-dentist interaction. . It is known as the pediatric dentistry treatment triangle. The child is at the apex of the triangle and is the focus of attention of both the family and the dental team (McDonald, Avery and Dean, 2011).

Following the social changes today, less aggressive methods are more acceptable to children as well as to their parents. The most widely used technique among the pediatric dentists is the *parental presence/absence* (PPA) technique. The presence or absence of the parent some-times can be used to gain cooperation for treatment. (Lewis and Law, 1958, cited in Afshar, et.al., 2011; Frankl, Shiere, and Fogels, 1962; Molinari, Deyoung, 2004).

This technique was called *Parental Separation* technique then it became PPA technique. This is because of parental insistence to stay with their children. Parents' desire to be present during their child's treatment does not mean that they intellectually distrust the dentist. It simply means that they are uncomfortable if they visually cannot verify their child's safety. It is important to understand the changing emotional needs of parents because of the growth of a latent but natural sense to be protective of their children. The question of a parent's presence should not cause conflict within the dentist, as long as dentists understand why they can be so easily be emotional about it (Pinkham, 1991). The increasing persistence of the parents for presence near their children has made dentists to reevaluate their strategies for asking the parents to leave the room (Kamp, 1992; Peretz and Zadik, 1998; Long, 2004).

Researcher suggests that children's behavior is unaffected by parental presence or absence (Kamp, 1992; Fenlon, Dobbs, and Curzon 1993; Freeman, 1999b; Afshar, et.al., 2011). The exception is young children like infants and preschool children (3.5- 4.5 years) who behave better with their mothers present to avoid separation anxiety (Frankl, Shiere, and Fogels, 1962). Separation anxiety is a normal developmental stage and it has been shown to be a good indicator of dental anxiety in childhood especially with boy due to *Oedipus complex*. Thus for young children parental presence is important, for older children parental

presence appears not to have such a clear effect on child behavior but it may be important to the parent (Holst, et.al., 1993; Marcum, Turner, and ,Courts,1995; Guthrie, 1997). Moreover, children with special needs cannot be separated from their parent due to the same reason. On the other hand, Marzo, et al have concluded that there were better results obtained in the group of children whose parents were absent than the other group whose parents were present (Marzo,Campanella, Albani, and Gallusi, 2003).

Kotsanos and his colleagues have observed the success of a suggested modified form of PPA technique by Molinari during the first and successive treatment visits (Molinari, Deyoung, 2004). In this modified technique, the parents are present in the dental operation room, and in case the child is uncooperative, the parent is asked to leave the room, and after the cooperation is stabilized, and as a reward, the parent is again asked to be present in the room (Kotsanos, Arhakis, and Coolidge, 2005). Early application of the PPA and its modified techniques appears to be very successful in managing initially uncooperative child patients (Kotsanos, Coolidge, Velonis, and Arapostathis, 2009).

Parent's presence can be divided into either active or passive. This strategy might change parents' mind and encourage them to do an active part during management of their children (Pinkham, 1991). However, involving the parents in the planning stage and outlining their role as a passive but silent helper may provide a comforting presence without unhelpful interference (Freeman, 1999b).

Scope of the Problem:

It is evident that, there is a strong/ significant relationship between dental fear and behavior of children (Chellappah, Vignesha, Milgrom and Lam, 1990; Chapman and Kirby-Turner, 1999; Folayan and Kolawole, 2004; Oosterink, De Jongh, and Aartman, 2008; Rãducanu, Feraru, Herteliu, and Anghelescu, 2009; Welly, Lang, Welly, and Kropp, 2012; Davies and Buchanan, 2013; Hägglin, Carlsson, and Hakeberg, 2013). However, limited research has dealt with the effect of children's intelligence on their dental fear and consequently on their behavior in the dental clinic (Rud and Kisling, 1973; Toledano, Osorio, Agullera, and Pegalajar, 1995; Armfield, 2006; Armfield, Slade, and Spencer, 2008; Muris and Field ,2008; Savin, and Maxim, 2008; Ali ,2010 ; Aminabadi, et.al., 2011; Carrillo- Diaz, Crego, Armfield, and Romero-Maroto, 2012a; 2012b; 2012c; Blomqvist, et.al., 2013). In addition, no research has investigated active versus passive presence of parent in the dental operatory and its effect on the child's behavior. These problems have furnished the stimulus for the present investigation.

Null Hypothesis: there is no significant effect of Parental Active/ Passive Presence (PA/PP) Technique with Tell-Sow-Do (TSD) Technique on the behavior of preschool children with different levels of intelligence and fear.

AIM OF THE STUDY

Aim of the Study

This study was conducted to:

1. Investigate the effect of preschool children's intelligence (IQ) on their dental fear.
2. Investigate the effect of preschool children's intelligence (IQ) on their overall behavior in the dental clinic.
3. Investigate the effect Parental Active/ Passive Presence Technique on the behavior of preschool children with different levels of intelligence.
4. Investigate the effect Parental Active/ Passive Presence Technique on the behavior of preschool children with different levels of fear.

MATERIAL AND METHODS

Material and Methods

Study Design

The design of the study was a randomized controlled clinical trial with an allocation ratio of 1:1. Children enrolled in this study were stratified based on their IQ into three groups; high, average and low IQ groups. In each of these three groups, children were randomly and equally allocated into study and control subgroups. Thus, this study included 6 subgroups.

Participants

Screening visit

Visual Screening and History taking were carried out to identify children who fulfilled the inclusion criteria. Parental meeting was also conducted to explain the child entire research plan.

Inclusion Criteria

1. Age ranging from 3-6 years (the preoperational stage) (Piaget, 1954; 1966).
2. Patients with no history of previous dental treatment and no history of dental pain.
3. Patients with at least one sound quadrant for sealant application.
4. Patients IQ level should be in the normal intelligence range.

Exclusion criteria:

1. Multiple dental problems with pain.
2. History of previous dental therapy
3. History of medical and psychological problems
4. Any degree of intellectual disability

Setting and location

The children were recruited from the Outpatient clinic of Pediatric Dentistry Department in Faculty of Dentistry at Alexandria University.

The IQ test for each selected child took place in a quiet closed room (special need clinic). The preventive measures were applied in the pediatric clinic of the department.

Interventions

In the first visit, children who fulfilled the inclusion/ exclusion criteria were evaluated by IQ test then divided into 3 equal groups (50 children) according to their level of intelligence IQ as follows:

1. High IQ Children group (HIQ): with score of (110 and above)
2. Average IQ Children (AIQ): with score of (90-109)
3. Low IQ Children (LIQ)(with the normal intelligence range): with score of (70-89)

In the second visit, fear was measured in each group followed by random allocation into test and control subgroups and then the implementation of the intervention.

In each group (50 children), 25 children in subgroup S (study group) were managed using *Parental Active Presence* (PAP) technique, while the other 25 children in subgroup C (control group) were managed using *Parental Passive Presence* (PPP) technique. Parental Active / Passive Presence technique was accompanied with *Tell-Show-Do* (TSD) Technique (Addelston, 1959). During this management, dental preventive measures were applied. The design of this study has been described using flow chart (Fig. 2).

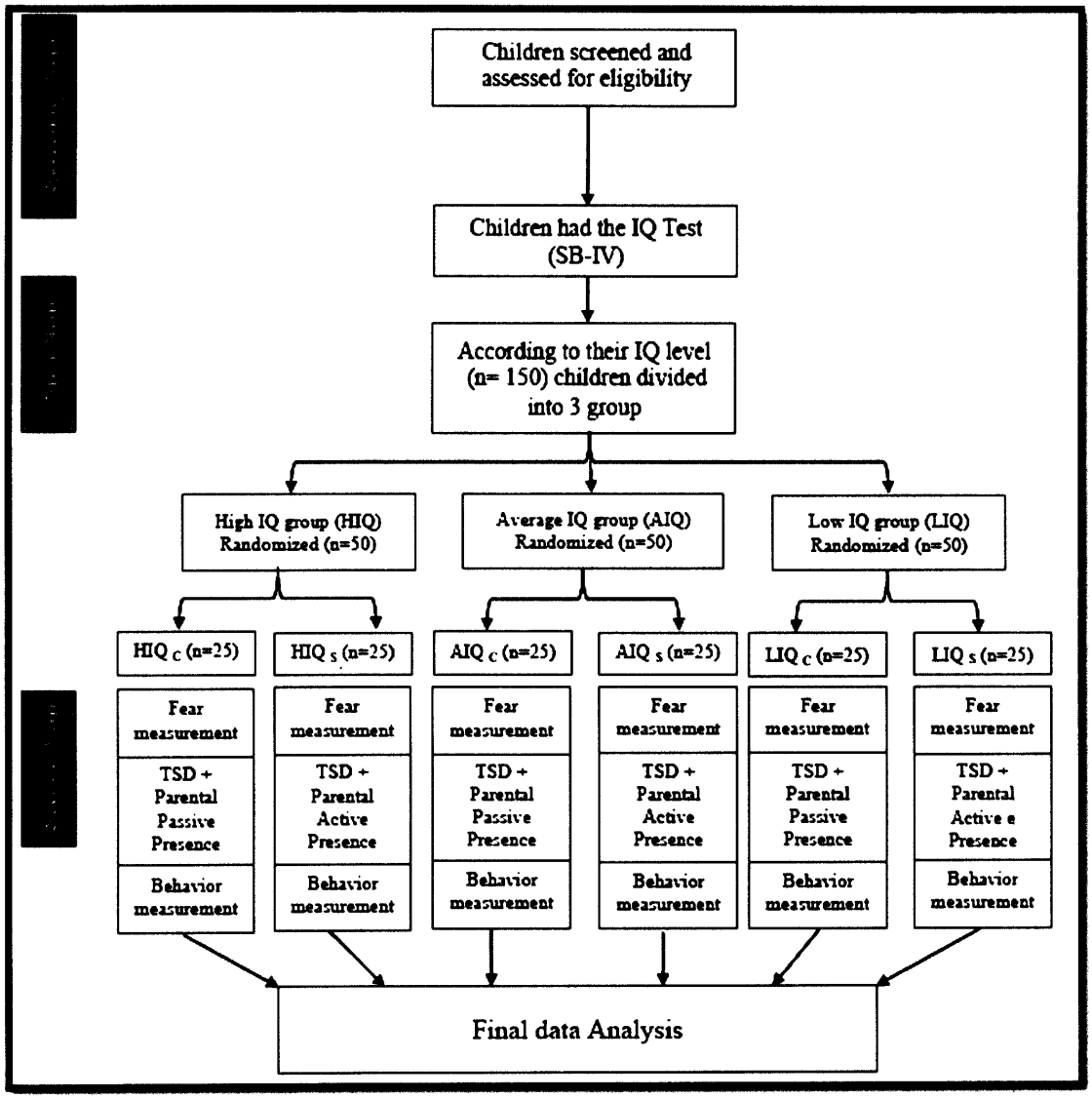

Fig. 2. Flow Chart of the Study Design

All the dental preventive measures were non-pain provoking including (Fig. 3):

1. Oral hygiene instructions (Pinkham,Casamassimo and McTigue, 2005).
2. Fissure Sealants* application (Pinkham,Casamassimo and McTigue, 2005; McDonald, Avery and Dean, 2011).
3. Prophylaxis and Topical Fluoride applications*‡ (McDonald, Avery and Dean, 2011; AAPD, 2013b) .

Parental Active Presence technique:

It is another modified form of parental presence/ absence (PPA) technique in which the parents have an active part and they share the responsibility with dentist during child management (Pinkham, 1991)

In this technique children were accompanied with their parents who stood in close proximity to their children. Parents were allowed to do hand holding, eye contacting and to help in explaining the dentist's instructions by reassuring the child (Fig. 4).

Parental Passive Presence technique:

This is the usual form of PPA technique during parental presence in the dental clinic (Lewis and Law, 1958, cited in Afshar, et.al., 2011).

Children were accompanied with their parents. Parents sat silently in the dental operatory behind the patient with no eye contact, and no spoken word. Their presence was only to reassure their children (Freeman, 1999b) (Fig. 5).

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* bioseal ® Pit and Fissure Sealant (Opaque 35% filled modified Bis-GMA - Urethane Dimethacrylate based light cure resin).Biodinamica. Madrid. Spain.
† Alpha- Pro ® preventives Prophylaxis Past. Dental Technologies. Hamlin Avenue. Lincolnwood. Illinodis. USA.
‡ Sorbet ® Fluoride gel (1.23% Acidulated Phosphate). Keystone Industries. Hollywood Avenue. Cherry Hill. USA.

Tell-Show-Do Technique: (Addleston, 1959)

Each child was told what would be done in a short explanation, and then what would happen exactly was shown by some sort of simulation before the procedure started. All the procedures were described step by step, and then dental preventive measures were applied.

Oral hygiene instructions: (Pinkham,Casamassimo and McTigue, 2005; McDonald, Avery and Dean, 2011; AAPD, 2013b)

The oral hygiene instructions were aided by a demonstration on typodont model to show the proper technique of brushing (Fig. 6a, 6b). Before instructions, each child was handed a toothbrush with soft, straight, and 3 rows bristles. The duration was standardized for each child (about 10 minutes). The instructions were standardized and included the following:

1. During brushing, you should follow a systemic order (starting from the buccal aspect of teeth in the maxillary right quadrant and ending by the lingual aspect of this quadrant).
2. You should brush your teeth for at least 1 minute.
3. You should brush your teeth twice daily in the morning time after breakfast and at night before bed time.
4. Your parent is responsible for your tooth brushing.
5. Your toothpaste has to contain the fluoride, while the amount of toothpaste for each use has to be a 'pea-size'.

Fig. 3. Preventive Measures Material and Instruments

Fig. 4. Parental Active Presence Technique

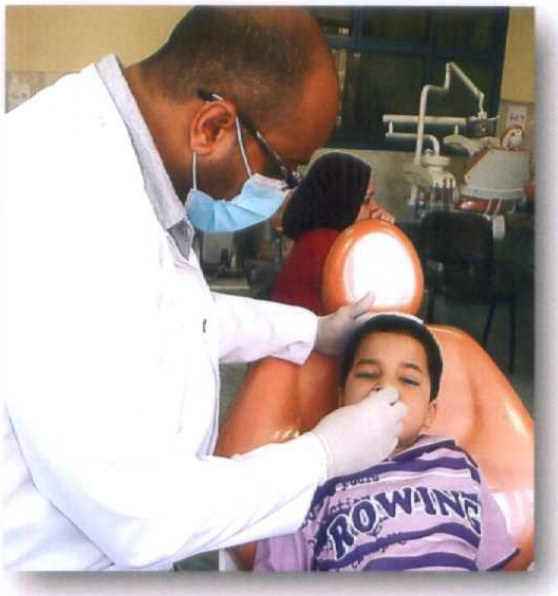

Fig. 5. Parental Passive Presence Technique

Fissure Sealant: (Pinkham,Casamassimo and McTigue, 2005; Farsai, Urib, Vig, 2010; McDonald, Avery and Dean, 2011)

The duration and technique for sealant application was standardized in approximately 10 minutes and child was treated as follows (Fig. 7a, 7b):

- I am going to clean your teeth with this tooth counter (explorer) to remove any debris from your teeth.
- I will put these cotton pillows (cotton rolls) to make your teeth feel comfortable, and I will put this suction for the excess water.
- I will apply wind gun to dry your teeth, then I will apply this blue gel (Acid etch) to your tooth for just a few seconds.
- I will rinse your mouth to remove this gel with this water gun (water syringe), then I will dry your tooth again with the wind gun.
- Then after placing cotton pillow again I will apply this tooth paint (sealant) to your tooth to give a shiny appearance.
- Now I will use this light machine (Light cure) on your tooth to make the tooth paint much harder, you have to wait also for a few seconds.
- I need to close your mouth and let me see if you can close it well, I will use this red strip (articulating paper) to check your bite.

Prophylaxis and Topical Fluoride applications: (McDonald, Avery and Dean, 2011; Duggal, Cameron, and Toumba, 2013; AAPD ,2013c)

The prophylactic paste and topical fluoride were applied to every child in the study in a standardized duration (about 15 minutes). The technique of application was also standardized for each child as follows (Fig. 8, Fig. 9):

- I am going to apply the toothpaste (pumice prophy past) to the brush (low speed hand-piece) to clean your teeth
- I need to try this empty plastic tray inside your mouth to see whether it fits your mouth or not
- I will apply this paste (fluoride gel) in this tray, and then I will insert it into your mouth.
- I need to use the wind gun (compressed air syringe) to make your mouth dry.
- You have to let the excess water from your mouth to be sucked by suction (saliva ejector) and wait for a while until I can remove this tray and clean your teeth
- You should not eat, drink or rinse for 30 minutes.

Fig. 6a. Demonstration on typodont model

Fig. 6b. Child Share by himself in this Demonstration.

Fig. 6. Oral Hygiene Instruction

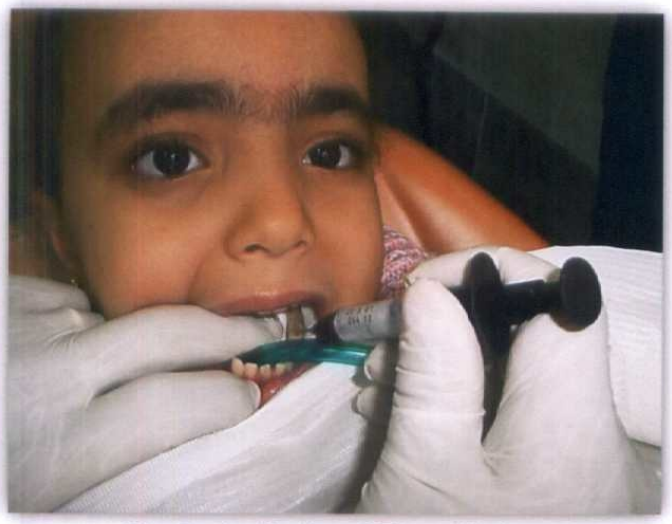

Fig. 7a. Application of Fissure Sealant

Fig. 7b. Fissure Sealant Light Curing

Fig. 7. Fissure Sealant Application

Fig. 8. Prophylaxis Procedure.

Fig. 9. Topical Fluoride Application

Measurements and outcomes:

1. IQ Test measure: Stanford Binet Intelligence Scales, Fourth Edition (SB-IV) - Arabic version (Thorndike, Hagen and Sattler,1986; Malika ,1998a) to classify children into the three study groups (Appendix II) (Fig .10).
2. Fear Measure: Facial Image Scale (FIS) (Buchanan and Niven, 2002) to account for fear state and is entered into the analysis as a confounder (Appendix III).
3. Overall Behavior: Frankl's Behavior Rating Scale (FBRS) (Frankl, Shiere and Fogels, 1962) for the outcome measure(Appendix IV).

Intelligent Quotient Test Measure (SB-IV):

The Intelligent Quotient was measured by means of Stanford Binet Intelligence Scales, Fourth Edition (SB- IV) - Arabic version. It is a standardized test that measures intelligence and cognitive abilities in children and adults, from age two through mature adulthood (Malika, 1998a).

The Stanford Binet Intelligence scales - Fourth Edition SB-IV was made by the researcher himself to avoid the problem of sending children from outpatient clinic of pediatric dentistry department to the psychological centers for their intelligence to be measured. Thus, a special course of how to use and apply this scale was taken in a specialized center[§] . The researcher was prepared in this center to be well trained to use this test efficiently on children and he was certified for that.

[§] Stanford Binet Intelligence Scales, Fourth Edition - Arabic version: Assessment Course, Steps Training Center, Alexandria, Egypt

Fig. 10. Stanford Binet Intelligence Scale, Fourth Edition (SB-IV) - Arabic version

Administration of the SB-IV scale typically takes between 30 to 90 minutes including full battery test. The parent of each child has attended the examination passively. The intelligent quotient (IQ) of children was measured and evaluated to distribute them into their groups accordingly (Malika, 1998a; Youngstrom, Glutiing, and Watkins, 2003).

The Stanford-Binet Intelligence scale is a collection of tests presented in a form of photos, different colored cubes, cubic's blossom, beads, paper tests, and some guiding books (Fig .10). The test is grouped into four area scores. The four main areas to be assessed are verbal reasoning, abstract/visual reasoning, quantitative reasoning, and short-term memory reasoning. There are 8 subtests selected from the total subtest (15 subtests) of SB-IV scale according to the age group (*Abbreviated test battery*). The reasoning and the subtests are as follows

I- Verbal reasoning (VR):

1. Vocabulary (V)
2. Comprehension (Com)
3. Absurdities (Ab)

II- Abstract/visual reasoning (A/VR):

1. Pattern (P)
2. Copy (Cop)

III- Quantitative reasoning (QR):

1. Quantitative (Q)

IV- Short-term memory reasoning (STMR):

1. Bead memory (BM)
2. Memory for sentence (MS).

I-Verbal Reasoning (VR):

The verbal reasoning area score measures verbal knowledge and understanding obtained from the school and home learning environment

and reflects the ability to apply verbal skills to new situations. Examples of the subtests comprising these factor measure skills include: word knowledge(vocabulary), social judgment and awareness (comprehension), and ability to isolate the inappropriate feature in visual material and social intelligence (absurdities) (Malika ,1998a; 1998b; Youngstrom, Glutiing, and Watkins, 2003).

- *Vocabulary subtest* (V): involved showing pictured object to the child and asked him to define them according to his knowledge (Fig. 11a) .
- *Comprehension subtest* (Com): involved the identification of body parts then a series of practical problem solving that the child was required to elicit his verbal responses (Fig.11b).
- *Absurdities subtest* (Ab): involved showing a picture with situations that are essentially false to the child and asking him to figure out the mistakes in such pictures (Fig. 11c).

II- Abstract/Visual Reasoning (A/VR):

The abstract/visual reasoning score examines the ability to interpret and perform mathematic operations and the ability to visualize patterns (visual/motor skills, and problem-solving skills) through the use of reasoning. The subtests which determine the A/VR score are timed test that involve tasks such as completing a basic puzzle and replicating cube designs (Pattern and Copy) (Malika ,1998a; 1998b; Youngstrom, Glutiing, and Watkins, 2003).

- *Pattern subtest* (P): the child was asked to complete formboards (whether it is a square, triangle, or circle) in its exact right space or replicate of visual patterns through block manipulation according to the proper pattern to form the same design of block presented by the examiner and seated in front of him (Appendix II) (Fig. 12a).

- *Copy subtest* (Cop): the child should copy and reproduce green block models presented by the examiner and seated in front of him or draw geometric designs, such as lines, rectangles, and arcs, that are shown on cards (Appendix II) (Fig.12b).

III-Quantitative Reasoning (QR):

The quantitative reasoning area score measures: numerical reasoning (Quantitative) (Malika, 1998a; 1998b;Youngstrom, Glutiing, and Watkins, 2003).

- *Quantitative subtest* (Q): By using 6 Cubic's blossom and some mathematical exercises the child was examined to count add, seriate, or complete other numerical operations (Appendix II) (Fig. 13).

IV- Short-Term Memory Reasoning (STMR):

The short-term memory score measures concentration skills, short-term memory, and sequencing skills. Subtests comprising this area score measure visual short-term memory (Bead memory) and auditory short term memory involved sentences sequences (Memory for sentence) (Malika, 1998a; 1998b; Youngstrom, Glutiing, and Watkins, 2003).

- *Bead memory* (BM): one of the subtests that measures visual short-term memory. The child was presented with pictures of a bead model, and asked to reproduce it in a precise sequence replicate from his own memory (Appendix II) (Fig. 14).
- *Memory for sentence* (MS): in this subtest, the child listened to a phrase or a sentence that was said by the examiner and then he was asked to repeat each word in the exact order of presentation from his own memory (Appendix II).

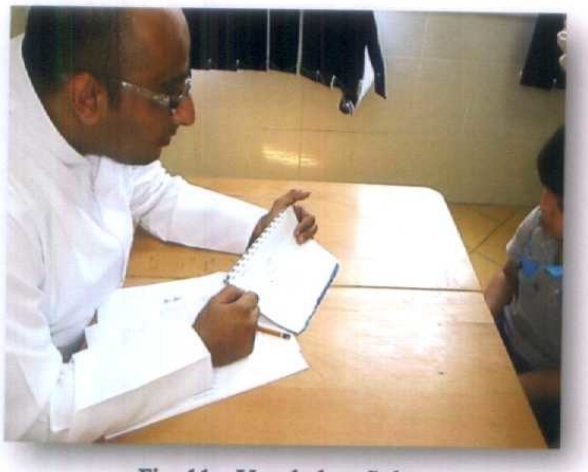

Fig. 11a. Vocabulary Subtest.

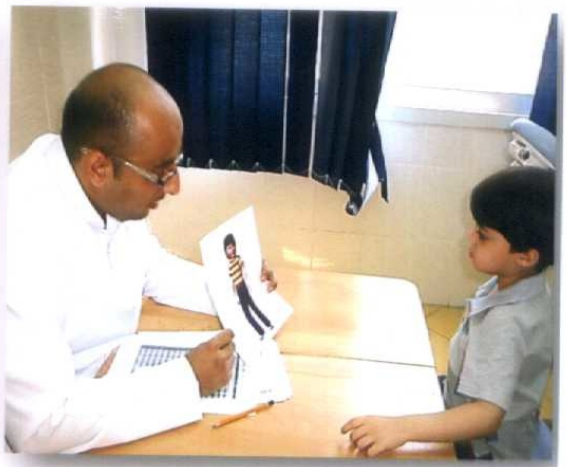

Fig. 11b. Comprehension Subtest.

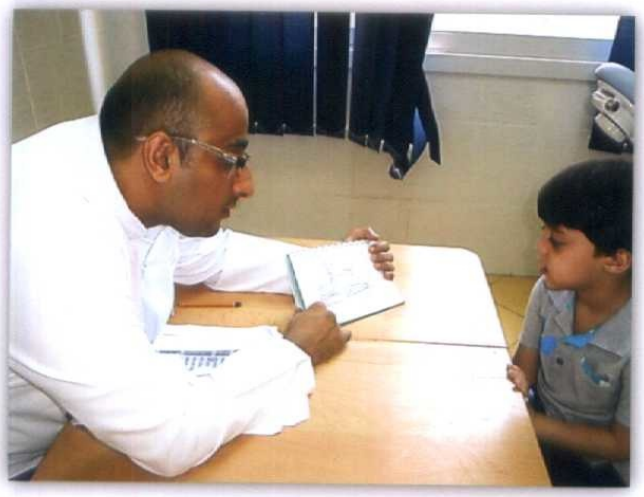

Fig. 11c. Absurdities Subtest.

Fig. 11. Verbal Reasoning (VR):

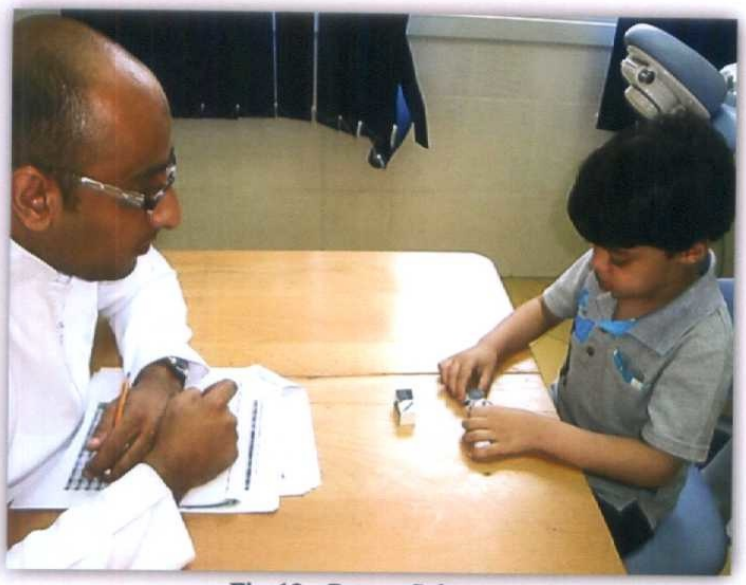

Fig. 12a. Pattern Subtest

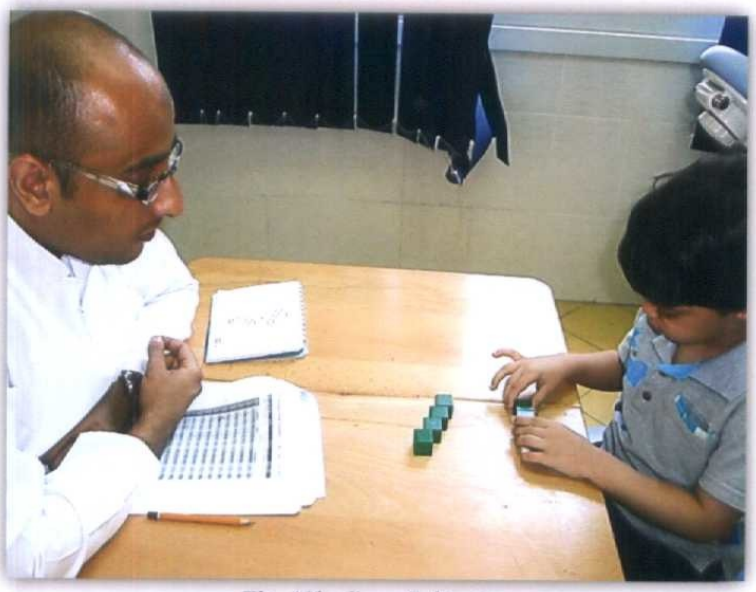

Fig. 12b. Copy Subtest

Fig. 12. Abstract/Visual Reasoning (A/VR)

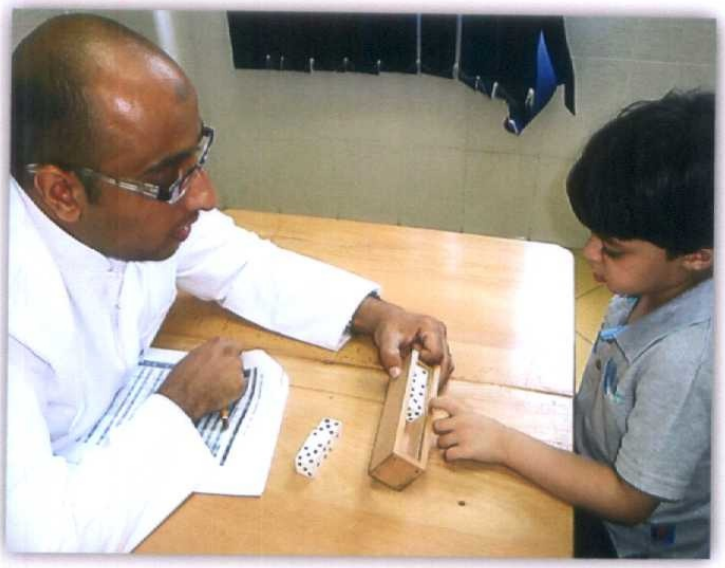

Fig. 13. Quantitative Reasoning (QR)

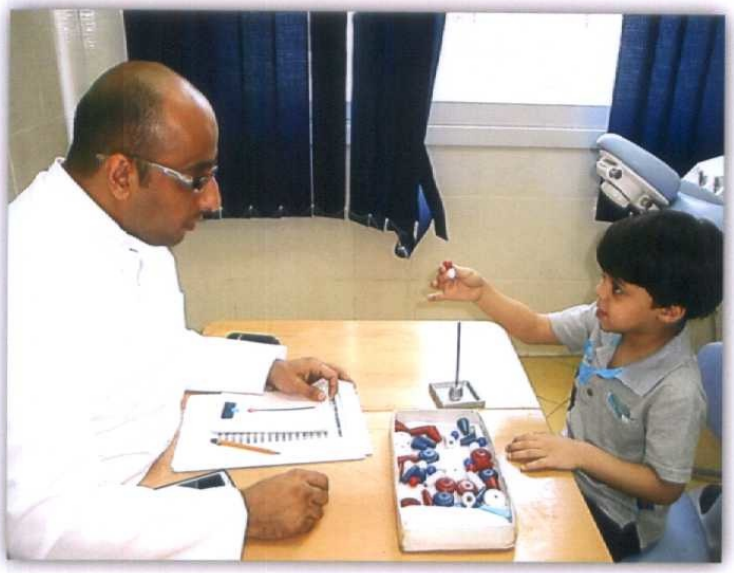

Fig. 14. Short-Term Memory (STMR): Bead Memory

Stanford-Binet Intelligence Scale -IV Administration:

In the first visit, Stanford Binet Intelligence Scale was used to determine the IQ level for each child (Appendix II).

The Stanford-Binet Intelligence scale was applied in the morning when the child is in a good mood for that test. The test was explained step by step starting from the first reasoning test and its subtests items until the last one. SB-IV scale was applied in one visit. If the child got bored and lost attention and concentration, the test was divided into two sessions with a 15 minutes break in the same visit.

In Stanford-Binet Intelligence scale each subtest was containing different consequent levels which were arranged hierarchically by item pairs (labeled "A" through "Q" on the test protocol). On the other hand, *basal level* and *ceiling level* represented the boundaries of these subtests. The child entered the ***basal level*** when he passed all items at two consecutive levels. The child moved from one level to another until he made three failures (out of four possible) take place across adjacent levels this represented the ***ceiling level*** (cut-off point). Then the child testing advanced to the next subtest (Malika, 1998b; Youngstrom, Glutiing, and Watkins, 2003).

The vocabulary subtest V serves as a "routing" measure at the beginning of each assessment. Performance on the vocabulary subtest, in conjunction with an examinee's chronological age, is used to determine the appropriate entry level for succeeding subtests. According to the placement test's paper in a V subtest the last level with the right answers in both item pairs should be matched with the chronological age to represent the entry level. (Fig. 15) (Malika, 1998b; Youngstrom, Glutiing, and Watkins, 2003).

Stanford-Binet Intelligence Scale -IV Scaling:

In every subtest data were documented in record booklet for each child (Appendix II). At the end of each subtest the calculation were counted by subtracting the total of the wrong answers from the value of last item pair at the cut-off point (ceiling level). A score was given for each subtest (Raw Scores)(Malika, 1998b).

According to the Standardized Tables (Malika, 1998c) aided with the SB-IV scale, raw score (RS) for each subtest was converted into Standard Age Score (SAS). The total of SAS in each reasoning test was switched into Reasoning Standardized Score(R-S-S) and finally the Compound Score (C-S) was estimated from the total of R-S-S. The C-S represented the IQ for each examined child.

As a result, children were divided into three groups according to their level of intelligence IQ (Table. 1). Some children were excluded from the study because they were out of indicated groups due to their intelligence was below the normal range.

Table. 1. Intelligence Quotient (IQ) Classification Guide

Groups	IQ Range	General Classification
HIQ	140 and up	Very Superior
	120-139	Superior
	110-119	High Average
AIQ	90-109	Average
LIQ (Normal Range)	80-89	Low Average
	70-79	Borderline Impaired
Sources: Thorndike, Hagen, and Sattler, 1986		

Fear Measure:

Dental fear was measured in the second visit by administration of Facial Image Scale (FIS). This measurement was done to every child in each group before the start of dental treatment. It is comprised of a row of five faces ranging from very happy face to very unhappy one (Fig. 16). Children were asked to point at which face they feel most like at that moment (Fig. 17). The face is scored by giving a value of one to the most positive affect face and five to the most negative affect face. The faces with 1 and 2 indicated a low dental fear , while the faces with the value of 4 and 5 indicated high dental fear (Buchanan and Niven. 2002).

Overall Behavior Measure:

At the end of the second visit, after the application of preventive measures, each child overall behavior in each group was evaluated according to Frankl's Behavior Rating Scale (FBRS). It is a four group scale used to assess and evaluate the behavior of a child starting from Rating no. 1 (– –) with the most negative child behavior to Rating no. 4 (++) with the most positive child behavior (Table. 2) (Frankl, Shiere and Fogels, 1962).

Level / Age	3.4	5.6	7.8	9.10	11.12	13.14	15.16	17.18	19.20	21.22	23.24	25.26	27.28	29.30	31.32	33.34	35.36	37.38	39.40
2.0 to 2.5	A	A	A	A	B	B	C	C	D	D									
2.6 to 2.11	A	A	A	B	B	B	C	C	D	D	E	E							
3.0 to 3.5	A	A	B	B	C	C	C	D	D	E	E	F	F						
3.6 to 3.11	A	B	B	C	C	D	D	D	E	E	F	F	G	G					
4.0 to 4.5	B	B	C	C	D	D	E	E	E	F	F	G	G	H	H				
4.6 to 4.11	B	B	C	C	D	D	E	E	F	F	G	G	H	H	I				
5.0 to 5.5	B	C	C	D	D	E	E	F	F	F	G	G	H	H	I				
5.6 to 5.11	C	C	D	D	E	E	F	F	G	G	G	H	H	I	I				
6.0 to 6.5	C	C	D	D	E	E	F	F	G	G	H	H	I	I	J				
6.6 to 6.11	C	D	D	E	E	F	F	G	G	H	H	H	I	I	J				
7.0 to 7.5	C	D	D	E	E	F	F	G	G	H	H	H	I	I	J	J			
7.6 to 7.11	C	D	D	E	E	F	F	G	G	H	H	I	I	J	J	K	K		
8.0 to 8.11	C	D	D	E	F	F	G	G	H	H	I	I	J	J	K	K	L	L	
9.0 to 9.11	C	D	D	E	F	G	G	H	H	I	I	J	J	J	K	K	L	L	
10.0 to 10.11	C	D	D	E	F	G	H	H	I	I	J	J	K	K	K	L	L	M	M
11.0 to 11.11	C	D	D	E	F	G	H	I	I	J	J	K	K	L	L	L	M	M	N

Fig. 15. Placement test's paper.

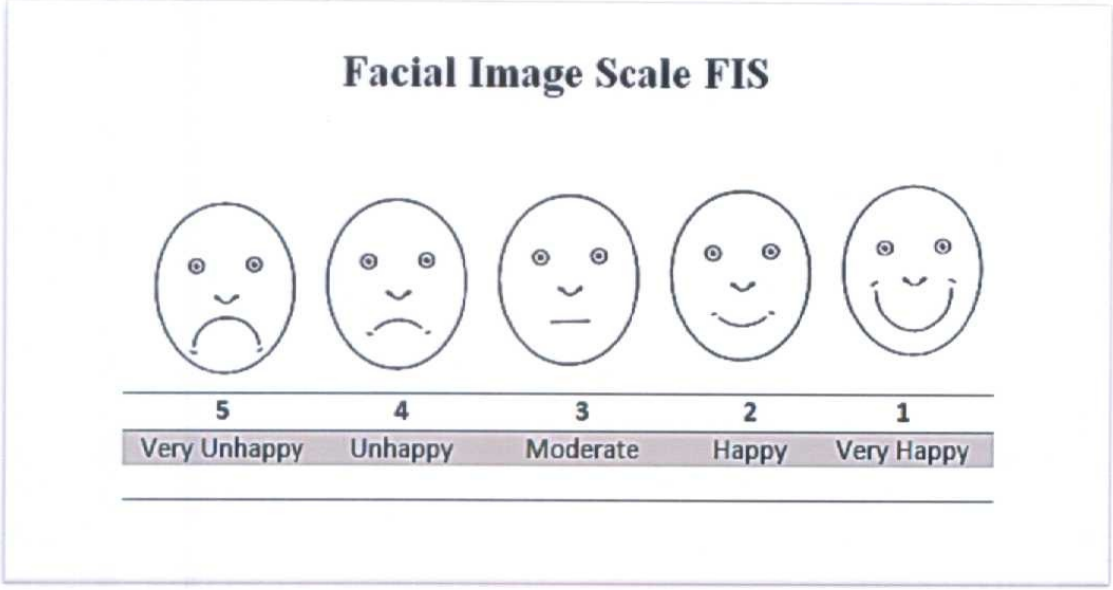

Fig. 16. Facial Image Scale (Buchanan and Niven, 2002)

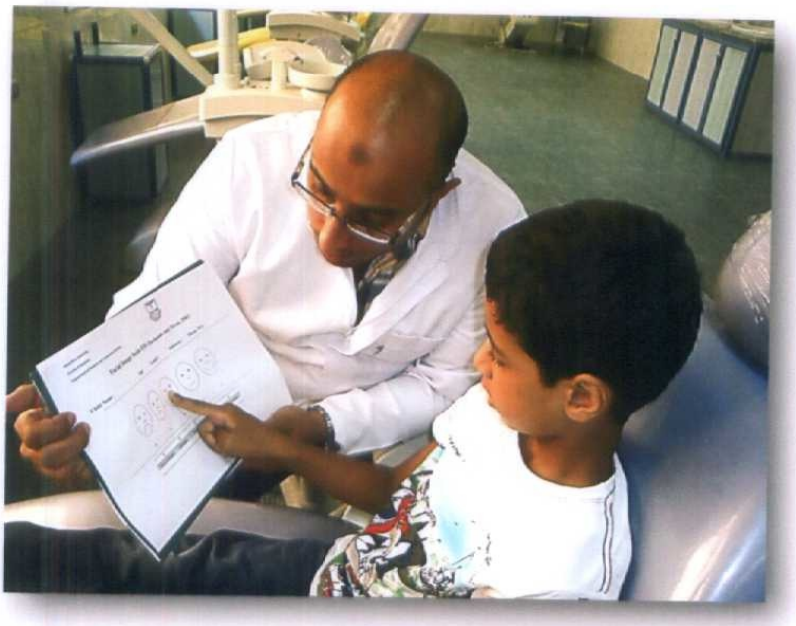

Fig. 17. Administration of Facial Image Scale.

Table. 2. Frankl's Behavioral Rating Scale (FBRS)

	Rating	Behavior
1	**Rating no. 1 (--)**	Refusal of treatment, forceful crying, fearfulness, or any other overt evidence of extreme negativism.
2	**Rating no. 2 (-)**	Reluctance to accept treatment, uncooperativeness, some evidence of negative attitude but not pronounced (sullen, withdrawn).
3	**Rating no. 3 (+)**	Acceptance of treatment; cautious behavior at times; willingness to comply with the dentist, at times with reservation, but patient follows the dentist's directions cooperatively.
4	**Rating no. 4 (++)**	Good rapport with the dentist, Interest in the dental procedures, Laughter and enjoyment.
	Source: Frankl, Shiere and Fogels, 1962	

Sample Size

Sample size estimation:

A total of 150 children were included in the study with 25 children per subgroup. The following assumptions were made for sample size estimation:

- Alpha error= 0.05
- Beta error= 0.20

Allocation ratio between test and control subgroups in each of the three study groups = 1:1.

- Probability of positive behavior in control subgroup in low IQ group = 0.25 (Fields and Pinkham, 1976).
- Probability of positive behavior in study subgroup in low IQ group so that the behavior score would be similar to healthy children in the same age group= 0.87 (Peretz and Gluck ,2005)

A logistic regression of a binary response variable (positive/ negative behavior) on a binary independent variable (test/ control subgroups) with a sample size of 50 children (50% of them are in the study subgroup and 50% are in the control subgroup) achieved 84% power at a 0.05 significance level to detect a difference between both subgroups. An adjustment was made since a multiple logistic regression of the independent variable (behavior) on the other independent variables in the logistic regression obtained an R-Squared of 0.2.

Randomization

Randomization for grouping was achieved by using a computer random number generator to produce the sequence needed to allocate the children to one of the study groups. Randomization sequence was created using Random allocation software** and was stratified by center with a 1:1 allocation using one block randomization.

The random allocation sequence was implemented by using a number of closed envelopes corresponded with the number of children in current study under analysis. The order of the child enrolled in the study was written on the envelope and a piece of folded paper included inside the envelope which sealed until the time of allocation. The group to which the child allocated was written inside this folded paper. The random allocation sequence was generated by a biostatistician not participating in the study, the children enrolled the in the study after ensuring that they fit the inclusion/ exclusion criteria (Fig. 18).

Blinding

The biostatistician was blinded to the actual status of the children as regards to which group they belong by recoding the groups for analysis purposes.

** Random allocation software version 1.0.0 ,M. Saghaei, Isfahan University, Iran

Group I

001 HIQs	010 HIQs	019 HIQs	028 HIQc	037 HIQc	046 HIQc
002 HIQs	011 HIQs	020 HIQc	029 HIQs	038 HIQs	047 HIQs
003 HIQs	012 HIQc	021 HIQs	030 HIQs	039 HIQc	048 HIQs
004 HIQc	013 HIQs	022 HIQs	031 HIQc	040 HIQs	049 HIQs
005 HIQs	014 HIQs	023 HIQc	032 HIQc	041 HIQc	050 HIQc
006 HIQc	015 HIQc	024 HIQc	033 HIQs	042 HIQc	
007 HIQs	016 HIQs	025 HIQc	034 HIQs	043 HIQc	
008 HIQc	017 HIQc	026 HIQc	035 HIQc	044 HIQc	
009 HIQs	018 HIQs	027 HIQc	036 HIQs	045 HIQc	

Group II

001 AIQc	010 AIQs	019 AIQs	028 AIQc	037 AIQc	046 AIQc
002 AIQc	011 AIQc	020 AIQc	029 AIQc	038 AIQs	047 AIQc
003 AIQc	012 AIQc	021 AIQs	030 AIQs	039 AIQs	048 AIQc
004 AIQc	013 AIQc	022 AIQs	031 AIQs	040 AIQs	049 AIQc
005 AIQs	014 AIQs	023 AIQs	032 AIQs	041 AIQs	050 AIQc
006 AIQs	015 AIQc	024 AIQs	033 AIQs	042 AIQs	
007 AIQc	016 AIQc	025 AIQs	034 AIQc	043 AIQc	
008 AIQs	017 AIQc	026 AIQc	035 AIQs	044 AIQs	
009 AIQc	018 AIQc	027 AIQs	036 AIQs	045 AIQs	

Group III

001 LIQs	010 LIQs	019 LIQc	028 LIQc	037 LIQc	046 LIQs
002 LIQs	011 LIQs	020 LIQs	029 LIQc	038 LIQs	047 LIQs
003 LIQc	012 LIQc	021 LIQs	030 LIQs	039 LIQc	048 LIQc
004 LIQs	013 LIQc	022 LIQc	031 LIQc	040 LIQs	049 LIQc
005 LIQc	014 LIQc	023 LIQs	032 LIQc	041 LIQs	050 LIQc
006 LIQc	015 LIQs	024 LIQs	033 LIQs	042 LIQc	
007 LIQs	016 LIQc	025 LIQs	034 LIQs	043 LIQs	
008 LIQc	017 LIQc	026 LIQs	035 LIQc	044 LIQc	
009 LIQc	018 LIQs	027 LIQc	036 LIQs	045 LIQs	

Fig. 18. Random Allocation Software- Sample Randomization for the Three Study Groups

Ethical Considerations:

The study procedure was explained to the parents and an informed written consent was taken (Appendix I) (AAPD, 2013d). The study procedure was approved by the research and ethics committees of the Faculty of Dentistry Alexandria University.

Every child in the study who had any carious teeth was scheduled for treatment and oral hygiene instruction.

Children below the normal intelligence range who were excluded from the study were given preventive measures treatment.

Calibration and reliability of examiner:

Prior to this study, the researcher was calibrated by conducting training sessions with the supervisor for the application of the two measurement scales. Intra-examiner reliability was assessed by the application of Facial Image Scale (FIS) and Frankl's Behavior Rating Scale (FBRS) to 10 children then these children were re-evaluated after 5 days. Kappa values for intra examiner consistency in applying the FIS and Frankl scales were 0.71 and 0.73 respectively which represented a substantial (good/ very good) reliability (Landis, Koch, 1977).

Statistical Analysis

Descriptive statistics were calculated to describe independent variables and outcome using mean and standard deviation, median and range and/ or frequencies and percent. FIS scores were included into happy (scores 1 and 2) and unhappy for otherwise (all other scores). Similarly, Frankl scores were recoded into positive behavior (scores 3 and 4) and negative behavior (scores 1 and 2).

The child age range was (3-6 years) and it was divided into three groups. The first group ranged from 3 years to 3 years and 11 months (3-

<4 years), while the second group ranged from 4 years to 4 and 11 months (4-<5 years), and finally the third group was from 5 years to 6 years (5-6 years).

Comparison between the subgroups in each group as regards age groups and gender was done using chi square. Differences in the distribution among the groups and / or subgroups on one hand, and Frankl scores and recoded scores as well as FIS scores and recoded scores on the other were assessed using chi square (or Fisher exact test when applicable).

Logistic regression analysis was done to assess the effect of the groups (based on IQ level), subgroups (test or control) and confounders (fear and age) on the outcome (behavior dichotomized into positive and negative behaviors). The same analysis was also done for each group with independent variables subgroups, fear and age groups. Wald chi square, their p values, estimates and their confidence intervals were calculated for the variables included in the models.

Significance level was set at 5% level. Statistical analysis was done using SPSS version 17.0. Bar charts were used for graphical presentation of data.

RESULTS

Results

Participant flow:

Three hundred children were screened and assessed for eligibility. One hundred and thirty children were excluded because they were younger than required age (n=15); had previous dental history (n= 45); had multiple dental problems (n=50) or had medical, psychological and mental problems (n=30). One hundred and seventy children had the IQ test and twenty of them were excluded because they were below the normal intelligence range (n=10) and out of the required number for each group (n=10) (Fig. 19).

The present study included 150 children with age range from (3-6 years). They were divided into three groups with 50 children in each group according to their level of IQ. The groups were HIQ, AIQ, and LIQ group. Then each group was randomly assigned into control subgroup with 25 children (TSD + Parental Passive Presence) and study subgroup with 25 children (TSD + Parental Active Presence) (Fig. 19).

Recruitment:

Eligible children were recruited from December 2011 to August 2013 at the Pediatric Dentistry department in Faculty of Dentistry at Alexandria University.

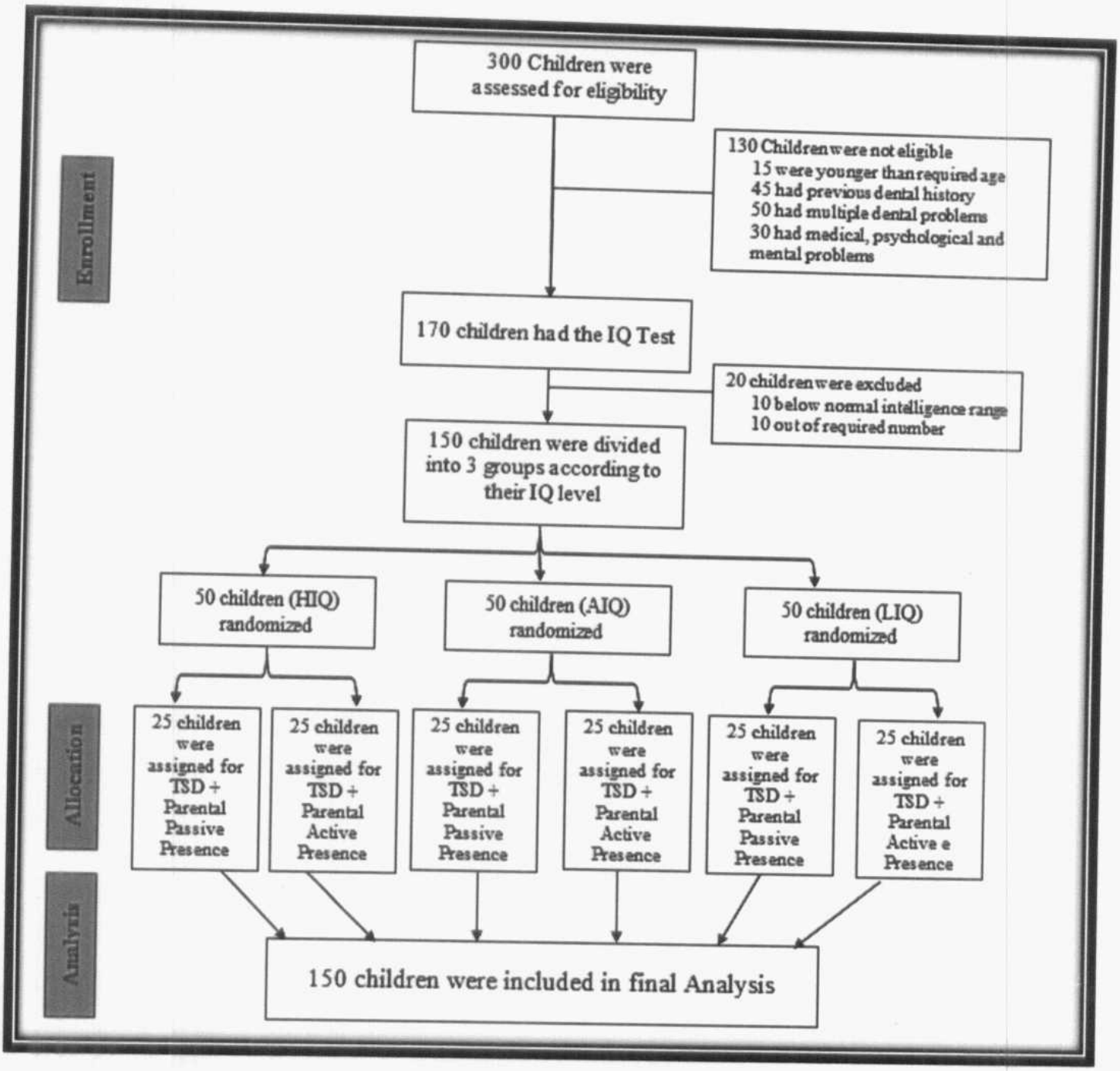

Fig. 19. Participant Flow Diagram through the Phases of the Parallel Randomized Trial.

Sample Description:

The Distribution of IQ scores among the different level of intelligence and parental presence technique are listed in (Table. 3). In HIQ group, children with (110-119) scores (High Average IQ) were more than children with (120-139) scores (Superior IQ), with no significant difference between them (P= 0.50). In LIQ group, children with (80-89) scores (Low Average IQ) were more than children with (70-79) scores (Borderline Impaired IQ), with no significant difference between them (P= 0.33).

The distribution of age groups among the different level of intelligence and parental presence technique is shown in (Table. 4, Fig. 20). In HIQ group there was an equal distribution in (3-<4 years) age group of children with both of parental active and passive techniques. On the other hand, the number of children was more in PAP group of (4-<5 years) group than PPP group. The greatest numbers of children in the two subgroups were included in 5-6 years old, with no significant different between the two subgroup in age groups distribution (P = 0.58).

In AIQ group, there was a significant difference in the distribution of children with the three age groups between the two subgroups (P = 0.05) with a greater number of older children in the PAP technique. In LIQ group, the distribution of children with the three age groups was similar in the two PAP and PPP techniques with no significant difference between them (P = 0.62). There was no difference in the distribution of the various age groups among the three study groups (chi square = 8.97, P = 0.07).

Gender distribution among the different level of intelligence and parental presence technique is shown in (Table. 5). Males and females

were generally equally represented in both PAP and PPP techniques of the three study groups in spite of that males were represented by a higher percent in the two subgroups of each of the AIQ and LIQ groups. There were no significant differences in gender distribution between the PAP and PPP techniques in any of the groups (P= 0.26, 0.56 and 1.00 for HIQ, AIQ and LIQ respectively). There was no significant difference among the three study groups as regards gender distribution (chi square = 3.52, P = 0.17).

Table. 3: Intelligence Quotient Scores Distribution among the Different Level of Intelligence and Parental Presence Technique.

Groups		Subgroups		Total
		PPP(C) N (%)	PAP(S) N (%)	N (%)
HIQ	Superior IQ (120-139)	6(24%)	3(12%)	9(18)
	High Average(110-119)	19(76%)	22(88%)	41(82)
	Total	25(100)	25(100)	50(100)
X^2		14.46		
P Value		0.50		
AIQ	Average IQ (90-109)	25(100)	25(100)	50(100)
	Total	25(100)	25(100)	50(100)
X^2		-		
P Value				
LIQ	Low Average IQ(80-89)	14(56%)	17(68%)	31(62)
	Borderline Impaired(70-79)	11(44%)	8(32%)	19(38)
	Total	25(100)	25(100)	50(100)
X^2		16.80		
P Value		0.33		

Table. 4: Age Distribution among the Different Level of Intelligence and Parental Presence Technique.

Groups			Subgroups PPP(C) N (%)	Subgroups PAP(S) N (%)	Total N (%)
HIQ	Age	3-<4 years	4(16)	4(16)	8(16)
		4-<5 years	4(16)	7(28)	11(22)
		5- 6years	17(68)	14(56)	31(62)
		Total	25(100)	25(100)	50(100)
X^2			1.11		
P Value			0.58		
AIQ	Age	3-<4 years	6(24)	7(28)	13(26)
		4-<5 years	13(52)	5(20)	18(36)
		5- 6years	6(24)	13(52)	19(38)
		Total	25(100)	25(100)	50(100)
X^2			6.21		
P Value			0.05*		
LIQ	Age	3-<4 years	8(32)	9(36)	17(34)
		4-<5 years	8(32)	5(20)	13(26)
		5- 6years	9(36)	11(44)	20(40)
		Total	25(100)	25(100)	50(100)
X^2			0.95		
P Value			0.62		

*** Statistically significant at P ≤0.05.**

Table. 5: Gender Distribution among the Different Level of Intelligence and Parental Presence Technique.

Groups			Subgroups		Total
			PPP (C) N (%)	PAP(S) N (%)	N (%)
HIQ	Gender	Male	10(40)	14(56)	24(48)
		Female	15(60)	11(44)	26(52)
		Total	25(100)	25(100)	50(100)
X^2			1.28		
P Value			0.26		
AIQ	Gender	Male	17(68)	15(60)	32(64)
		Female	8(32)	10(40)	18(36)
		Total	25(100)	25(100)	50(100)
X^2			0.35		
P Value			0.56		
LIQ	Gender	Male	16(64)	16(64)	32(64)
		Female	9(36)	9(36)	18(36)
		Total	25(100)	25(100)	50(100)
X^2			0.00		
P Value			1.00		

Measurement of Children's Dental Fear:

The mean Facial Image scale score ± SD in HIQ group was 2.16 ± 1.18 while the median score was 2 ranging from 1 to 4. The mean ± SD in AIQ group was 2.04 ± 1.12 with median score 2 ranging from 1-5. The mean ± SD FIS score in LIQ group was (3.00 ± 1.34) and the median score was 3 (range: 1-5).

The distribution of FIS scores among the different level of intelligence is shown in (Table. 6, Fig. 21). The total distribution of score 1 (very happy) was the most frequent score (51children) of 150 children. In HIQ, AIQ, and LIQ groups, there were 21, 22, and 8 children respectively with score 1. The frequency of distribution in score 2 (happy) was (10, 11, and 11 children respectively) among the three different level of intelligence. Furthermore, score 3 (moderate) had a number of (9, 11, and 13 children respectively) for the three study group. The distribution of score 4 (unhappy) in the HIQ group was (10 children), while in the AIQ group was (5 children) and it was (9 children) in the LIQ group. On the other hand, the total frequency of distribution of score 5 (very unhappy) was the lowest score (10 children) of the total sample size.

There was a statistically significant difference in the distribution of FIS scores among three study groups (Chi square = 24.32, $P = 0.002$). Greater number of children had scored 1 in AIQ and HIQ groups compared to children in the LIQ group. There were no children with score 5 in HIQ group and only one child in the AIQ group compared to 9 children in the LIQ group.

Facial Image Scale scores were recoded into happy (scores 1 and 2) and unhappy (all other scores). The distribution of FIS scores (happy/ unhappy) among the different level of intelligence is presented in (Table. 7, Fig. 22). Unhappy children were represented 67 (44.7%) from the total sample size (150 children). In the HIQ and AIQ groups there were a great number of happy children (31 and 33 children respectively) compared to 19 children in the LIQ group (Chi square= 9.28, $P = 0.01$).

Table 8 shows the relation between FIS scores (happy/ unhappy) with parental active/passive presence (PA/PP) techniques in different level of intelligence. Most children in the HIQ group were scored happy whether in the PPP or PAP subgroups (60% and 64% respectively), with no significant difference between them (P= 0.77). In the AIQ group the happy score was higher in PAP technique more than PPP technique (80% and 52% respectively), with significant difference between them (P=0.04). In the LIQ group there was no significant difference in the number of happy children between PPP and PAP subgroups (8 and 11 respectively) (P= 0.38).

Table. 6: Distribution of Facial Image Scales Scores among the Different Level of Intelligence.

FIS	Group			Total N (%)
	HIQ N (%)	AIQ N (%)	LIQ N (%)	
1	21(42)	22(44)	8(16)	51(34)
2	10(20)	11(22)	11(22)	32(21.3)
3	9(18)	11(22)	13(26)	33(22)
4	10(20)	5(10)	9(18)	24(16)
5	0(0)	1(2)	9(18)	10(6.7)
Total	50(100)	50(100)	50(100)	150(100)
X^2	24.32			
P Value	0.002*			

*** Statistically significant at P ≤0.05.**

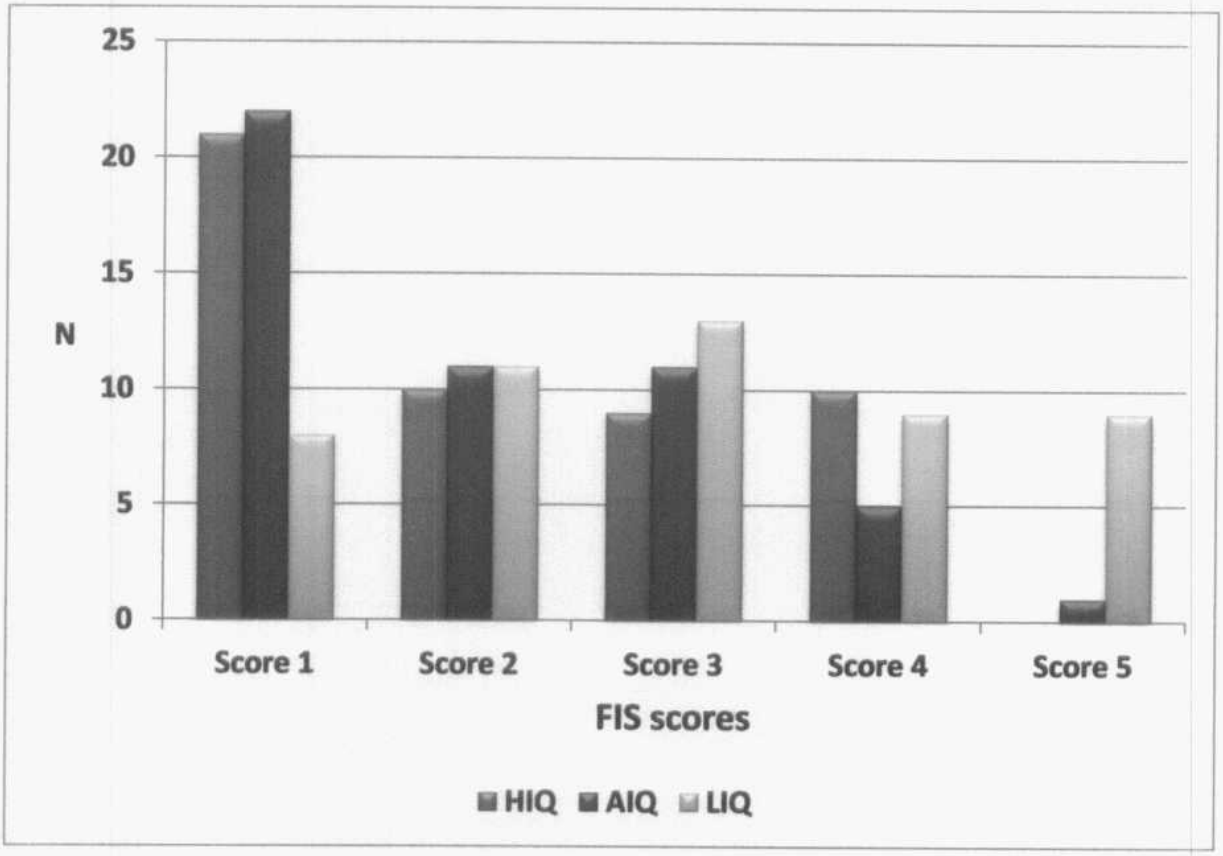

Fig. 21. Distribution of Facial Image Scales Scores among the Different Level of Intelligence.

Table. 7: Distribution Of Facial Image Scales Scores (Happy/ Unhappy) among the Different Level of Intelligence.

FIS	Group			Total N (%)
	HIQ N (%)	AIQ N (%)	LIQ N (%)	
Happy	31(62%)	33(66%)	19(38%)	83(55.3%)
Unhappy	19(38%)	17(34%)	31(62%)	67(44.7%)
Total	50(100 %)	50(100 %)	50(100 %)	150(100.0%)
X^2	9.28			
P Value	0.01*			

* Statistically significant at P ≤0.05.

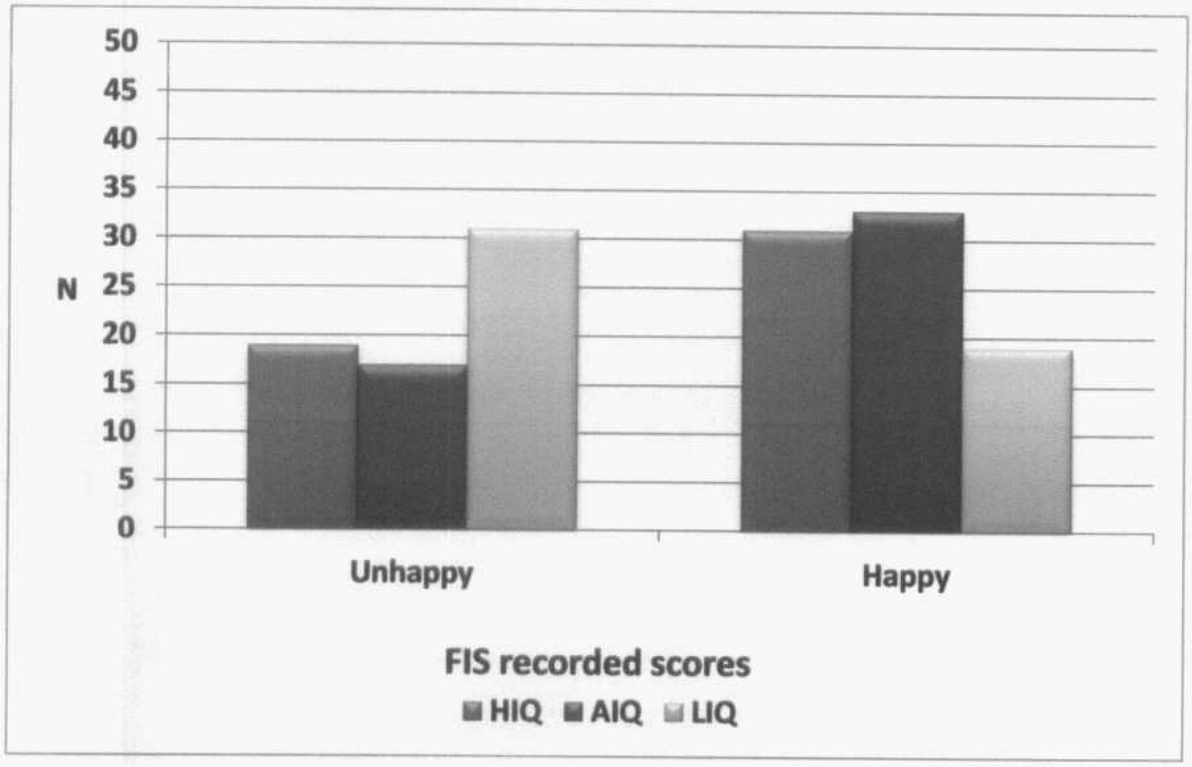

Fig. 22. Distribution Of Facial Image Scales Scores (Happy/ Unhappy) among the Different Level of Intelligence.

Table. 8: Relation between Dental Fear and Parental Active/Passive Presence Techniques among the Different Level of Intelligence.

Groups			Subgroups PPP (C) N (%)	Subgroups PAP (S) N (%)	Total N (%)
HIQ	FIS	Happy	15(60)	16(64)	31(62)
		Unhappy	10(40)	9(36)	19(38)
		Total	25(100)	25(100)	50(100)
X^2			0.09		
P Value			0.77		
AIQ	FIS	Happy	13(52)	20(80)	33(66)
		Unhappy	12(48)	5 (20)	17(34)
		Total	25(100)	25(100)	50(100)
X^2			4.37		
P Value			0.04*		
LIQ	FIS	Happy	8(32)	11(44)	19(38)
		Unhappy	17(68)	14(56)	31(62)
		Total	25(100)	25(100)	50(100)
X^2			0.76		
P Value			0.38		

*statistically significant at P ≤0.05.

Children's Overall Behavior in the Dental Clinic:

The Frankl behavior rating scale means score ± SD score in HIQ group was 3.02± 0.85 while the median was 3 (range: 1-4). In AIQ, the mean ± SD was 2.78 ± 0.89 and the median 3 ranging from 1 to 4. The mean ± SD score for Frankl scale in LIQ group was 2.12 ± 1.003 and the median was 2 (range: 1-4).

The distribution of Frankl behavior rating scale scores among the different level of intelligence is presented in (Table. 9, Fig. 23). Score 1 (-: definitely negative) was the least frequent score, 25 children out of 150 children (16.7%). The number of children with score 1 in HIQ, AIQ, and LIQ groups was (3, 4, and 18 children respectively). The distribution in recorded score 2 (-: negative) was (8, 14, and 12 children respectively) among the three study group. In contrast, the frequency of distribution of score 3 (+: positive) in the HIQ group was (24 children), while in the AIQ group was (21children) and it was (16 children) in the LIQ group. Furthermore, the total frequency of distribution in score 3 represented the highest score (61) of the total sample size. Score 4 (+: definitely positive) was more frequent in in HIQ and AIQ groups (15, 11children) than in the LIQ group (4 children).

There was a statistically significant difference in Frankl scale scores distribution among the three study groups (Chi square= 26.33, $P<0.0001$). Scores 1 and 2 (denoting definitely negative and negative behavior) in HIQ and AIQ groups were significantly lower than LIQ group.

Frankl behavior rating scale scores were recoded into positive behavior (scores 3 and 4) and negative behavior (scores 1 and 2). The distribution of the recorded scores (positive/ negative) among the different level of intelligence is shown in (Table. 10, Fig. 24). Children with negative behavior were 59 out of all 150 children enrolled in the study. In the HIQ and AIQ groups, more children had the positive behavior compared to LIQ group (39 and 32 compared to 20 children respectively) (Chi square= 15.48, $P<0.0001$).

Table 11 shows the relation between children overall behavior and parental active/passive presence techniques among the different level of intelligence. In the HIQ group, 23 children showed positive behavior with a significant different in the PAP technique compared to 16 children in the PPP technique ($P = 0.04$). In LIQ group, 14 children showed a significant positive behavior in the PAP subgroup compared to 6 children in the PPP subgroup (Chi square = 5.13, $P = 0.02$). In the AIQ group there was no significant difference between parental active and passive presence techniques in the number of children with positive behavior ($P = 0.08$).

Table. 9: Distribution of Frankl Behavior Rating Scale Scores among the Different Level of Intelligence.

Frankl	Group			Total
	HIQ N (%)	AIQ N (%)	LIQ N (%)	N (%)
1	3(6)	4(8)	18(36)	25(16.7)
2	8(16)	14(28)	12(24)	34(22.7)
3	24(48)	21(42)	16(32)	61(40.7)
4	15(30)	11(22%)	4(8)	30(20)
Total	50(100)	50(100)	50(100)	150(100)
X^2	26.33			
P Value	0.0001*			

*** Statistically significant at P ≤0.05.**

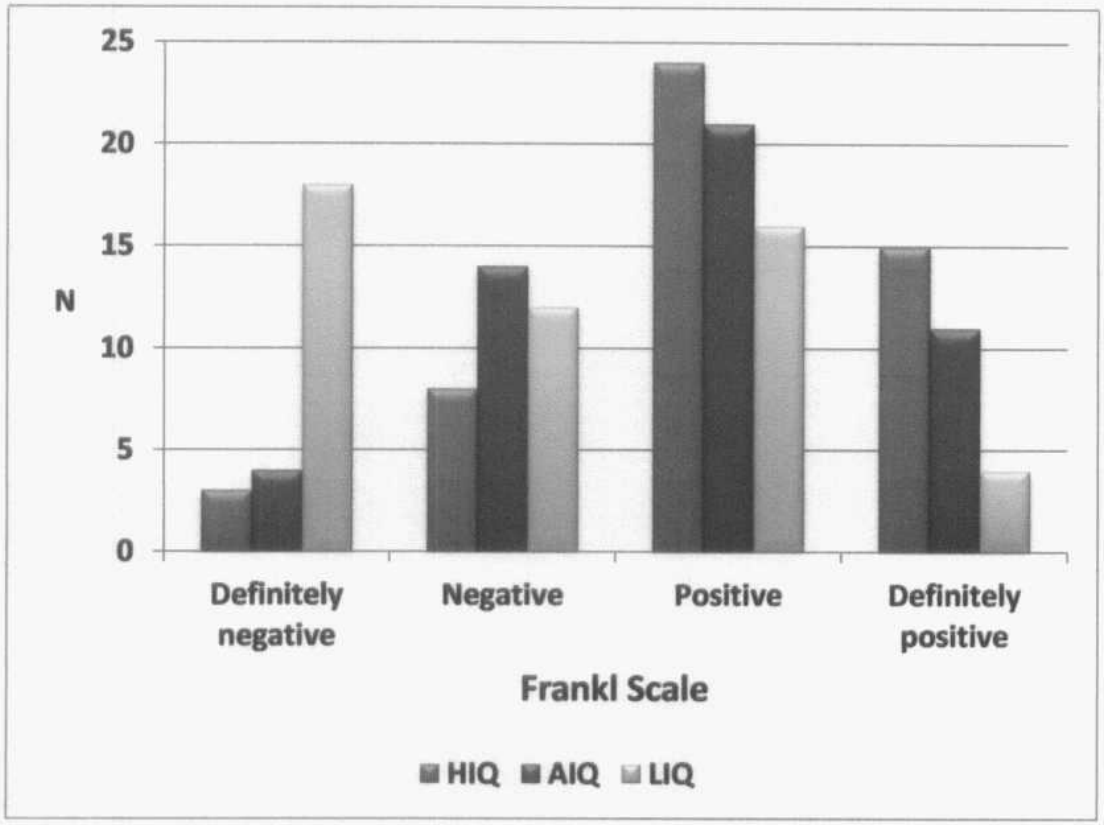

Fig. 23. Distribution of Frankl Behavior Rating Scale Scores among the Different Level of Intelligence.

Table. 19: Distribution of Frankl Behavior Rating Scale Scores (Positive/ Negative) among the Different Level of Intelligence.

Frankl	Group			Total
	HIQ N (%)	AIQ N (%)	LIQ N (%)	N (%)
Positive behavior	39(78)	32(64)	20(40)	91(60.7)
Negative behavior	11(22)	18(36)	30(60)	59(39.3)
Total	50(100)	50(100)	50(100)	150(100.0)
X^2 test	15.48			
P Value	0.0001*			

* Statistically significant at P ≤0.05.

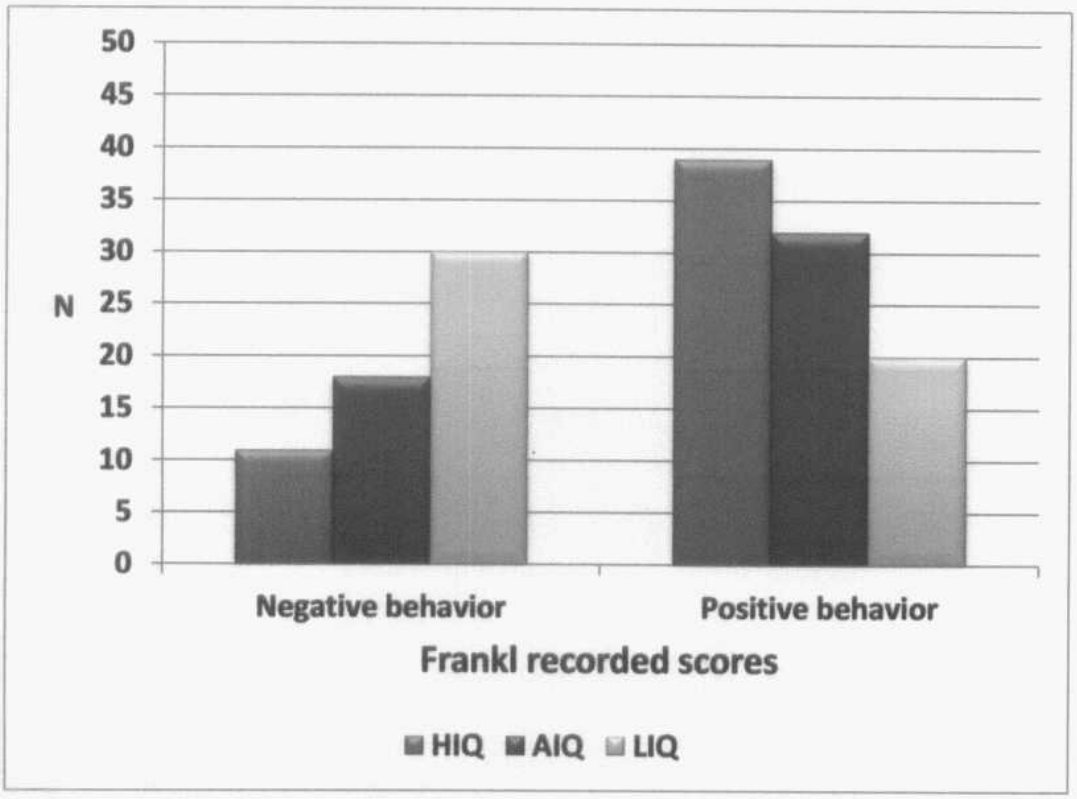

Fig. 24. Distribution of Frankl Behavior Rating Scale Scores (Positive/ Negative) among the Different Level of Intelligence.

Table. 11: Relation between Children Overall Behavior and Parental Active/Passive Presence Techniques among the different level of intelligence

Groups			Subgroups PPP(C) N (%)	Subgroups PAP(S) N (%)	Total N (%)
HIQ	Frankle	Positive behavior	16(64)	23(92)	39(78)
		Negative behavior	9(36)	2(8)	11(22)
		Total	25(100)	25(100)	50(100)
P value of Fisher Exact	0.04*				
AIQ	Frankle	Positive behavior	13(52)	19(76)	32(64)
		Negative behavior	12(48)	6(24)	18(36)
		Total	25(100)	25(100)	50(100)
X^2	3.13				
P Value	0.08				
LIQ	Frankle	Positive behavior	6(24)	14(56)	20(40)
		Negative behavior	19(76)	11(44)	30(60)
		Total	25(100)	25(100)	50(100)
X^2	5.13				
P Value	0.02*				

*** Statistically significant at P ≤0.05.**

Logistic regression analysis:

Two regression models were developed to assess the effect of study groups (HIQ, AIQ, and LIQ), subgroups and confounders (fear and age) on the outcome (positive and negative behaviors) and also for each group with independent variables subgroups, fear and age groups.

Table 12 shows the logistic regression model for factors affecting positive behavior. Age had a significant effect on positive behavior. Children who were (3-<4) and (4-<5) years old had significantly less odds of positive behavior compared to older children (5-6 years old) (P<0.0001 and 0.05 respectively). Children who were (3-<4 years old) had about 10% the odds of positive behavior compared to (5-6 years old) children, whereas children who were (4-<5 years old) had about 40% the odds of positive behavior compared to (5-6 years old) children (OR= 0.12 and 0.36 respectively).

Intelligence had a significant effect on positive behavior where children with HIQ had significantly higher odds of positive behavior compared to children with LIQ whereas children with AIQ did not differ significantly from children with LIQ as regards positive behavior (P= 0.01 and 0.09 respectively). Children with HIQ had 4 times higher odds as children with LIQ for positive behavior (OR= 4.08).

Parental active presence technique had significantly higher odds of positive behavior than parental passive presence technique ($P = 0.002$). Children with the PAP technique had 4 times higher odds as in children with PPP technique (OR=4.08). Facial Image scale categories (dental fear) significantly affected positive behavior ($P < 0.0001$). Children who were unhappy had about 20% of the odds of happy children for positive behavior (OR= 0.19)

Table 13 shows the logistic regression model for factors affecting positive behavior per study group. In HIQ group, there was as significant effect of age and PA/PP technique on positive behavior with children in the youngest age group having significantly lower odds of positive behavior than oldest children (OR= 0.06, *P*= 0.02) and children with PAP technique having significantly higher odds of positive behavior than children with PPP technique (OR= 13.17, *P*= 0.03)

In AIQ group, age and FIS had significant effect on positive behavior where (3-<4) and (4-<5) years old children had significantly lower odds of positive behavior compared to (5-6) years old children (OR= 0.03 and 0.07, *P*= 0.01 and 0.03 respectively). Unhappy children had significantly lower odds of positive behavior compared to happy children (OR= 0.15, *P*= 0.02 respectively).

In LIQ group, positive behavior was affected significantly by age, PA/PP technique and FIS. The youngest children had significantly lower odds of positive behavior compared to the oldest children (OR= 0.20, *P*= 0.05). Children with PAP technique had significantly higher odds of positive behavior than children with PPP technique (OR= 4.14, *P*= 0.04). Unhappy children had significantly lower odds for positive behavior compared to happy children (OR= 0.15, *P*= 0.01).

Table. 12: Logistic Regression Model for Factors Affecting Positive Behavior

Variables	Wald X^2	P value	OR	95% CI for OR	
				Lower	Upper
Age: 3-<4 years Vs 5-6years	15.60	<0.0001*	0.12	0.04	0.34
Age: 4- <5years Vs 5-6years	3.78	0.05*	0.36	0.13	1.01
Group: HIQ Vs LIQ	6.89	0.01*	4.08	1.43	11.67
Group: AIQ Vs LIQ	2.81	0.09	2.40	0.86	6.68
Subgroup: PAP Vs PPP	10.01	0.002*	4.08	1.71	9.74
FIS (Fear): unhappy Vs happy	14.64	<0.0001*	0.19	0.08	0.44

OR: Odd ratio, CI: Confidence Interval

*** Statistically significant at P ≤0.05.**

Table. 13: Logistic Regression Model for Factors Affecting Positive Behavior per Study Group

Groups	Variables	Wald X^2	P value	OR	95.0% C.I. for OR	
					Lower	Upper
HIQ	Age: 3-<4 years Vs 5-6years	5.12	0.02*	0.06	0.01	0.68
	Age: 4- <5years Vs 5-6years	0.03	0.87	1.23	0.11	14.40
	Subgroup: PAP Vs PPP	4.85	0.03*	13.17	1.33	130.74
	FIS (Fear): unhappy Vs happy	1.82	0.18	0.31	0.06	1.69
AIQ	Age: 3-<4 years Vs 5-6years	7.63	0.01*	0.03	0.00	0.36
	Age: 4- <5years Vs 5-6years	4.86	0.03*	0.07	0.01	0.74
	Subgroup: PAP Vs PPP	0.21	0.65	1.45	0.29	7.26
	FIS (Fear): unhappy Vs happy	5.41	0.02*	0.15	0.03	0.74
LIQ	Age: 3-<4 years Vs 5-6years	3.69	0.05*	0.20	0.04	1.03
	Age: 4- <5years Vs 5-6years	1.35	0.25	0.35	0.06	2.05
	Subgroup: PAP Vs PPP	4.13	0.04*	4.14	1.05	16.26
	FIS (Fear): unhappy Vs happy	6.56	0.01*	0.15	0.04	0.64

OR: Odd ratio, CI: Confidence Interval

*** Statistically significant at P ≤0.05**

DISCUSSION

Discussion

It is now well documented that, there is a strong relationship between dental fear and behavior of children. Furthermore, dental fear can be used as an indicator of child behavior. (Salem, Kousha, Anissian, and Shahabi, 2012; Davies and Buchanan, 2013; Hägglin, Carlsson, and Hakeberg, 2013). On the other hand, there are some limited researches about the relation of children's intelligence with their behavior in the dental clinic (Rud and Kisling, 1973; Toledano, Osorio, Agullera, and Pegalajar, 1995; Armfield, 2006; Armfield, Slade, and Spencer, 2008; Muris and Field ,2008; Savin, and Maxim, 2008; Ali ,2010 ; Aminabadi, et.al., 2011; Carrillo- Diaz, Crego, Armfield, and Romero-Maroto, 2012a; 2012b; 2012c; Blomqvist, et.al., 2013). Thus, this study was performed to determine the possible effect of children's intelligence on their dental fear and overall behavior in the dental clinic. Furthermore, a parental active/ passive presence modified technique was investigated on children's behavior with different levels of intelligence and fear.

The study was conducted on 3-6 years old healthy preschool children. This age group was chosen to match the preoperational stage of Piaget cognitive theory (Piaget, 1954; 1966), which is one of the remarkable theories related to child intelligence development. Moreover, in such an age group verbal capacity is of importance to monitor behavior and feelings in a dental visit that could be a stressful situation for this particular child (Blomqvist, et.al., 2013). That is why a younger age group child would have communication problems with the dentist due to children in this stage (sensori-motor stage) tend to interact with environment through their sensory stimuli and motor response with little verbal capacity (Boeree, 2006a; Singleton and Shulman, 2014) . On the

other hand older children would have had any sort of dental intervention, thus influencing the assessment of the child's fear and overall behavior throughout the study. (Klingberg, 2007).

The children that were chosen for this investigation didn't encounter any previous dental treatment nor went through any dental pain related to caries or extraction. One of the possible causes of fear and/or behavior problems is a painful past dental experience, since it exert a great sensitivity to painful stimuli and enhance a negative dental attitude for future visits, thus this will affect communications between the dentist and child (Versloot, Veerkamp, and Hoogstraten, 2008).

Social class differences have presented conflicting results related to fearful or anxious behavior of children in previous studies (Frankl, Shiere, and Fogels, 1962). To avoid any kind of influence, children in the current study were recruited from the dental clinic of Pediatric Dentistry Department in Faculty of Dentistry thus they would have the same socioeconomic status as well as educational level. Several studies have also proved the influence of different educational levels on children's behavior in different dental settings (Arnup, et.al., 2002 ; Dash, Sahoo, and Baliarsing, 2002; Salem, Kousha, Anissian, and Shahabi, 2012).

The Stanford-Binet Intelligence Scale: Fourth Edition (Thorndike, Hagen, and Sattler, 1986) was chosen to measure children intelligence. The fourth version of SB scale was the most applicable scale to the chosen population as it was the only Arabic translated scale and standardized for Egyptian norms (Malika, 1998a; 1998b; 1998c). This scale is the most flexible test in administration and implementation as it allows for short form of item (*abbreviated test battery*) to be used instead of time consuming with a full battery test. The selected item was age appropriate, in other words, related to the selected age group in the current study (Youngstrom, Glutiing, and Watkins, 2003). Besides, it has

an adequate valid measure for many aspects of intellectual functioning for children of most ages and for a variety of exceptional subpopulations (Grigorenko and Stemnberg, 1999; Youngstrom, Glutting, and Watkins, 2003; Chase, 2005). Moreover, SB-IV included a wide verbal reasoning item that can lead to a valid strong verbal IQ. The verbal tasks in the SB-IV require the child to understand the verbal information, extract the meaning and relevant information, memorize it, and respond appropriately. Thus, Verbal IQ is the most significant cognitive index that could be correlated to children DFA and overall behavior (Blomqvist, et.al., 2013). In spite of there was a fifth edition for the Stanford-Binet Intelligence scale SB5, it was not used in this study as the Arabic version wasn't available in the market and no centers provided training sessions. Besides, there was no great difference between the verbal IQ in both of SB-IV and SB5, which is the most appropriate index for estimation of children's dental fear and behavior (Becker, 2003; Blomqvist, et.al., 2013).

The researcher in a standardized setting, which was composed of a quite closed room with passive parental presence, performed the IQ test. A quite room is important to avoid any disturbance or distraction of child during test application. The parental presence was mandatory for child's assurance due to their young age. The passiveness of the attending parent was also important to avoid redirection of child interaction with the examiner during the IQ test (Thorndike, Hagen, and Sattler, 1986; Malika, 1998a; 1998b; 1998c).

Intelligence can be expected to have a significant impact on children's understanding of causes and consequences, information and instructions. It may also influence their ability to communicate feelings or distress and to behave adequately in the dental situation (Rud, and Kisling, 1973). Therefore, children that were included in this study had an

IQ ranged from (70-139) according to SB-IV and were divided into three groups to measure their behavior during the dental intervention according to their IQ level (HIQ, AIQ, and LIQ groups). This is one of the first studies that tried to divide the children into groups according to their level of intelligence. Thus, children's dental fear as well as overall behavior could be evaluated at different intelligence level. Normally, the cognitive development in the preschool stage children tends to be improved through thought and language. The child begins to acquire reading and writing skills and his attention span starts to increase (Piaget, 1954; 1964; 1966). According to American Psychiatric Association (APA) any child with score (69) and below this range with significant limitations in adaptive function in at least two domains would be considered intellectually disable (APA, 1994). Communication is one of these domains (McDonald, Avery and Dean, 2011). That's why; children with any degree of intellectual disability have been excluded from the current study. Since it would have a negative impact on their normal communication processes as well as their behavior in dental clinic (AAPD, 2013e). In addition, children with psychological problems as well as medical condition were excluded from the study due to lack of communication and negative behavior (AAPD, 2013e).

Parental presence/absence technique is intended to utilize the parent to increase patient psychological comfort and reduce patient anxiety. This debate concept may increase communication during treatment, or may be distract to the patient's attention (Feigal, 2001; Molinari, Deyoung, 2004) Past studies have suggested that parental presence has the advantage of decreasing negative patient behavior thus improving patient management and reducing anxiety (Fenlon, Dabbs, and Curzon, 1993; Dalhquist, Power, Cox, and Fernbach, 1994; O'Laughlin and Ridley-Johnson, 1995; Bauchner, et.al., 1996; Molinari, Deyoung,

2004). Parental presence/ absence technique PPA is one of the suitable and less invasive techniques for management of children. (Molinari and Deyoung, 2004). On the other hand, the Parental Presence technique alone was a recommended strategy for children less than four years old (Kamp, 1992 ;Corkey and Freeman, 1994; Marcum, Turner, and Courts,1995 ; Peretz and Zadik, 1998). Besides, psychiatric researches have confirmed the presence of at least one of the parents in order to enhance feeling of security and betterment of the child's behavior (Certo and Bernat, 1995). Parent's presence can either be active or passive. Involving the parents in the planning stage and outlining their role as a passive but silent helper may provide a comforting presence without unhelpful interference (Freeman, 1999b). If the parent is properly instructed and motivated, they can be a valuable adjunct in establishing rapport between child and the dentist (Frankl, Shiere, and Fogels, 1962). This strategy might change parents' mind and encourage them to do an active part during management of their children (Pinkham, 1991). Thus the manner of the parent presence beside their children is still questionable. That is why, the new modified technique" Parental active/ passive presence technique" PA/PP, have been applied in this study to evaluate its efficacy in the management of preschool children with different levels of intelligence.

Children were randomly and equally allocated into either PAP technique (study subgroup) or PPP technique (control group) in each of the three study groups. Randomization for grouping was achieved by using a computer random number generator to give the entire participants an equal chance in this study.

Dental preventive measures were applied to all participants in the study. These preventive measures were chosen because they are simple procedures, not pain provoking, and no need for dental anesthesia. Thus

the problem of pain induced fear was eliminated. This might have a negative effect on the child's behavior (Klingberg, 2007; Versloot, Veerkamp, and Hoogstraten, 2008).

Dental fear is considered as a confounder as it might affect the outcome of the study. That's why; dental fear was measured before the application of any dental procedures. The Facial Image Scale was used to measure dental fear as this scale is recommended by the AAPD for very young children (AAPD, 2013a). This is a non-verbal tool for fear measurement that gives the child the ability to recognize and interpret the physiological and cognitive manifestations of fear and anxiety without parental influence (Klingberg, 1995; AAPD, 2013a). The other scales for measurement of dental fear such as Modified Child Dental Anxiety Scale (MCDAS), Children's Fear Survey Schedule (CFSS) and Dental Subscale of Children's Fear Survey Schedule (CFSS-DS) used parental help as children in this particular age group are unable to comprehend the content of theses fear measurement scales (Klingberg, 1994; Folayan, Idehen, and Ojo, 2004). Therefore, there might be a chance for questionable agreement between parent and child interpretation of fear rating thus affecting the results of the study (Folayan, Idehen, and Ojo, 2004; Gustafsson, et. al., 2010; Luoto, et. al., 2010; Krikken, Van Wijk, Ten Cate, and Veerkamp,2013).

The result of this study revealed a significant inverse relationship between the children intelligence and their dental fear (Table. 6, 7). Thus children with high or average IQ showed low percentage or no dental fear while the children with lower IQ showed a higher percentage of dental fear. This is in agreement with Toledano et al who found a significant correlation between IQ and anxiety at the first dental visit. In another study by Blomqvist et al similar results were obtained that revealed that dental fear to be significantly correlated to the verbal intelligence quotient

(IQ) (Toledano, Osorio, Agullera, and Pegalajar, 1995; Blomqvist, et.al., 2013). On the other hand there was a disagreement with Di Bona and Aminabadi et al (Di Bona, 1973, Aminabadi, et.al., 2011). The result of Di Bona concluded that a more intelligent child may show more dental fear that can be related to children overactive imagination. Bad expectations and negative perceptions of dental bad events with lack of good explanation prior to dental treatment might be other causes for dental fear in children with high IQ (Arntz, van Eck, and Heumans, 1990; Carrillo- Diaz, Crego, Armfield, and Romero-Maroto, 2012c). However, Aminabadi and his colleagues indicated there was an absence of significant relationship between IQ score and dental anxiety (Aminabadi, et.al., 2011). The drawback in their study was the unequal distribution between groups and applications of a painful type of dental anesthesia such as nerve block which might induce dental fear even with children of high intelligence level. Besides, they depended on Raven's colored progressive matrices (RCPM) for IQ testing which doesn't measure verbal intelligence which is an important measure for the cognitive ability of children in relation to dental fear (Blomqvist, et.al., 2013).

In the current study, the presence of parent whether active or passive had no significant effect on the child's dental fear before performing any dental intervention in both high and low IQ level (Table. 8). On the other hand, the number of fearful children was more in the AIQ group (33). This difference in number might have led to the difference between the three levels of intelligence either with the active or passive presences of parents.

Children overall behavior is the major outcome of this study so it was measured at the end of the second visit after the application of the preventive measures. The overall behavior was measured using Frankl's Behavior Rating Scale (FBRS) (Frankl, Shiere and Fogels, 1962). This

scale is one of the most reliable and frequently used behavior rating systems in both clinical dentistry and research due to its clear rating system with shorthand form that can be used easily in recording child behavior in clinic (Klingberg, 2007; AAPD, 2013a).

The present results indicated that there was a significant effect of preschool child intelligence on their overall behavior in the dental clinic (Table.9, 10). Thus, children with high and average intelligence showed a more significant positive behavior in the dental clinic. On the contrary, children with negative behavior were in the low intelligence level. These results are consistent with the finding of Rud and Kisling, which concluded that children with low IQ showed a more negative behavior and needed a significantly longer time to accept the dental treatment situation (Rud and Kisling, 1973). Savin and Maxim were in agreement with the present results in which there were a significant correlation between the IQ level and the behavioral response manifested by the child (Savin and Maxim, 2008). Moreover, Blomqvist et al observed a significant correlation between IQ and acceptance of dental treatment (Blomqvist, et.al., 2013). On the other hand, Di Bona had found that, the children with high intelligence showed more dental fear with more negative behavior (Di Bona, 1973). Ali and Aminabadi et al found that there was no effect of children IQ on their behavior in dental clinic (Ali, 2010; Aminabadi, et.al., 2011). This difference might be due to the different IQ measurement scale. The Porteus maze test (PMT) that Ali used for IQ measure was a single nonverbal test which couldn't neither measure the child IQ accurately nor correlate the child's behavior to the intelligence. Furthermore, Ali induced pain during his treatment procedure through local anesthesia which might have had an additional negative effect in their behavior.

In the current study, during preforming dental treatment it was observed that children with a lower IQ tend to have less social activity in the dental clinic, i.e. child felt afraid, unsecured and tried to avoid contact with the dentist. Low IQ is a consistent risk factor for emergence and continuity of antisocial behavior across the life course in different types of studies (Hinshaw, 1992; Nigg and Huang-Pollock, 2003; Simonoff et al., 2004; Koenen, et.al., 2006). The presence of the parent in the operatory in close proximity to his child helped in explaining the dentist's instruction by reassuring the child, thus the children's behavior was reinforced (Feigal, 2001; Law and Blain, 2003; Eaton, McTique, Fields, and Beck, 2005). That's why parental active presence technique might have had a positive effect on the child's behavior thus making him feel more secure and cooperative (Table.11). Meanwhile using TSD technique with parental physical contact had also a significant effect on the child's behavior thus improving child's communication with dentist. On the other hand, children with high IQ have a high imagination and bad expectation about dental treatment (Arntz, van Eck, and Heumans, 1990; Carrillo- Diaz, Crego, Armfield, and Romero-Maroto, 2012c), so parental reassurance during dental treatment might have had a positive effect on the child behavior. In spite of that, there was no effect of the parental active presence technique on the children behavior with average IQ. This might be due to the significant greater number of non-fearful (happy) children with average IQ.

When describing the distribution of the study sample according to the different categories such as gender and age, the children were normally distributed among the three studied IQ groups in regard to their gender and age. Regarding gender there was no significant difference among subgroups of the study (PAP, PPP) (Table. 5). Thus, gender cannot be assessed for further statistical analysis especially logistic

regression type. Thus, there was lack of association between gender and fear in one hand and with behavior in another hand. This result came in accordance with many studies (Milgrom, Mancel, and King, 1995; Schwarz and Birn, 1995; Brill, 2000; Kyritsi, Dimou, and Lygidakis, 2009; Kamran, Qiam, and Khan, 2011). Although these results were not in agreement with the other studies which implied that female children showed higher levels of dental fear anxiety than male children (Chapman and Kirby-Turner, 1999; Peretz, and Efrat, 2000; Chellappah, Vignesha, Milgrom and Lam, 2006; Heft, Meng, Bradley, and Lang, 2007; Klingberg and Broberg ,2007; Hittner and Hemmo,2009; Carrillo-Diaz, Crego, Armfield, and Romero-Maroto, 2013). The reason for that might be due to higher in percentage of male children participants in the study than female children which lead to hindering the difference between them. Since most of the previous studies included more female children than male children thus they supported that female child had a high DFA than male children.

On the other hand, there was no significant difference between the parental active presence and parental passive presence techniques with age groups distribution in both of HIQ and LIQ. On the contrary, in AIQ group, there was a significant difference in the distribution of children with the three age groups between the PAP/PPP subgroups (Table. 4). As a result age can be assessed for further statistical analysis.

In the current study, the results of regression analysis highlighted the factors that had a significant effect on positive behavior of children. These factors are children's age, IQ level, dental fear as well as parent's active/passive presence technique PA/PP (Table. 12, 13). There is considerable evidence that positive behavior increased with age. Older children with an age 5-6 years showed a more positive behavior compared to younger children. As a result, older children (5-6 years) with

different IQ levels were more cooperative than younger children. This result came in accordance with the finding of many researches that have found that age of the child was significantly related to children's behavior. Thus, more negative behavior should be expected from younger children (3- 6 years) (Brill, 2000; Kyritsi, Dimou, and Lygidakis, 2009; Zhou, Cameron, Forbes, and Humphris, 2010; Kamran, Qiam, and Khan, 2011). Therefore, children's age would be an influential factor on the positive overall behavior of children during dental treatment.

Regarding the level of intelligence on the child's positive behavior, it was found that the HIQ children were more cooperative during dental treatment. These results, match the result of Toledano et al (Toledano, Osorio, Aguilera, and Pegalajar, 1995). On the other hand, there was no significant difference between the other levels of intelligence in relation to positive behavior. Other researchers showed similar results but they had included children with IQ below the normal range (Rud and Kisling, 1973).

Furthermore, dental fear had a significant effect on the child's overall behavior during dental treatment. Thus fearful children appeared to be less cooperative. The lower the IQ level, the more fearful is the child towards dental treatment. Children with an average IQ level showed more positive behavior during dental treatment. These findings are similar to previous mentioned studies (Rud and Kisling, 1973; Toledano, Osorio, Agullera, and Pegalajar, 1995; Savin and Maxim, 2008; Blomqvist, et.al., 2013).

The positive behavior was highly increased by the parental active presence technique than the parental passive presence technique in a ratio (4:1). This result rejected the study null hypothesis, thus parental active/ passive presence modified technique had a significant effect on the preschool children behavior. Interestingly there was another modified

form of PPA in which parental presence was conditioned according to child behavior (Kotsanos, Arhakis, and Coolidge, 2005). The application of this modified technique seemed to be very successful in managing initially uncooperative child patients (Kotsanos, Coolidge, Velonis, and Arapostathis, 2009). Thus, using different modifications in parental presence absence technique can help in improvement of child's overall behavior in different situations during dental treatment.

The main limitation of the present study was the lack of measurement of the parental/ maternal anxiety (Corkey and Freeman, 1994; Freeman, 1999b). Parents exert a significant influence on their child's behavior, especially if they have previous negative dental experiences. Therefore, an anxious or fearful parent may affect the child's behavior negatively (Klingberg and Berggren, 1992; Baier, et.al., 2004; Versloot and Craig, 2009). For these reasons, it was difficult to relate child's DFA to either parental/ maternal anxiety or fear of the unknown. Moreover, parental active presence technique was one of the behavior management techniques, thus parental anxiety would have had an effect during dental treatment. Consequently, further studies to evaluate this relationship effect are necessary.

This clinical study tried to explore the association between children dental fear, overall behavior and their intelligence. It can be concluded that there is an association between dental fear and overall behavior. Child's intelligence exhibited an additional effect, thus children with low intelligence level tend to be more fearful than children with average and high level of intelligence. Children with low intelligence have the most negative overall behavior. Identifying the intellectual abilities at early stages is a helpful step towards the likelihood of early intervention that might probably shift children away from some behavioral problems that is likely to appear. This on the other hand may

help in constructing an intelligence-based management approach for children's behavior during dental treatment. Initiating cognitive approach in pediatric dentistry field using children intelligence assessment is a significant method to understand children dental fear and overall behavior (Savin and Maxim, 2008; Carrillo-Diaz, et.al., 2012b).

There was a promising result in regard to the new modified technique in child behavior management in which there was a significant effect of parental active/passive presence technique. The parental active presence technique significantly improved children's positive behavior especially with low intelligence level. This might help during management of such children with some intelligence limitation. Further studies are needed to evaluate the effectiveness of this technique with children older than 6 years as well as with different treatment modalities including more intervention pain provoking techniques.

SUMMARY AND CONCLUSIONS

Summary

The effect of children's intelligence on their dental fear and their behavior in the dental clinic is still questionable especially with different levels of intelligence.

This study was conducted to investigate the effect of preschool children's intelligence on their dental fear and their overall behavior in the dental clinic. It is also meant to evaluate the effect of a new modified technique called Parental Active/ Passive Presence Technique on the overall behavior of preschool children with different levels of intelligence.

Three hundred children were recruited from the Outpatient Clinic of Pediatric Dentistry Department in Faculty of Dentistry at Alexandria University. Their age ranged from 3-6 years old. Children were screened and assessed for eligibility. In the first visit 170 children of them had the IQ test using Stanford Binet Intelligence Scales, Fourth Edition (SB-IV) - Arabic version (Thorndike, Hagen and Sattler, 1986; Malika, 1998a) in a quite closed room. Twenty children were excluded from the sample due to not being in the normal range and some of them were out of the required number.

One hundred and fifty children were enrolled in a randomized clinical trial with an allocation ratio of 1:1 based on a sample size estimation analysis to fulfill the aims of the present study. Children were divided based on their IQ into three groups; high, average and low IQ groups. Each group contained 50 children. High IQ group (HIQ) had the score of (110 and above). Average IQ (AIQ) group had the score of (90-109) while low IQ (LIQ) group had the score of (70-89) with normal intelligence range. In each of these three groups, children were randomly

and equally allocated into the study and control subgroups. Each subgroup contained 25 children. Randomization for grouping was achieved by using a computer random number generator to produce the sequence needed to allocate the children to one of the study groups.

In the second visit, dental fear was measured in each group using Facial Image Scale (FIS) (Buchanan and Niven, 2002) followed by the application of preventive measures (oral hygiene instruction, fissure sealants application, prophylaxis and topical fluoride applications) with standardized time and instructions. During the application of preventive measures, 25 children were managed by TSD and parental active presence (PAP) techniques in the study subgroup. The other 25 children of the control subgroup were managed using TSD and parental passive presence (PPP) techniques.

In the parental active presence technique, parents were allowed to stand beside their children with a nonverbal contact (hand holding and eye contacting). In the PPP technique, parents were seated silently in the dental operatory behind the patient with no eye contact, and no single word be spoken. All the procedures were described to children step by step using TSD technique.

After the application of preventive measures, overall behavior was evaluated for each child in each group according to Frankl's Behavior Rating Scale (FBRS) (Frankl, Shiere and Fogels, 1962).

The measurement scales were calibrated by intra-examiner reliability test for the FIS and Frankl's behavior rating scale prior to the study. The study was approved by the Research and Ethics Committee of the Faculty of Dentistry, Alexandria University. The study procedure was explained to the parents and an informed written consent was taken. Ethically, any child in the study who had any carious teeth was scheduled for treatment and oral hygiene instruction.

Data was collected and tabulated and only the biostatistician was blinded for the actual status of the children in regards to which group they will belong to. Then data were analyzed statistically. The results showed that there was a significant effect of children's intelligence on dental fear in which the most fearful children had a low IQ. There was also a significant relation between children intelligence with the overall behavior, i.e high and average intelligence children showed a more positive behavior in the dental clinic. Moreover, Parental active presence technique had a positive effect on the overall children's behavior at different intelligence levels. Age of the child was significantly related to the overall behavior of the child. Therefore more negative behavior should be expected from younger children. On the other hand gender have no significant effect on the children overall behavior.

Conclusions

According to the methodology proposed and based on the results of the present study it was concluded that:

1. There is an inverse relation between preschool children's dental fear and their level of intelligence. Children with low intelligence showed more dental fear.
2. There is a significant effect of preschool children's intelligence on their positive behavior in the dental clinic. Children with high and average intelligence showed a more positive behavior in the dental clinic.
3. Parental active presence technique has a positive effect on the overall children's behavior at different intelligence levels.
4. In children with low IQ level, parental active presence technique has a positive effect on the child behavior with different levels of fear. Thus, fearful children are more cooperative with parental active presence.
5. Age has a significant effect on the positive behavior on children. Older children showed a more positive behavior compared to younger children
6. Gender has no significant effect on the positive behavior of children.
7. Preventive measures can be applied effectively for low IQ children using parental active presence with tell show do techniques.

RECOMMENDATIONS FOR FUTURE RESEARCH

Recommendations for Future Research

Recommendations based on the findings are presented below:

1. Further study is needed to evaluate the parental/ maternal anxiety effect on the child behavior with different levels of intelligence.
2. Further study is needed to evaluate the effectiveness of parental active/passive presence technique on children with different treatment modalities, especially the pain provoking procedures at different age levels.

REFERENCES

References

Aartman, I.H.A., Van Everdingen, T.A., Hoogstraten, J., and Schuurs, A.H.B., 1996. Appraisal of behavioral measurement techniques for assessing dental anxiety and fear in children: a review, J Psychopathol Behav Assess, 18, pp. 153- 171.

Aartman, I.H.A., Van Everdingen, T.A., Hoogstraten, J., and Schuurs, A.H.B., 1998. Self-report measurements of dental anxiety and fear in children: a critical assessment, ASDJ Dent Child, 65, pp. 252-258.

Abrahamsson, K.H., Berggren, U., Hallberg, L.R., and Carlsson, S.G., 2002. Ambivalence in coping with dental fear and avoidance: A qualitative study, J Health Psycho, 7, pp.653-664

Abushal, M.S., and Adenubi, J.O., 2000. The use of behavior management techniques by dentists in Saudi Arabia: A Survey, Saudi Dent J, 12, pp. 129-134.

Addleston, H.K., 1959. Child patient training. Fort Rev Chicago Dent Soc, 38, pp. 27-29.

Afshar, H., Nakhjavani Y.B., Gharaei J.M., Paryab, M., et.al., 2011. The effect of parental presence on the 5 year-old children's anxiety and cooperative behavior in the first and second dental visit, Iran J Pediatr, 21 , pp. 193-200.

Alammouri, M., 2006. The attitude of parents toward behavior management techniques in pediatric dentistry, J Clin Pediatr Dent, 30, pp.310-313.

Alfonso, V. C., and Flanagan, D. P., 1999. Assessment of cognitive functioning in preschoolers. In: E. V. Nuttall, I. Ramero, and J. Kalesnik, eds. *Assessing and screening preschoolers*. Boston, MA: Allyn and Bacon. pp. 186-217.

Ali, S.E.A., 2010. *Effect of the children's intelligence on their behavior in dental clinic*. Master Thesis. Mansoura University.

Allen, K.D., Stanley, R. T., and McPherson, K., 1990. Evaluation of behavior management technology dissemination in pediatric dentistry, Pediatr Dent, 12, pp. 79-82.

Alwin, N.P., Murray, J.J., and Niven, N., 1994. The effect of children's dental anxiety on the behaviour of a dentist, Int J Pediatr Dent, 4, pp. 19-24.

Alwin, N.P., Murray, J.J., and Britton, P.G., 1999. An assessment of dental anxiety in children, Br Dent J, 171, pp. 201- 207.

American Academy of Pediatric Dentistry, 1990. Guidelines on Behavior Guidance for the Pediatric Dental Patient.

American Academy of Pediatric Dentistry, 2006. Guidelines on Behavior Guidance for the Pediatric Dental Patient.

American Academy of Pediatric Dentistry, 2013a. Guidelines on Behavior Guidance for the Pediatric Dental Patient. Available at:

<http://www.aapd.org/media/policies.asp> [Accessed at 25 August 2013].

American Academy of Pediatric Dentistry, 2013b. Guideline on Fluoride Therapy. Available at: <http://www.aapd.org/media/policies.asp> [Accessed at 10 July 2013].

American Academy of Pediatric Dentistry, 2013c. Guidelines on the Role of Dental Prophylaxis in Pediatric Dentistry. Available at: <http://www.aapd.org/media/policies.asp> [Accessed at 5 July 2013].

American Academy of Pediatric Dentistry, 2013d.Guidelines on informed consent. Available at: <http://www.aapd.org/media/policies.asp> [Accessed at 10 July 2013].

American Academy of Pediatric Dentistry, 2013e. Guideline on Management of Dental Patients with Special Health Care Needs. Available at: <http://www.aapd.org/media/policies.asp> [Accessed at 29 November 2013].

American Psychiatric Association, 1994. *Diagnostic and statistical manual of mental disorders*. 4th ed. Washington (DC): Author.

Aminabadi, N.A., Erfanparast, L., Adhami, Z.A., Maljaii, L., et.al., 2011. The impact of emotional intelligence and intelligence quotient (IQ) on child anxiety and behavior in the dental setting, Acta Odontol Scand, 69, pp. 292-298.

Anderson, L., M. and Fielding, J. E., 2003. The Effectiveness of Early Childhood Development Programs: A Systematic Review, Am J Prev Med, 24, pp.32-46.

Antony, M.M., and Barlow, D.H., 1996. Emotion theory as a framework for explaining panic attacks and panic disorders. In: R.M. Rapee, ed. *Current controversies in the anxiety disorders*. New York: Guilford Press, pp. 55-76.

Antony, M.M., Orsillo, S.M., and Roemer, E., 2001. *Practitioner's guide to empirically based measures of anxiety*. New York: Kluwer Academic/Plenum Publishers.

Armfield, J.M., 2006. Cognitive vulnerability: a model of the etiology of fear, Clin Psychol Rev, 26, pp. 746- 768.

Armfield, J.M., Stewart, J.F., and Spencer, A.J., 2007. The vicious cycle of dental fear: exploring the interplay between oral health, service utilization and dental fear, BMC Oral Health, 7, p.1.

Armfield, J.M., Slade, G.D., and Spencer, A.J., 2008. Cognitive vulnerability and dental fear, BMC Oral Health, 8, pp.1-11.

Armfield, J.M., Slade, G.D., and Spencer, A.J., 2009. Dental fear and adult oral health in Australia, Community Dent Oral Epidemiol, 37, pp.220-230.

Armfield, J.M, 2010. How do we measure dental fear and what are we measuring anyway? Oral Health Prev Dent, 8, pp. 107- 115.

Armfield, J.M., 2012. What goes around comes around: Revisiting the hypothesized vicious cycle of dental fear and avoidance, Commun Dent Oral Epidemiol, 41, pp. 279-287.

Arntz, A., van Eck, M., and Heumans, M., 1990. Predictions of dental pain: the fear of any expected evil is worse than the evil itself. Behav Res Ther, 28, pp. 29-41.

Arnup, K., Broberg, A.G., Berggren, U., and Bodin, L., 2002. Lack of cooperation in pediatric dentistry: The role of child personality characteristics, Pediatr Dent, 24, pp. 119-128.

Ashkenazi, M., Faibish, D., and Sarnat, H., 2002. Dental fear and knowledge of children treated by certified pediatric dentists and general practitioners. ASDC J Dent Child, 69, pp. 297-305.

Aylward, G. P., 1992. Review of the Differential Ability Scales. In: J. J. Kramer and J. C. Conoley , eds. *The eleventh mental measurements yearbook* .Lincoln: The Buros Institute of Mental Measurements of the University of Nebraska-Lincoln. pp. 281-282.

Ayoub, C.C., and Fischer, K.W., 2006. Developmental pathways and intersections among domains of development. In: k. McCartney and D. Phillips, ed. *Handbook of early child Development* .Oxford, U.K: Blackwell. pp. 62-82.

Baghdadi, Z.D., 2002. Principles and application of learning theory in child patient management, Quintessence Int, 32, pp.135-141.

Baier, K., Milgrom, P., Russell, S., Mancl, L., et.al., 2004. Children's fear and behavior in private pediatric dentistry practices, Pediatr Dent, 26, 316-321.

Barlow, D.H., 1988. *Anxiety and its disorders: The nature and treatment of anxiety and panic.* New York: Guilford Press.

Bauchner, H., Vinci, R., Bak, S., Person, C., et.al., 1996. Parents and procedures: a randomized controlled trial, Pediatrics, 98.pp.861-867.

Becker, K. A., 2003. *History of the Stanford-Binet intelligence scales: Content and psychometrics.* (Stanford-Binet Intelligence Scales, Fifth Edition Assessment Service Bulletin No. 1). Itasca, IL: Riverside Publishing.

Bedi, R., Sutcliffe, P., Donnan, P., Barrett, N., et.al., 1992. Dental caries experience and prevalence of children afraid of dental treatment, Community Dent Oral Epidemiol, 20, pp. 368-371.

Benjamins, C., Asscheman, H., and Schuurs, A.H., 1992. Increased salivary cortisol in severe dental anxiety, Psychophysiology, 29, pp. 302-305.

Berggren, U., and Odont, D.C.S., 2001. Long-term management of the fearful adult patient using behavior modification and other modalities, J Dent Educ, 65, pp. 1357-1368.

Bhatia, S., and Chadwick, B., 2010. Behavior management of anxious children. Dental Nursing, 6, pp. 88-92.

Blomqvist, M., Ek, U., Fernell, E., Holmberg, K., et.al., 2013. Cognitive ability and dental fear and anxiety, Eur J Oral Sci, 121, pp. 117-120.

Boeree, G., 2006a. Personality Theories: Sigmund Freud. [Online] Available at :< http://webspace.ship.edu/cgboer/freud.html > [Accessed 15 August 2013].

Boeree, G., 2006b. Personality Theories: Erik Erikson. [Online] Available at :< http://webspace.ship.edu/cgboer/erikson.html > [Accessed 15 January 2014].

Boeree, G., 2006c. Personality Theories: Alfred Adler. [Online] Available at :< http://webspace.ship.edu/cgboer/adler.html > [Accessed 15 August 2013].

Boeree, G., 2006d. Personality Theories: Jean Piaget. [Online] Available at :< http://webspace.ship.edu/cgboer/piaget.html> [Accessed 10 August 2013].

Bowden, S.C., Gregg, N., Bandalos, D., Davis, M., et.al., 2008. Latent mean and covariance differences with measurement equivalence in college students with developmental difficulties versus the Wechsler Adult Intelligence Scale–III/Wechsler Memory Scale-III normative sample. Educat Psychol Measur, 68, pp. 621-642.

Boynton, J.R., Johnson, L.A., Nainar, H., and Hu, J.C.C, 2007. Portable digital video instruction in predoctoral education of child behavior management. J Dent Educ, 71, pp. 545-549.

Brain Matrix, 2013. Intelligence Definition. [Online] Available at: < http://www.brainmetrix.com/intelligence-definition/ > [Accessed 20 August 2013].

Brill, W.A., 2000, Child behavior in a private pediatric dental practice associated with types of visits, age and socioeconomic factors, J Clin Pediatr Dent, 25, pp.1-7.

Brill, W.A., 2002. The effect of restorative treatment on children's behavior at the first recall visit in a private pediatric dental practice, J Clinic Pediat Dent,26, pp.389-394.

Brown, T. L., and Morgan, S. B., 1991. Concurrent validity of the Stanford-Binet, 4th Edition: Agreement with the WISC-R in classifying learning disabled children. Psychological Assessment, 3, pp. 247-253.

Buchanan, H., and Niven, N. 2002. Validation of a Facial Image Scale to assess child dental anxiety, Int J Ped Dent, 12, pp. 47-52.

Buchanan, H. Niven, N. 2003. Further evidence for the validity of the Facial Image Scale, Int J Ped Dent, 13, pp. 368-369.

Byrnes, J. P., and Fox, N.A., 1998. The educational relevance of research in cognitive neuroscience, Educat Psycho Rev, 10, pp. 297-373.

Carlson, C.L., Lahey, B.B., and Neeper, R., 1986. Direct assessment of the cognitive correlates of attention deficit disorders with and without Hyperactivity, J Psychopathol Behav Assess, 8, pp. 69-86.

Carrillo-Diaz, M., Crego, A., Armfield, J.M., and Romero-Maroto, M., 2012a. Treatment experience, frequency of dental visits and children's dental fear: a cognitive approach, Eur J Oral Sci, 120, pp. 75-81.

Carrillo-Diaz, M., Crego, A., Armfield, J.M., and Romero-Maroto, M., 2012b. Assessing the relative efficacy of cognitive and non-cognitive factors as predictors of dental anxiety, Eur J Oral Sci, 120, pp. 82-88.

Carrillo- Diaz, M., Crego, A., Armfield, J.M., and Romero-Maroto, M., 2012c. Self-assessed oral health, cognitive vulnerability and dental anxiety in children: testing a meditational model, Community Dent Oral Epidemiol, 40, pp. 8-16.

Carrillo-Diaz, M., Crego, A., and Romero-Maroto, M., 2013. The influence of gender on the relationship between dental anxiety and oral health-related emotional well-being, Int J Ped Dent, 23, pp. 180-187.

Carrillo-Diaz, M., Crego, A., Armfield, J.M., and Romero-Maroto, M., 2013. The moderating role of dental expectancies on the relationship between cognitive vulnerability and dental fear in children and adolescents, Community Dent Oral Epidemiol, 41, pp. 269-278.

Carson, P., and Freeman, R., 1997. Assessing child dental anxiety: the validity of clinical observations, Int. J. Paed. Dent, 7, pp. 171-176.

Casamassimo, P.S., Wilson, S., and Gross, L., 2002. Effects of changing US parenting styles on dental practice: Perceptions of diplomats of the American Board of Pediatric Dentistry presented to the College of Diplomates of the American Board of Pediatric Dentistry 16th Annual Session, Atlanta, Ga, Saturday, May 26, 2001, Pediatr Dent, 24, pp. 18-22.

Certo, M.A., and Bernat, J.E., 1995. Parents In the operatory, NY State Dent J ,61, pp. 34-38.

Chapman, H, R. and Kirby-Turner, N.C., 1999. Dental fear in children: a proposed model, Br Dent J. 187, pp.408-412.

Chapman, H.R., and Kirby-Turner, N.C., 2002. Visual/verbal analogue scales: Examples of brief assessment methods to aid management of child and adult patients in clinical practice, Bri Dent J, 193, pp. 447-450.

Chase, D., 2005. *Underlying Factor Structures of the Stanford-Binet Intelligence Scales - Fifth Edition.* Ph. D. Dissertation. Drexel University.

Chellappah, N.K., Vignehsa, H., Milgrom, P., and Lam, L.G., 1990. Prevalence of dental anxiety and fear in children in Singapore. Community Dent Oral Epidemiol, 18, pp.269-271.

Cherry, K., 2013a. *Child Development Theories.* About.com Guide. [Online]Available.at:<http://psychology.about.com/od/developmentalpsychology/a/childdevtheory.htm > [Accessed 15 August 2013].

Cherry, K., 2013b. *What Is the Electra complex?* About.com Guide. [Online]Available.at:<http://psychology.about.com/od/eindex/g/def_electracomp.htm>[Accessed 1 January 2014].

Cherry, K., 2013c. *Alfred Adler.* About.com Guide. [Online] Available at: < http://psychology.about.com/od/profilesal/p/alfred-adler.htm > [Accessed 15 August 2013].

Chrousos, G.P., and Kino, T., 2007. Glucocorticoid action networks and complex psychiatric and/or somatic disorders, Stress, 10, pp. 213-219.

Clark, D.M., 1986. A cognitive approach to panic, Behav Res Ther, 24, pp. 461-470.

Cohen, M., Fiske, J., Newton, J.T., 2000. The impact of dental anxiety on daily living, Br Dent J, 189, pp.385- 390.

Cohen, R. J., and Swerdlik, M. E., 2004. *Psychological testing and assessment: An introduction to tests and measurement*. 6th ed. Mountain View, CA: Mayfield.

Cook, J.L., and Cook, G., 2005. *Child Development: Principles & Perspectives*. Boston: Allyn & Bacon

Corah, N.L., 1969. Development of a Dental Anxiety Scale. J Dent Res, 48, p. 596.

Corkey, B. and Freeman, R., 1994. Predictors of dental anxiety in 6 year-old children- a report of a pilot study, ASCD J Dent 61, pp. 267-271.

Cornelius, M.D., Goldschmid, L., De Genna, N.M., Richardson, G.A., et.al., 2010. Improvement in intelligence test scores from 6 to 10 years in children of teenage mothers, J Dev Behav Pediatr, 31, pp. 405-413.

Crocombe, L.A., Broadbent, J.M., Thomson, W.M., Brennan, D.S., et.al., 2011. Dental visiting trajectory patterns and their antecedents, J Public Health Dent, 71, pp. 23-31.

Crossley, M.L., and Joshi, G., 2002. An investigation of pediatric dentists' attitudes towards parental accompaniment and behavioral management techniques in the UK, Bri Dent J, 192, pp. 517-521.

Cuthbert, M., and Melamed, B., 1982. A screening device: Children at risk for dental fears and management problems, ASDJ Dent Child, 49, pp. 432-438.

Dalhquist, L.M., Power, T.G., Cox, C.N., and Fernbach, D.J., 1994. Parenting and child distress during cancer procedures: a multidimensional assessment, Children's Health Care, 23, pp.149-166.

Dash, J.R., Sahoo, P.K., and Baliarsing, R.R., 2002. A study of behavior patterns of normal children in a dental situation and its relationship with socioeconomic status, family type and sibling position, Indian Soc Pedo Prev, 20, pp. 23-29.

Davies, E.B., and Buchanan, H., 2013. An exploratory study investigating children's perceptions of dental behavioral management techniques, Int J Pediatr Dent, 23, pp. 297-309.

De Jongh, A., and ter Horst, G., 1993. What do anxious patients think? An exploratory investigation of anxious dental patients' thoughts Community Dent Oral Epidemiol, 21, pp. 221-223.

De Jongh, A., and ter Horst, G., 1995. Dutch students' dental anxiety and occurrence of thoughts related to treatment, Community Dent Oral Epidemiol, 23, pp. 170-172.

De Jongh, A., Muris, P., Horst, G., and Duyx, M., 1995. Acquisition and maintenance of dental anxiety: the role of conditioning experiences and cognitive factors, Behav Res Ther, 33, pp. 205-210.

De Jongh, A., Muris, P., Schoenmakers, N., and ter Horst, G., 1995. Negative cognitions of dental phobics: reliability and validity of the dental cognitions questionnaire, Behav Res Ther, 33, 507-515.

De Jongh, A., Schutjes, M., and Aartman, I.H., 2011. A test of Berggren's model of dental fear and anxiety, Eur J Oral Sci, 119, pp. 361-365.

De Los, R.A., and Kazdin, A.E., 2004. Measuring informant discrepancies in clinical child research, Psychol Assess, 16, 330-334.

Denham, S.A., Blair, K., Schmidt, M., and DeMulder, E., 2002. Compromised emotional competence: seeds of violence sown early? Am J Orthopsychiatry, 72, pp. 70-82.

Di Bona, M.C., 1973. The relationship between fear and intelligence in child patient, NYJD, 43, pp. 52-56.

Di Cerbo, K. E., and Barona, A., 2000. A convergent validity study of the Differential Ability Scales and the Wechsler Intelligence Scale for Children-Third Edition with Hispanic children, J Psychoedu Assess, 18, pp. 344-352.

Diercke, K., Bürger, G.D., Bermejo,J.L., Lux,C.J., et.al., 2012. The management of dental anxiety and impact of psychosomatic factors on dentistry: Is recent scientific research translated into German dental practices? J Health Psycho, 0, pp. 1-10.

Diessner, R., and, Tiegs, J., 2001. *Notable selections in human development* .2nd ed. Connecticut: McGraw Hill/Dushkin.

Do, C., 2004. Applying the social leaning theory to children with dental anxiety, J Contemp Dent Pract, 5, pp.1-8.

Doebling, S., and Rowe, M.M., 2000. Negative perceptions of dental stimuli and their effects on dental fear, J Dent Hyg, 74, pp. 110-116.

Duggal, M., Cameron, A., and Toumba, J., 2013. *Paediatric Dentistry at a Glance*. Chichester, West Sussex, England: John Wiley & Sons Ltd.

Dunn, L.M., and Dunn, D.M., 2007. *Peabody Picture Vocabulary Test, Fourth Edition (PPVT™-4)*. San Antonio: Pearson Education, Inc.

Eaton, J.J., McTique, D.J, Fields, H.W., and Beck, M., 2005. Attitudes of contemporary parents toward behavior management techniques used in pediatric dentistry, Pediatr Dent, 27, pp. 107-113.

Elliott, C. D., 1990a. *Differential Ability Scales administration and scoring manual*. New York: Harcourt Brace Jovanovich.

Elliott, C. D., 1990b. *Differential Ability Scales introductory and technical handbook*. New York: Harcourt Brace Jovanovich.

Elliott, C. D. ,2005. The Differential Ability Scales. In: D. P. Flanagan and P. L. Harrison .eds., *Contemporary intellectual assessment: Theories, tests, and issues* 2nd ed . New York: Guilford. pp. 402-424.

Elliott, C. D., 2006. *Differential Ability Scales-Second Edition. New York*: Harcourt Brace Jovanovich.

Evans, L. D., Tannehill, R., and Martin, S., 1995. Children's reading skills: A comparison of traditional and computerized assessment, Behav Res Meth Instr Comput, 27, pp. 162-165.

Eyberg, S., and Pincus, D., 1999. *Child Behavior Inventory*. Odessa, Fla: Professional Manual Psychological Assessment Resources, Inc.

Faraj, S., 2010. *Stanford-Binet Intelligence Scale- Record Booklet: Fifth Edition.* . Cairo: Anglo-Egyptian (Arabic text).

Farsai, P., Urib, S.and Vig ,K. W. , 2010. How to clean the tooth surface before Sealant Application, J Am Dent Assoc, 141, pp.696-698.

Feigal, R.J., 2001. Guiding and managing the child dental patient: A fresh look at old pedagogy. J Dent Educ, 65, pp. 1369-1377.

Fenlon, W.L., Dobbs, A.R. and Curzon, M.E.J., 1993. Parental presence during treatment of the child patient: a study with British patients, Br Dent J, 174, pp. 23-28.

Fields, H. and Pinkham J.R. , 1976. Videotape Modeling of the Child Dental Patient. J Dent Res, 55, pp.958-963.

Fields, J., 1997. Measuring giftedness in young children: a comparative study in Malaysia, Early Child Develop Care, 131, pp. 93-106.

Fiorello, C. A., Hale, J. B., Snyder, L. E., Forrest, E., et.al. , 2008. Validating individual differences through examination of converging psychometric and neuropsychological models of cognitive functioning. In: S. K. Thurman and C. A. Fiorello , eds. *Appled Cognitive Research to K-3 Classroom Learning*. New York: Routledge. pp. 232-254.

Fiset, L., Milgrom, P., Weinstein, P., and Melnick, S., 1989. Common fears and their relationship to dental fear and utilization of the dentist. Anesth Prog. 36, pp. 258- 264.

Folayan, M.O., and Otuyemi, O.D., 2002. Reliability and validity of a Short Form of the Dental Subscale of the Child fear Survey Schedule used in a Nigerian children population, Niger J Med, 11, pp. 161-163.

Folayan, M.O., and Kolawole, K.A., 2004. A critical appraisal of the use of tools for assessing dental fear in children. Afri J Oral Health. 1, pp. 54-63.

Folayan, MO., and Idehen, E., 2004. Factors influencing the use of behavioral management techniques during child management by dentists. J Clin Pediatr Dent, 28, pp.155-162.

Folayan, M.O., Idehen, E.E., and Ojo, O.O., 2004. Identified factors in child-dentist relationship important for the management of dental anxiety in Nigerian children, Eur J Paediatr, 5, pp. 225-232.

Forehand, R. and Long, N., 1999. Strong-willed children: a challenge to parents and pediatric dentists, Pediat Dentist. 21, pp. 463-468.

Frankl, S. N., Shiere, F. R., and Fogels, H. R., 1962. Should the parent remain with the child in the dental operatory? J Dent Child, 29, pp.150-163.

Frazier, T.W., and Youngstrom, E. A., 2007. Historical increase in the number of factors measured by commercial tests of cognitive ability: Are we over factoring? Intelligence, 35, pp. 169-182.

Freeman, R., 1999a. Barriers to accessing dental care: patient factors, Br Dent J, 187, pp. 141-144.

Freeman, R., 1999b. The case for mother in the surgery, Br Dent J, 186, pp. 610-613.

Freeman, R., 2008. Communicating with children and parents: Recommendations for a child-parent-centred approach for paediatric dentistry, Eur Arch Paediatr Dent, 9, pp. 16-22.

Georgas, J, Weiss, L.G., van de Vijver, F.G.R., and Saklofske, D.H., 2003. *Culture and Children's Intelligence: Cross-Cultural Analysis of the WISC-III*. New York: Academic press Elsevier Inc.

Glutting, J. J., McGrath, E. A., Kamphaus, R. W., and McDermott, P A., 1992. Taxonomy and validity of subtest profiles on the Kaufman Assessment Battery for Children, J Spec Edu, 26, pp. 85-115.

Grant, S.K., 2010. Classification and. Assessment of Abnormal Behavior. *Psychology 310 Behavior Disorders*. [Online via internal VLE], California State University, Northridge, Available at:< http://www.csun.edu/%7Ehcpsy002/Psy310.htm> [Accessed Date 25 August 2013].

Greenbaum, P., Turner, C., Cook, E.W., and Melamed, B.G., 1990. Dentists' voice control: effects on children's disruptive and affective behavior, Health Psychol, 9, pp.546-558.

Greenberg, M., Kusche, C., Cooke, E., and Quamma, J., 1995. Promoting emotional competence in school aged children: the

effects of the PATHS Curriculum, Dev Psychopathol, 7, pp. 117-136.

Grigorenko, E.L., and Stemnberg, R.J., 1999. *Assessing cognitive development in early childhood.* Washington : World Bank.

Gudjonsson, G., 1995. The Standard Progressive Matrices: methodological problems associated with the administration of the 1992 adult standardization sample. Personal Individ Differ, 18, pp. 441-442.

Gustafsson, A., Arnrup, K., Broberg, A.G., Bodin, L., et.al., 2007. Psychosocial concomitants to dental fear and behaviour management problems, Int J Pediat Dent, 17, pp. 449-59.

Gustafsson, A., 2010. Dental behavior management problems among children and adolescents- a matter of understanding? Studies on dental fear, personal characteristics and psycho-social concomitants, Swed Dent J Suppl, 202, pp. 1-46.

Gustafsson, A., Arnrup, K., Broberg, A.G., Bodin., L., et.al., 2010. Child dental fear as measured with the Dental Subscale of the Children's Fear Survey Schedule: the impact of referral status and type of informant (child versus parent), Community Dent Oral Epidemiol, 38, pp. 256-266.

Guthrie, A., 1997. Separation anxiety: an overview, Pediatr Dent, 19, pp. 486-490.

Gyurke, J. S., Prifitera, A., and Sharp, S. A., 1991. Frequency of verbal and performance IQ discrepancies on the WPPSI-R at various levels of ability, J Psychoeducat Assess, 9, pp. 230-239.

Hägglin, C., Carlsson, S.G. and Hakeberg, M., 2013. On the dynamics of dental fear: dental or mental? Eur J Oral Sci, 121, pp. 235-239.

Harris, R.V., Pender, S.M., Merry, A., and Leo, A., 2008. Unravelling referral paths relating to the dental care of children: a study in Liverpool. Prim Dent Care, 15, pp. 45-52.

Haugejorden, O., Klock, K.S., 2000. Avoidance of dental visits: the predictive validity of three dental anxiety scales, Acta Odontologica Scandinavica, 58, pp.255-259.

Heft, M.W., Meng, X., Bradley, M.M., and Lang, P.J., 2007. Gender differences in reported dental fear and fear of dental pain, Community Dent Oral Epidemiol, 35, pp.421-28.

Hellhammer, D.H., Wüst, S., and Kudielka, B.M., 2009. Salivary cortisol as a biomarker in stress research, Psychoneuroencodrinology, 34, pp.163-171.

Hinshaw, S.P., 1992. Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms, Psychol Bull, 111, pp.127-155.

Hittner, J.B., and Hemmo, R., 2009. Psychosocial predictors of dental anxiety, J Health Psycho, 14, pp. 53-59.

Hodges, K., and Plow, J., 1990. Intellectual ability and achievement in psychiatrically hospitalized children with conduct, anxiety, and affective disorders, J Consult Clin Psychol, 58, pp. 589-95.

Holst, A., Hallonsten, A-L., Schroder, U., Ek, L., et.al., 1993. Prediction of behaviour-management in 3-year-old children, Scand J Dent Res, 101, pp.110-114.

Humphris, G.M., Morrison, T., and Lindsay, S.J., 1995. The Modified Dental Anxiety Scale: validation and United Kingdom norms, Community Dent Health, 12, pp. 143-150.

Humphris, G., and Hull, P., 2007. Do dental anxiety questionnaires raise anxiety in dentally anxious adult's patients? A two wave panel study, Primary Dental Care, 14, pp. 7-11.

Ilguy, D., Ilguy, M., Dinçer, S., and Bayirli, G., 2005. Reliability and Validity of the Modified Dental Anxiety Scale in Turkish Patients, Journal of International Medical Research, 33, pp. 252-259.

Ingersoll, B.D., Nash, D., Blount, R. and Gamber, C., 1984. Distraction and contingent reinforcement with pediatric dental patients, J Dent Child, 51, pp. 203-207.

Irwin, M., and Hauger, R.L., 2002. Development aspects of psychoneuroimmunology in child and adolescent psychiatry. In: M., Lewis, ed., *Child and Adolescent Psychiatry:A comprehensive textbook*. 3rd ed. Philadelphia: Williams and Wilkins, pp.51-62.

Jensen, B., and Stjernqvist, K., 2002. Temperament and acceptance of dental treatment under sedation in preschool children, Acta Odontol Scand, 60, pp. 231-236.

Kagono, T., 2006. *Cognitive theories and knowledge management: A review of recent studies*, the annual bulletin of Knowledge

management society of Japan 2005-2006. Tokyo: Knowledge management society of Japan.

Kain, Z.N., Mayes, L.C., Weisman, S.J. and Hofstadter, M.B., 2000. Social adaptability, cognitive abilities, and other predictors for children's reactions to surgery, J Clin Anesth, 12, pp.549-554.

Kamp, A.A., 1992. Parent child separation during dental care: a survey of parent's preference, Pediatr Dent, 14, pp. 231-35.

Kamran, M., Qiam, F., and Khan, H., 2011. Evaluation of age, gender and parental factors Affecting child behavior in the dental surgery, JKCD, 1, pp.82-86.

Kantaputra, P.N., Chiewcharnvalijikit, K., Wairatpanich, K., Malikaew, P., et.al., 2007. Children's attitudes towards behaviour management techniques used by dentists, J Dent Child, 74, pp. 4-9.

Kaplan, C. H., Fox, L. M., and Paxton, L., 1991. Bright children and the revised WPPSI: Concurrent validity, J Psychoeducat Assess, 9, pp. 240-246.

Kaplan, C., 1992. Ceiling effects in assessing high-IQ children with the WPPSI-R, J Clinic Child Psychol, 21, pp.403-406.

Kaplan, R. M., and Saccuzzo, D. P., 2010. *Psychological Testing: Principles, Applications, and Issues*. 8th ed. Belmont, CA: Wadsworth, Cengage Learning.

Kaufman, A. S., and Kaufman, N. L., 1993. *The Kaufman Adolescent and Adult Intelligence Test.* Circle Pines, MN: American Guidance Service.

Kaufman, A. S., and Lichtenberger, E. O., 1999. *Essentials of WAIS-III Assessment.* New York: John Wiley & Sons, Inc.

King, N.J., Hamilton, D.I. and Ollendick, T.H., 1988. *Children's phobias: A Behavioral Perspectives.* Chichester: Wiley.

Kirschbaum, C., and Hellhammer, D.H., 1994. Salivary cortisol in psychoneuroendocrine research: recent developments and applications. Psychoneuroendocrinology, 19, pp. 313-33.

Klaassen, M.A., Veerkamp, J.S.J., and Hoogstraten, J., 2007. Dental fear, communication, and behavioral management problems in children referred for dental problems. Int J Pediat Dent, 17, pp. 469-477.

Kleiman, M.B., 1982. Fear of dentists as an inhibiting factor in children's use of dental services. ASDJ Dent Child, 49, pp. 209-213.

Kleinknecht, R., Klepac, R., and Alexander, L., 1973. Origins and characteristics of fear of dentistry. J Am DentAssoc, 86, pp. 842-848.

Klingberg, G., and Berggren, U., 1992. Dental problem behaviors in children of parents with severe dental fear. Swed Dent J, 16, pp. 27-32.

Klingberg, G., 1994. Reliability and validity of the Swedish version of the Dental Subscale of the Children's Fear Survey Schedule, CFSS-DS, Acta Odontol Scand, 52: pp. 255-256.

Klingberg, G., Berggren, U., and Noren, J.G., 1994. Dental fear in an urban Swedish child population: prevalence and concomitant factors, Community Dent Health, 11, pp. 208-214.

Klingberg, G., and Hwang, C.P., 1994. Children's dental fear picture test (CDFP): A projective test for the assessment of child dental fear, ASDJ Dent Child, 61, pp. 89-98.

Klingberg, G., 1995. Dental fear and behavior management problems in children, Swed Dent J, 103, pp. 1-78.

Klingberg, G., Berggren, U., Carlsson, S.G., and Noren, J.G., 1995. Child dental fear: cause-related factors and clinical effects, Eur J Oral Sci, 103, pp. 405-412.

Klingberg, G., Vannas Löfqvist, L., and Hwang, C.P. 1995. Validity of the Children's Dental Fearr Picture test (CDFP), Eur J Oral Sci. 103, pp. 55-60.

Klingberg, G., and Broberg, A.G., 1998. Temperament and child dental fear, Pediatr Dent, 20, pp. 237-243.

Klingberg, G., and Raadal, M., 2001. Behavior management problems in children and adolescents. In: G. Koch, S. Poulsen , eds. *Pediatric Dentistry: A Clinical Approach*. Copenhagen: Munksgaard. pp. 62-66.

Klingberg, G., 2007. Dental anxiety and behavior management problems in pediatric dentistry: A review of background factors and diagnostics, Eur Arch Paediatr Dent, 8, pp.11-5.

Klingberg, G. and Broberg, A.G., 2007. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors, Int J Pediatr Dent, 17, pp. 391-406.

Klingberg, G., 2008. Dental anxiety and behavior management problems in pediatric dentistry - a review of background factors and diagnostics, Eur Arch Pediatr Dent, 1,pp. 11-15.

Koenen, K.C., Caspi, A., Moffitt, T.E., Rijsdijk, F., et.al., 2006. Genetic Influences on the Overlap between Low IQ and Antisocial Behavior in Young Children, J Abnorm Psychol, 115, pp. 787-797.

Kotsanos, N., Arhakis, A., and Coolidge, T., 2005. Parental presence versus absence in the dental operatory: a technique to manage the uncooperative child dental patient, Eur J Pediatr Dent, 6, pp. 144-148.

Kotsanos, N., Coolidge, T., Velonis, D., and Arapostathis, K.N., 2009. A form of "parental presence/absence" (PPA) technique for the child patient with dental behaviour management problems, Eur Arch Paediatr Dent, 10, pp. 90-92.

Krikken, J.B., Ten Cate, J.M., and Veerkamp, J.S., 2010. Child dental fear and general emotional problems: a pilot study, Eur Arch Pediatr Dent, 11, pp. 283-286.

Krikken, J.B., Van Wijk, A.J., Ten Cate, J.M., and Veerkamp,.J.J.,2013. Measuring dental fear using the CFSS-DS. Do children and parents agree? Int J Pediatr Dent, 23, pp. 94-100.

Krueger, T.H., Heller, H.W., Hauffa, B.P., Haake, P., et.al. , 2005. The dental anxiety scale and effects of dental fear on salivary cortisol, Perceptual Motor Skills, 100, pp. 109-117.

Kumar, S., Bhargav, p., Patel,A., Bhati,M., et.al., 2009. Does dental anxiety influence oral health-related quality of life? Observations from a cross-sectional study among adults in Udaipur district, India, J Oral Science, 51, pp. 245-254.

Kunda, M., McGreggor, K., and Goel, A., 2009. Addressing the Raven's Progressive Matrices Test of "General" Intelligence, AAAI. [Online] Available at :< http://www.aaai.org > [Accessed 22 August 2013].

Kyritsi, M.A., Dimou, G., and Lygidakis, N.A., 2009. Parental attitudes and perceptions affecting children's dental behavior in Greek population- A clinical study, Eur Arch of Paediatr Dent, 10, pp.29-32.

Lamp, R. E., and Krohn, E. J., 1990. Stability of the Stanford-Binet Fourth Edition and K-ABC for young Black and White children from low income families, J Psychoeducat Assess, 8, pp. 139-149.

Landis, J.R., Koch, G.G. 1977. The measurement of observer agreement for categorical data, Biometrics. 33, pp.159-174.

Lang, P.J. ,1971. The application of psychophysiological methods to the study of psychotherapy and behavior modification. In: Bergin,

A.E. Garfield, S.L., editors. *Handbook of psychotherapy and behavior change*. New York: Wiley; p. 75-125.

Law, C.S., and Blain, S., 2003. Approaching the pediatric dental patient: A review of nonpharmacologic behavior manage-ment strategies, J Calif Dent Assoc, 31, pp. 703-713.

Lawrence, S.M. , McTique, D.J., Wilson, S., Odom, J.G., et.al., 1991. Parental attitudes toward behavior management techniques in pediatric dentistry, Pediatr Dent, 13, pp. 151-155.

Lee, C-Y., Chang, Y-Y., and Huang, S-T., 2007. Prevalence of dental anxiety among 5- to 8-year old Taiwanese children, J Public Health Dent, 67, pp. 36-41.

Lochary, M.E., Wilson, S., Griffen, A.L., and Coury, D.L., 1993. Temperament as a predictor of behavior for conscious sedation in dentistry, Pediatr Dent, 15, pp. 348-352.

Locker, D., Poulton, R., and Thomson, W.M., 2001. Psychological disorders and dental anxiety in a young adult population, Community Dent Oral Epidemiol, 29, pp.456-463.

Long, N., 2004. The changing nature of parenting in America, Pediatr Dent, 26, pp. 121-124.

Luoto, A., Tolvanen, M., Rantavuori, K., Pohiola, V., et al., 2010. Can parents and children evaluate each other's dental fear? Eur J Oral Sci, 118, pp. 254-258.

Malika, L.M., 1998a. *Stanford-Binet Intelligence Scale- Record Booklet: Fourth Edition*. Cairo: Dar Al Nahdah Al Arabia (Arabic text).

Malika, L.M., 1998b. *Stanford-Binet Intelligence Scale- Standardized tables: Fourth Edition*. Cairo: Dar Al Nahdah Al Arabia (Arabic text).

Malika, L.M., 1998c. *Stanford-Binet Intelligence Scale- Guide for Administration and Scoring*: Fourth Edition. Cairo: Dar Al Nahdah Al Arabia (Arabic text).

Marcum, B.K., Turner, C., and, Courts, F.G., 1995. Pediatric dentists' attitudes regarding parental presence during dental procedures. AAPD, 17, pp. 432-436.

Mărginean, I. and Filimon, L., 2012. Modified dental anxiety scale: a validation study on communities from the west part of Romania, IJEPC, 2, pp. 102-114.

Marzo, G., Campanella, V., Albani, F., and Gallusi, G., 2003. Psychological aspects in pediatric dentistry: parental presence, Eur J Pediatr Dent, 4, 177-180.

Matthews, G., Deary, I. J., and Whiteman, M. C., 2003. *Personality traits*: 2nd ed. Cambridge: Cambridge University Press.

McDonald, R. E., Avery, D. R. and Dean, J. A., 2011. *Dentistry for the child and adolescent*. Missouri: Mosby Inc.

McCrowell, K. L., and Nagle, R. J., 1994. Comparability of the WPPSI-R and the S-B: IV among preschool children, J Psychoeducat Assess, 12, pp. 126-134.

McGrath, C., and Bedi, R., 2004. The association between dental anxiety and oral health related quality of life in Britain, Community Dent Oral Epidemiol, 32, pp. 67-72.

McGrew, K. S. and Hessler, G. L., 1995. The relationship between the WJ-R Gf-Gc cognitive clusters and mathematics achievement across the life-span, J Psychoeducat Assess, 13, pp.21-38.

McGrew, K. S., and Murphy, S., 1995. Uniqueness and general factor characteristics of the Woodcock- Johnson Tests of Cognitive Ability-Revised, J School Psychol, 33, pp. 235-245.

McGrew, K. S., and Flanagan, D. P., 1996. *The intelligence test desk reference (ITDR): Gf-Gc crossbattery assessment.* Boston: Allyn & Bacon.

McKnight-Hanes, C., Myers, D.R., Dushku, J.C., and Davi, H.C., 1993. The use of behavior management techniques between dentists across practitioner type, age, and geographic region, Pediatr Dent, 15, pp. 267-271.

Mehrstedt, M., Tönnies, S., and Eisentraut, I., 2004. Dental fears, health status and quality of life, Anesth Prog, 51, pp. 90-94.

Mehrstedt, M., John, M.T., Tonnies, S., and Micheelis, W, 2007. Oral health-related quality of life in patients with dental anxiety, Community Dent Oral Epidemiol, 35, pp. 357-363.

Melamed, B.G., 1986a. Assessment and management strategies for the difficult pediatric dental patient, Anesth Prog, 33, pp.197-200.

Melamed, B.G., 1986b. Methodological needs and behavioral research with child dental patients, Anesth Prog, 33, pp. 34-40.

Milgrom, P., and Weinstein, P., 1993. Dental fears in general practice: new guidelines for assessment and treatment, Int Dent J, 43, pp. 288-293.

Milgrom, P., Jie, Z., Yang, Z., and Tay, K.M., 1994. Cross-cultural validity of a parent's version of the Dental Fear Survey Schedule for children in Chinese, Behav Res Ther, 32, pp. 131-135.

Milgrom, P., Mancel, L., and King, B., 1995. Weinstein P. Origins of childhood dental fear, Behav Res Ther, 33, pp. 313-319.

Milgrom, P., Weinstein, P., and Getz, T., 1995. *Treating fearful dental patients. A patient management handbook*. 2nd ed. Seattle, WA: University of Washington.

Milgrom, P., Mancl, L., King, B., Weinstein, P., et.al., 1998. An explanatory model of the dental care utilization of low-income children, Med Care, 36, pp. 554- 566.

Molfese, V, Yaple, K., Helwig, S., Harris, L., et.al., 1992. Stanford-Binet Intelligence Scale (4ht ed.): Factor structure and verbal subscale scores for three-year-olds, J Psychoeducat Assess, 10, pp. 47-58.

Molinari, B.G.E., Deyoung, A., 2004. Parental Presence and absence as a behavior management technique, J MICH Dent Assoc, 86, pp. 30-33.

Moore, R., and Brodsgaard, I., 2001. Dentists' perceived stress and its relation to perceptions about anxious patients, Community Dent Oral Epidemiol, 29, pp. 73-80.

Moore,R., Brodsgaard , I. , and Rosenberg, N., 2004. The contribution of embarrassment to phobic dental anxiety: a qualitative research study, BMC Psychiatry, 4, p .10

Mullen, E. M., 1995. *Mullen scales of early learning: AGS edition.* Circle Pines, MN: American Guidance Service.

Muris, P., and Field, 2008. A., Distorted cognition and pathological anxiety in children and adolescents, Cogn Emot, 22, pp. 395-421.

Muris, P., Vermeerb,E., and Horselenberg, R., 2008. Cognitive development and the interpretation of anxiety-related physical symptoms in 4-13-year-old non-clinical children, J Behav Ther Exp Psychiat, 39 , pp. 73-86.

Nagle, R.J., and Bell, N.L., 1995. Validation of an item-reduction short form of the Stanford-Binet Intelligence Scale: Fourth Edition with college students, J Clinic Psychol, 51, pp. 63-70.

Neisser, U., Boodoo, G., Bouchard, T.J., Boykin, A.W., et.al., 1996. Intelligence: Knowns and unknowns, Am Psycho, 51,pp. 77-101.

Newton, J., and Buck, D., 2000. Anxiety and pain measures in dentistry: a guide to their quality and application. J Am Dent Assoc, 131, pp. 1449-1457.

Nicolas, E., Bessadet, M., Collado, V., Carrasco, P., et.al., 2010. Factor's affecting dental fear in French children aged 5-12 years, Int J Pediatr Dent, 20, pp. 366-373.

Nicolosi, L., Harryman, E., and Kresheck,J. ,1989. *Terminology of Communication Disorders: Speech-Language-Hearing*. 3rd ed. Baltimore: Williams & Wilkins.

Nigg, J.T., and Huang-Pollock, C.L., 2003. An early-onset model of the role of executive functions and intelligence in conduct disorder/delinquency. In: B.B. Lahey, T.E. Moffitt, and A. Caspi, ed. 2003. *The causes of conduct disorder and serious juvenile delinquency*. New York: Guilford Press, p. 227-253.

Ohman, A. ,2000. Fear and anxiety: Evolutionary, cognitive, and clinical perspectives. In M. Lewis and J. M. Haviland-Jones ,eds. *Handbook of emotions*. New York: The Guilford Press. pp.573-593.

O'Laughlin, E., and Ridley-Johnson, R., 1995. Maternal presence during children's routine immunizations: the effect of mother as observer in reducing child distress, Children's Health Care, 24, pp.175-191.

Oosterink, F.M., De Jongh, A. and Aartman, I.H., 2008. What are people afraid of during dental treatment? Anxiety-provoking capacity of 67 stimuli characteristic of the dental setting, Eur J Oral Sci , 116, pp. 700-704.

Oosterink, F.M., De Jongh, A., and Hoogstraten, J., 2009. Prevalence of dental fear and phobia relative to other fear and phobia subtypes, Eur J Oral Sci, 117, pp.135-143.

Owens, R. E. Jr., 2008. *Language Development: An Introduction*. 7th ed. New York: Pearson Education.

Papalia, D. E., Gross, D., and Feldman, R. D., 2003. *Child Development: A Topical Approach*. [e-book] Available through: McGraw-Hill Higher Education website <www.mhhe.com/papaliat1> [Accessed 15 August 2013].

Paik, H.S., 1998. *One intelligence or many alternative approaches to cognitive abilities*. Washington University press.

Peretz, B., and Zadik, D., 1998. Attitudes of parents towards their presence in the operatory during dental treatments to their children, J Clin Pediatr Dent, 23, pp. 27-30.

Peretz, P., and Zadik, D., 1999. Parents' attitudes toward behavior management techniques during dental treatment, Pediatr Dent, 21, pp. 201-204.

Peretz, B., and Efrat, J., 2000. Dental anxiety among young adolescent patients in Israel, Int J Pediatr Den, 10, pp. 126-132.

Peretz, B., Nazarian, Y., and Bimstein, E., 2004. Dental anxiety in a students' paediatric dental clinic: children, parents and students, Int J Pediatr Den, 14, pp.192-198.

Peretz, B., Gluck, G., 2005. Magic trick: a behavioural strategy for the management of strong-willed children, Int J Pediatr Dent, 15, pp. 429-436.

Piaget, J., 1954. *The development of object concept: The construction of reality in the child*. New York: Basic Books, pp. 3-96.

Piaget, J., 1964. Development and learning. Dans : Piaget rediscovered : A report of the Conference on cognitive studies and curriculum development. Ithaca (NY), Cornell University Press, p. 7-20.

Piaget, J.1966. The psychology of intelligence and education. Childhood Education (Wheaton, MD), 42, p. 528.

Pinkham, J.R. and Paterson, J.R., 1985. Voice control: an old technique re-examined, J Dent Child, 52, pp. 199-202.

Pinkham, J.R., 1991. An analysis of the phenomenon of increased parental participation during the child's dental experience, ASDC J Dent Child, 58, pp. 458-463.

Pinkham, J. R. , Casamassimo, P. S. ,and McTigue, D. J., 2005. *Pediatric Dentistry: Infancy Through Adolescence*. 4th ed. Saunders Co: Elsevier.

Porritt, J., Marshman, Z., and Rodd, H. D., 2012. Understanding children's dental anxiety and psychological approaches to its reduction, Int J Pediatr Den, 22, pp. 397-405.

Poulton, R., Waldie, K.E., Thomson, W.M., and Locker, D., 2001. Determinants of early- vs late-onset dental fear in a longitudinal epidemiological study, Behav Res Ther, 39, pp.777- 785.

Pramila, M., Krishna-Murty, A., Chandrakala, B., and Ranganath, S., 2010. Dental fear in children and its relation to dental caries and gingival condition: a cross sectional study in Bangalore city, India, Int J Clin Dent Sci, 1, pp. 1-5.

Quteish Taani, D.S., 2002. Dental anxiety and regularity of dental attendance in younger adults, J Oral Rehabil, 29, pp. 604-608.

Radis, F.G., Wilson, S., Griffen, A.L., and Coury, D.L., 1994. Temperament as a predictor of behavior during initial dental examination in children, Pediatr Dent , 16, pp.121-127.

Răducanu,A.M., Feraru,V., Herteliu,C., and Anghelescu, R., 2009. Assessment of The Prevalence of Dental Fear and its Causes Among Children and Adolescents Attending a Department of Pediatric Dentistry in Bucharest, OHDMBSC, 8, pp.42-49.

Rantavuori, K., Lahti ,S., Hausen, H., Seppä, L., et.al.,2004. Dental fear and oral health and family characteristics of Finnish children, Acta Odontol Scand, 62, pp. 207-213.

Rapee, R.M.,1996. *Information-processing views of panic disorder. Current controversies in the anxiety disorders*. New York: Guilford Press.

Reedal, K.E., 2010. Jean Piaget's Cognitive Development Theory in Mathematics Education, Summation, pp. 16-20. [Online] Available at :< http://ripon.edu/macs/summation > [Accessed 10 August 2009].

Reinehr, R. C. ,1992 . Review of the Differential Ability Scales. In: J. J. Kramer and J. C. Conoley, eds., *The eleventh mental measurements yearbook* . Lincoln: The Buros Institute of Mental Measurements of the University of Nebraska-Lincoln. pp. 282-283.

Robbie, C., 1993. Theories of Learning and Theories of Development, Edu Psycholol , 28, pp. 219-233.

Roberts, J.F.,Curzon, M.E.J., Koch G. and Martens L.C.,2010. Review: Behaviour Management Techniques in Paediatric Dentistry, Eur Arch Paediatr Dent,11,pp.166-174.

Roid, G. H., 2003a. *Stanford-Binet Intelligence Scales, Fifth Edition.* Itasca, IL: Riverside Publishing.

Roid, G. H., 2003b. *Stanford-Binet Intelligence Scales, Fifth Edition: Technical Manual.* Itasca, IL: Riverside Publishing.

Rothlisberg, B A., and McIntosh, D. E., 1991. Performance of a referred sample on the Stanford-Binet IV and the K-ABC, J Scho Psychol, 29, pp. 367-370.

Rousset, C., Lambin, M., and Manas, F., 1997. The etiological method as a means for evaluating stress in children two to three years of age during a dental examination, ASDJ Dent Child , 64, pp. 99- 106.

Roy, J.,2011. *Dental Anxiety in Future and Current Orthodontic Patients.* Master Thesis. Toronto University.

Rud, B., and Kisling, E., 1973. The influence of mental development on children's acceptance of dental treatment, Scand J Dent Res ,81,pp. 343-352.

Rust, J. O., and Yates, A. G., 1997. Concurrent validity of the Wechsler Intelligence Scale for Children- Third edition and the Kaufman Assessment Battery for Children, Psychol Rep, 80, pp. 89-90.

Sachdeva, A., and Dutta, A. K., 2012. *Advances in Pediatrics*. 2nd ed. Panama: Jaypee Brother medical publisher.

Salem, K., Kousha, M., Anissian, A., and Shahabi,A.S., 2012. Dental Fear and Concomitant Factors in 3-6 Year-old Children, J Dent Res Dent Clin Dent Prospects,6, pp. 70-74.

Sattler, J. M., 1992 . *Assessment of children*. 3rd ed.-Revised. San Diego, CA: Author.

Savin, C., and Maxim, A., 2008. The role of the psychological factor in pediatric dental management. J Prev Med, 16, pp. 132-140.

Scherer, M.W., and Nakamura, N.Y., 1968. A fear schedule for children: a factor analytic comparison with manifest anxiety, Behav Res Ther, 6, pp.173-182.

Schmidt, F.L., and Hunter, J.E., 1992. Development of causal models of processes determining job performance, Curr Dir Psychol Sci, 1, pp. 89-92.

Schrank, F. A., McGrew, K. S., and Woodcock, R. W., 2001. *Technical Abstract (Woodcock-Johnson III Assessment Service Bulletin No. 2)*. Itasca, IL: Riverside Publishing.

Schrank, F. A., and Wendling, B. J., 2009. *Educational interventions and accommodations related to the Woodcock-Johnson® III Tests of Cognitive Abilities and the Woodcock-Johnson III Diagnostic Supplement to the Tests of Cognitive Abilities (Woodcock-Johnson III Assessment Service Bulletin No. 10)*. Rolling Meadows, IL: Riverside Publishing.

Schwarz, E., and Birn, H. ,1995. Dental anxiety in Danish and Chinese adults- a cross-cultural perspective, Soc Sci Med, 41,pp.123-30.

Sharath, A., Rekka, P., Muthu, M.S., Rathna Prabhu, V., et.al., 2009. Children's behavior pattern and behavior management techniques used in a structured postgraduate dental program, J Indian Soc Pedod Prevent Dent, 27, pp. 22-26.

Sharma, A., and Tyagi, R., 2011. Behavior assessment of children in dental setting: A retrospective study. Int J Clinic Pediatr Dent, 4, pp. 35-39.

Sheller, B.,2004. Challenges of managing child behavior in the 21st century dental setting, Pediatr Dent, 26, pp. 111-113.

Shinohara, S., Nomura, Y., Shingyouchi, K., Takase, A., et.al., 2005. Structural relationship of child behavior and its evaluation during dental treatment, J Oral Sci, 47, pp. 91-96.

Silverman, L.K., and Kearney, K., 1992. The case for the Stamford-Binet L-M as a supplemental test, Roeper Review, 15, pp. 34-37.

Simonoff, E., Elander, J., Holmshaw, J., Pickles, A., et.al., 2004. Predictors of antisocial personality: Continuities from childhood to adult life, Br J Psychiatry, 184, pp.118–127.

Simpson, M., Carone, D.A., Burns, W.J., Seidman, T., et.al., ,2002. Assessing giftedness with the WISC-III and the SB-IV, Psychol School 2002. 39. pp. 515-524.

Singleton, N.C., and Shulman, B.B, 2014. *Language development*. 2nd ed. London: Jones and Bartlett learning. LLC.

Sparrow, S.S., and Davis, S.M., 2000. Recent advances in the assessment of intelligence and cognition, J Child Psycho Psychiatry, 41, pp. 117-131.

Spielberger, C.D., 1983. *Manual for the State-Trait Anxiety Inventory (STAI).* Palo Alto, CA: Consulting Psychologists Press.

Spielberger, C. D., Sydeman, S. J., Owen, A. E., and Marsh, B. J. 1999. Measuring anxiety and anger with the State-Trait Anxiety Inventory (STAI) and State-Trait Anger Expression Inventory (STAXI). In: M. E. Maruish ,ed. *The use of psychological testing for treatment planning and outcomes assessment* .2nd ed. Mahwah, NJ: Lawrence Erlbaum Associates. pp. 993-1021.

Sternberg, R. J., and Kaufman, J. C., 1998. Human abilities, Annual Review Psychol, 49,pp. 479-502.

Stokes, T.F. and Kennedy, S.H., 1980. Reducing child uncooperative behaviour during dental treatment through modelling and reinforcement, J Appl Behav Anal, 13, pp. 41-49.

Taani, D.Q., El-Qaderi, S.S., and Abu Alhaija, E.S., 2005. Dental anxiety in children and its relationship to dental caries and gingival condition, Int J Dent Hyg, 3.pp.83-87.

Ten Berge, M., Veerkamp, J.S., and Hoogstraten, J., 2002. The etiology of childhood dental fear: the role of dental and conditioning experiences, J Anxiety Disord, 16, pp. 321-329.

Ten Berge, M., Veerkamp, J.S., Hoogstraten, J., Prins, P.J., et. al., 2002. Childhood dental fear in the Netherlands: prevalence and

normative data, Community Dent Oral Epidemiol, 30, pp. 101-107.

Thorndike, R.L., Hagen, E., and Sattler, J., 1986. *Stanford-Binet Intelligence Scale- Fourth Edition: Guide for Administration and Scoring*. Chicago: Revised Publishing Co.

Toledano, M., Osorio, R., Agullera, F.S., and Pegalajar, J., 1995. Children's dental anxiety: influence of personality and intelligence factors, Int J Pediatr Dent,5, pp. 23-28.

Tovilović, S., Novović, Z., Mihić, L., and Jovanović, V., 2009. The role of trait anxiety in induction of state anxiety, Phisologija, 42, pp.491-504.

Townend, E., Dimigen, G., and Fung, D., 2000. A clinical study of child dental anxiety, Behav Res Ther, 38, pp. 31-46.

Udoye, C.H., Oginni, A.O., and Oginni, F.O., 2005. Dental anxiety among patients undergoing various dental treatments in a Nigerian teaching hospital, J Contemp Dent Pract, 6, pp.91-98.

Venham, L.L., 1979. The effect of mother's presence on child's response to dental treatment, ASDCJ Dent Child, 46, pp. 219-225.

Venham, L.L., Gaulin-Kremer, E., Munster, E., Bengston -Audia, D., et.al. , 1980. Interval rating scales for children's dental anxiety and uncooperative behavior, Pediatr Dent, 2, pp. 195-202.

Versloot, J., Veerkamp, J.S., Hoogstraten, J., and Martens, L.C., 2004. Children's coping with pain during dental care, Community Dent Oral Epidemiol, 32, pp. 456-461.

Versloot, J., Veerkamp, J .S.J., and Hoogstraten, J., 2008. Children have self-reported pain at the dentist, Pain, 137, pp. 389-394.

Versloot ,J., and Craig, K.D., 2009. The communication of pain in paediatric dentistry. Eur Arch Paediatr Dent, 10, pp. 61-66.

Vygotsky, L. S. , 1978. *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wechsler, D., 1991. *Wechsler Intelligence Scale for Children-Third Edition*. San Antonio, TX: The Psychological Corporation.

Wechsler, D., 2002. *Wechsler Preschool and Primary Scale of Intelligence- Third Edition .Administration and Scoring Manual*. San Antonio, TX: The Psychological Corporation.

Wechsler, D., 2003. *Wechsler Intelligence Scale for Children-Fourth Edition*. San Antonio, TX: Pearson Education, Inc.

Wechsler, D., 2008. *Wechsler Adult Intelligence Scale-Fourth Edition (WAIS IV)*.San Antonio, TX: Pearson.

Wechsler, D., 2009. *Wechsler Memory Scale-Fourth Edition (WMS-IV) technical and interpretive manual*. San Antonio, TX: Pearson.

Wechsler, D., 2012. *Wechsler Preschool and Primary Scale of Intelligence- Fourth Edition(WPPSI-IV)*. San Antonio, TX: Pearson.

Welly, A., Lang, H., Welly, D., and Kropp, P., 2012. Impact of Dental Atmosphere and Behaviour of the Dentist on Children's Cooperation, Appl Psychophysiol Biofeedback, 37, pp. 195-204.

Whitten, J., Slate, J. R., Jones, C. H., and Shine, A. E., 1994. Examiner errors in administering and scoring the WPPSI-R. J Psychoeducat Assess, 12, pp. 49-54.

Williams, W.M., 1996. Consequences of how we define and assess intelligence. Psycho Public Policy and Law, 2, pp. 506-535.

Wilson, S., and Cody, W.E., 2005. An analysis of behavior management papers published in the pediatric dental literature. Pediatr Dent , 27, pp. 331-338.

Wogelius, P., Poulsen, S., and Toft Sörensen, H.T., 2003. Prevalence of dental anxiety and behavior management problems among six to eight years old Danish children, Acta Odontol Scand , 61,pp. 178-183.

Woodcock, R. W., McGrew, K. S., and Mather, N., 2001a. *Woodcock-Johnson III*. Itasca, IL: Riverside Publishing.

Woodcock, R. W., McGrew, K. S., & Mather, N., 2001b. *Woodcock-Johnson III Tests of Cognitive Abilities*. Itasca, IL: Riverside Publishing.

Woodcock, R. W., McGrew, K. S., and Mather, N., 2001c. *Woodcock-Johnson III Tests of Achievement*. Itasca, IL: Riverside Publishing.

Woodcock, R. W., McGrew, K. S., and Mather, N., 2007a. *Woodcock-Johnson III. Rolling Meadows*, IL: Riverside Publishing.

Woodcock, R. W., McGrew, K. S., & Mather, N., 2007b. *Woodcock-Johnson III Tests of Cognitive Abilities*. Rolling Meadows, IL: Riverside Publishing.

Wright, G.Z., 1975. *Behavior management in dentistry for children*. WB Saunders Company.

Wright, S., Taylor, p., and Ruggiero, K., 1996. Examining the potential for academic achievement among Inuit children: Comparison on the Raven Colored Progressive Matrices, J Cross-Cultural psycho, 27, pp. 733-753.

Youngstrom, E.A., Glutiing, J.J, and Watkins, M.W., 2003. Stanford-

Binet Intelligence Scale: Fourth Edition (SB4): Evaluating the Empirical Bases for Interpretations. In: C. R. Reynolds and R. W. Kamphaus, eds. *Handbook of psychological and educational assessment: Intelligence, aptitude, and achievement*. 2nd ed. New York: Guilford, pp. 217-242.

Zhou, Y., Cameron, E., Forbes, G., and Humphris, G., 2010. Systematic review of the effect of dental staff behaviour on child dental patient anxiety and behaviour, Pateint Educ Cons, 85, pp. 4-13.

APPENDIX I

Alexandria University
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Appendix I

نموذج الموافقة المستنيرة للاشتراك في دراسة علمية

اسم الباحث / الباحثين: ذي يزن عبدالله احمد
القسم: طب اسنان الاطفال
عنوان الدراسة: تأثير مستوي الذكاء علي مدي الخوف عند اطفال ما قبل المدرسة وعلي سلوكهم في عيادة الاسنان باستخدام اسلوب وجود الوالدين الايجابية السلبية
مستوى الدراسة: ماجستير دكتوراه بعد الدكتوراه
القسم: طب أسنان أطفال

١ـ **مقدمة:** ومستوي الذكاء لدي الاطفال مدى الخوف من طبيب الاسنان من الاسباب التي قد تؤثر علي سلوك الطفل وتقبلة للعلاج من طبيب الاسنان.
٢ـ **الهدف من الدراسة:** دراسة وتقييم مدي تأثير ومستوي الذكاء لدي الاطفال في مدي خوفهم من طبيب الاسنان و سلوكهم وطبيعة تقبلهم للعلاج لدي طبيب الاسنان

٣ـ **عدد الاشخاص المشاركين:** ١٥٠ شخص
٤ـ **طريقة الدراسة:** سوف يتم اجراء فحص لمستوي الذكاء للاطفال ثم سيتم اجراء الوقاية السنية اللازمة لحماية اسنانهم.
٥ـ **فترة مشاركة طفلي/طفلتي بالدراسة:** حتي انتهاء فترة العلاج
٦ـ **مخاطر الدراسة:** : لا يوجد اى مخاطر
٧ـ **فوائد الدراسة:** معرفة مدي اهمية ذكاء الطفل في استجابتة للعلاج عند طبيب الاسنان
٨ـ **سرية المعلومات:** : سوف يتم حفظ المعلومات المتعلقة بالطفل في سرية تامة ولن يتم التعريف به في أي تقرير أو نشر لنتائج الدراسة
٩ـ **وسائل علاج اي اصابة ربما تحدث من الدراسة:**
سوف يقوم الباحث باتخاذ جميع الوسائل لمنع أي اصابة ممكن ان تحدث نتيجة هذه الدراسة. ولكن اذا حدثت أي اصابات غير متوقعة نتيجة اشتراكه بالدراسة سوف يتلقى العلاج اللازم بالكلية. ولا يوجد أي تعويض عن أي اصابات قد تنتج من هذه الدراسة.
١٠ـ **تكاليف الاشتراك بالدراسة:** لا يوجد.
١١ـ **لن تتلقى أي أموال للاشتراك بالدراسة.**
١٢ـ **حقوقك كمشارك في الدراسة:**
الاشتراك تطوعيا ولك الحق في ان تستمر أو تنسحب من الدراسة في اي وقت دون تبعات عليك مع توضيح أسباب الانسحاب.
١٣ـ **للاستفسار عن الدارسة** أو عند حدوث اي مشاكل او شكوى غير متوقعة او شعرت بأن اشياء غير طبيعية او معتادة تحدث. يمكنك الاتصال بنائب رئيس لجنة اخلاقيات البحث العلمي للقسم ا.د هناء رسلان
أو مقابلته بقسم: طب اسنان الاطفال تحويلة: ٢٢١ ت: ٠١٠٤٨٦٩٦٩٠١/٠٤٨٦٨٠٦٦

١٤ـ **اقرار الباحث:**
لقد قمت بشرح الدراسة بالتفصيل والهدف منها وطريقة الدراسة والمخاطر والفوائد المتعلقة بالدراسة مع الإجابة عن أي أسئلة اثارها المشارك. وسوف التزم بخطوات الدراسة كاملة وبالمعايير الأخلاقية والقانونية للبحث العلمي بالكلية.
توقيع الباحث: **التاريخ:**

١٥ـ **توقيع المشارك:**
ان الموقع أدناه والد الطفل قد شرح لي الهدف من الدراسة وطريقتها وفهمت الفوائد والمخاطر المتعلقة بالدراسة. وأخذت نسخة من هذه الموافقة وقد تم اعطائي الفرصة للسوال والاستفسار قبل التوقيع وقبل لي أن من حقي الاستفسار في أي وقت لاحق. وانا التطوع للمشاركة في هذه الدراسة ولي الحق في الانسحاب في أي وقت دون تبعات علي. واوافق علي التعاون مع الباحث واخباره مباشرة باي مشاكل غير متوقعة يمكن أن تحدث أثناء اشتراك ابني/ابنتي في الدراسة.
- لقد قرات وفهمت المعلومات المذكورة في هذه الموافقة.
- لقد تم شرح المعلومات المذكورة لي وفهمتها.

اسم وتوقيع المشارك والد الطفل: **التاريخ:**
اسم وتوقيع الشاهد: **التاريخ:**

توقيع رئيس لجنة اخلاقيات البحث العلمي: **التاريخ:** **الختم**

APPENDIX II

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Appendix II

Stanford-Binet Intelligence Scale IV (SB-IV): Record Booklet

(Thorndike, Hagen and Sattler, 1986; Malika, 1998a; 1998b)

Name:

Age: **Gender:**

Address:

Phone No.:

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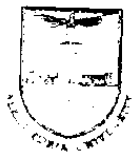

صحيفة تحديد المستوى المدخلى
أعلى زوج من الفقرات فى اختبار المفردات
طبق على المفحوص

العمر الزمنى	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-21	22-23	24-25	26-27	28-29	30-31	32-33	34-35	36-37	38-39	40-41	42-43	44-45	46-
2.0 to 2.5	A	A	A	A	B	B	C	C	D	D												
2.6 to 2.11	A	A	A	B	B	B	C	C	D	D	E	E										
3.0 to 3.5	A	A	B	B	C	C	C	D	D	E	E	F	F									
3.6 to 3.11	A	B	B	C	C	D	D	D	E	E	E	E	G	G								
4.0 to 4.5	B	B	C	C	D	D	E	E	E	F	F	G	G	H	H							
4.6 to 4.11	B	B	C	C	D	D	E	E	F	F	G	G	H	H	I							
5.0 to 5.5	B	C	C	D	D	E	E	E	F	E	G	G	H	H	I							
5.6 to 5.11	C	C	D	D	E	E	E	E	G	G	G	H	H	I	I							
6.0 to 6.5	C	C	D	D	E	E	E	E	G	G	H	H	I	I	J							
6.6 to 6.11	C	D	D	E	E	E	E	G	G	H	H	H	I	I	J							
7.0 to 7.5	C	D	D	E	E	E	F	G	G	H	H	H	I	I	J	J						
7.6 to 7.11	C	D	D	E	E	F	F	G	G	H	H	I	I	J	J	K	K					
8.0 to 8.11	C	D	D	E	F	F	G	G	H	H	I	I	J	J	K	K	L	L				
9.0 to 9.11	C	D	D	E	F	G	G	H	H	I	I	J	J	J	K	K	L	L				
10.0 to 10.11	C	D	D	E	F	G	H	H	I	I	J	J	K	K	K	L	L	M	M			
11.0 to 11.11	C	D	D	E	F	G	H	I	I	J	J	K	K	L	L	L	M	M	N	N		
12.0 to 12.11	C	D	D	E	F	G	H	I	I	J	J	K	K	L	L	L	M	M	N	N	O	
13.0 to 13.11	C	D	D	E	F	G	H	I	J	J	K	K	L	L	M	M	M	N	N	O	O	P
14.0 to 14.11	C	D	D	E	F	G	H	I	J	J	K	K	L	L	M	M	N	N	O	O	P	P
15.0 to 15.11	C	D	D	E	F	G	H	I	J	K	K	L	L	M	M	N	N	N	O	O	P	P
16.0 to 16.11	C	D	D	E	F	G	H	I	K	K	L	L	M	M	N	N	O	O	O	P	P	Q
17.0 to 17.11	C	D	D	E	F	G	H	I	K	K	L	L	M	M	N	N	O	O	P	P	Q	Q
18.0 and over	C	D	D	E	F	G	H	I	K	L	L	M	M	N	N	O	O	P	P	P	Q	Q

هذا الجدول هو لتحديد المستوى الدخلى . ويحدد هذا المستوى عند نقطة التقاطع بين العمر الزمنى للمفحوص وأعلى زوج من الفقرات فى إختبار المفردات طبق على المفحوص . فمثلاً ، إذا كان العمر الزمنى للمفحوص اربع سنوات وشهرين (٤ ـ ٢) ، وكان أعلى زوج من الفقرات طبق على المفحوص فى اختبار المفردات هو ١٣ ـ ١٤ ، فإن بقية الاختبارات يبدأ تطبيقها عند المستوى D . ويسجل العمر الزمنى بالسنين والشهور . فإذا كان عمر الطفل هو ٩ سنين وخمسة شهور و١٦ يوماً ، فأن عمره الزمنى المسجل يكون ٩ ـ ٦ . وإذا كان عمر الطفل ٩ سنين وخمسة شهور و١٥ يوماً ، فأن عمره الزمنى المسجل يكون ٩ ـ ٥ ، تتبع بقية التعليمات كما وردت فى دليل المقياس .

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Stanford Binet Intelligence Scale, IV (SB-IV)

Child Name: Age:
Gender:
Address: Phone No.:
EL:

IQ Calculation from standard tables							
MR	**S**	**RS**	**SAS**	**Total**	**R-S-S**	**Total**	**C-S = IQ**
VR	V						
	Com						
	Ab						
A/VR	P						
	Cop						
QR	Q						
STM R	BM						
	MS						
Note:							

Abbreviations	
EL	Entry Level
MR	Mean Reasoning
S	Subtests
RS	Raw Score
SAS	Standard Age Score
R-S-S	Reasoning Standardized Score
C-S	Compound Score
VR	Verbal reasoning
V	Vocabulary
Com	Comprehension
Ab	Absurdities
A/VR	Abstract/visual reasoning
P	Pattern
Cop	Copy
QR	Quantitative reasoning
Q	Quantitative
STMR	Short-term memory
BM	Bead memory
MS	Memory for sentence

Intelligence Quotient IQ Classification Guide	
IQ Range	**General Classification**
140 and up	Very Superior
120-139	Superior
110-119	High Average
90-109	Average
80-89	Low Average
70-79	Borderline Impaired
Sources; Thorndike, Hagen, and Sattler, 1986	

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I- Verbal reasoning (VR)- الاستدلال اللفظي

1- Vocabulary (V) - المفردات

Record Answers – Draw Circle on(+) or (-)

Age	Level	V Photos		V	Answer
2	A	+	-	1	
		+	-	2	
3	B	+	-	3	
		+	-	4	
	C	+	-	5	
		+	-	6	
4	D	+	-	7	
		+	-	8	
	E	+	-	9	
		+	-	10	
5	F	+	-	11	
		+	-	12	
6	G	+	-	13	
		+	-	14	
		V Words			
7-8	H	+	-	15	
		+	-	16	
9	I	+	-	17	
		+	-	18	
10-11	J	+	-	19	
		+	-	20	
12-13	K	+	-	21	
		+	-	22	
14-15	L	+	-	23	
		+	-	24	
16 +	M	+	-	25	
		+	-	26	
	N	+	-	27	
		+	-	28	
	O	+	-	29	
		+	-	30	

	P	+	-	31	
		+	-	32	
	Q	+	-	33	
		+	-	34	
	R	+	-	35	
		+	-	36	
	S	+	-	37	
		+	-	38	
	T	+	-	39	
		+	-	40	
	U	+	-	41	
		+	-	42	
	V	+	-	43	
		+	-	44	
	W	+	-	45	
		+	-	46	
(+): Pass				(-): Fail	

Calculation of Raw Score RS	
A-Highest Paragraph Score	
B- Total No. of (-)	
Raw Score RS (A- B)	

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I- Verbal reasoning (VR)- الاستدلال اللفظي

2- Comprehension (Com) - الفهم

Record Answers – Draw Circle on(+) or (-)

Level	Photo		COM		Answer
A	+	-	1	انف	
	+	-	2	فم	
B	+	-	3	شعر	
	+	-	4	رجل	
C	+	-	5	ابهام/ اظفر	
	+	-	6	ذقن/ اظفر	
	Q				
D	+	-	7	جامع	
	+	-	8	عطشان	
E	+	-	9	شراء الاكل	
	+	-	10	الشارع	
F	+	-	11	حمام	
	+	-	12	مظلة	
G	+	-	13	تمشيط شعر	
	+	-	14	حقنة	
H	+	-	15	باب	
	+	-	16	قمامة	
I	+	-	17	بحر	
	+	-	18	اذن	
J	+	-	19	قراءة جريدة	
	+	-	20	حاجة للفلاحين	
K	+	-	21	علامات مرور	
*	+	-	22	تفضيل سيارة	*
L	+	-	23	مجانية تعليم	
	+	-	24	تنقية مياة المجاري	
M*	+	-	25	لمبة كهربائية	*
	+	-	26	تدريبات علي الحريق	
N	+	-	27	الاطباء	
*	+	-	28	التلفون	*
O	+	-	29	لا يعرف الهجاء	

	+	-	30	قروض	
P	+	-	31	اكثر من جريدة	
	+	-	32	ملابس فاتحة	
Q	+	-	33	بيوت المدن	
*	+	-	34	العمل الحر	*
R	+	-	35	مجلس ادارة	
	+	-	36	رخصة قيادة	
S*	+	-	37	سيارة صغيرة	*
	+	-	38	مدة محدودة	
T	+	-	39	حقوق الانسان	
	+	-	40	تغيير القوانين	
U	+	-	41	براءة اختراع	
*	+	-	42	اعلانات	*
(+): Pass				(-): Fail	
*: mean it need 2 answers					

Calculation of Raw Score RS	
A- Highest Paragraph Score	
B- Total No. of (-)	
Raw Score RS (A-B)	

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I- Verbal reasoning (VR)-الاستدلال اللفظي

3- Absurdities (Ab) – السخافات					
Draw Circle on Choices (a-c) A-B - Draw Circle on (+) or (-) – S1 Not count					
Level	3 Pic		Ab		Response
A-B			S1	شجرة مقلوبة	a b c
A	+	-	1	سكين منحني	a b c
	+	-	2	قبعة مقلوبة	a b c
B	+	-	3	ولد يمشط شعرة بالملعقة	a b c
	+	-	4	بطة لها اذنا ارنب	a b c
	EXP				
C	+	-	5	القرأة معصوب العينين	
	+	-	6	الكتابة بالشوكة	
D	+	-	7	الكنس	
	+	-	8	الشرب من بزازة طفل	
E	+	-	9	عجلات مربعة الشكل	
	+	-	10	المشي في المطر	
F	+	-	11	سمكة تمشي	
	+	-	12	قطة في قفص	
G	+	-	13	اكل الشوربة بالسكينة	
	+	-	14	تمشيط شعر راس اصلع	
H	+	-	15	لبس البنطلون مقلوب	
	+	-	16	ركوب البسكليتة في الماء	
I	+	-	17	منشار مقلوب	
	+	-	18	رجلين جالسان في المطر	
J	+	-	19	القفز فوق المنزل	
	+	-	20	الكتابة العكسية	
K	+	-	21	ديك يرقد علي البيض	
	+	-	22	اوزان غير متساوية	
L	+	-	23	طابع البريد في المكان الخطأ	
	+	-	24	ظلال في جهات مختلفة	
M	+	-	25	الارنب داخل في الكلب	
	+	-	26	لا يوجد يوم جمعة	
N	+	-	27	يصوب بندقية	

	+	-	28	الفقاقيع نازلة لتحت	
O	+	-	29	رياح في مختلف الجهات	
	+	-	30	الابهام في الجانب الخطأ	
P	+	-	31	نقطة الارتكاز في الموقع الخطأ	
	+	-	32	امريكا الشمالية والجنوبية	
(+): Pass				(-): Fail	

Calculation of Raw Score RS	
A- Highest Paragraph Score	
B- Total No. of (-)	
Raw Score RS (A-B)	

II- Abstract/visual reasoning (A/VR)-الاستدلال المجرد البصري

4- Pattern (P) – تحليل النمط

Draw Circle on (+) or (-)or (T-) or (R-) – S 1,2,3,4,5 Not counts

Level			Degree		Time	P	Response	Cube No.
A	+	-	T-	R-	∞	1	Demo	/
	+	-	T-	R-	∞	2	//	/
B	+	-	T-	R-	∞	3	//	/
	+	-	T-	R-	∞	4	//	/
C	+	-	T-	R-	∞	5	//	/
	+	-	T-	R-	∞	6	//	/
D-E					∞	S1	Cube Demo	1
D	+	-	T-	R-	30 S	7	//	1
	+	-	T-	R-	30 S	8	//	1
E	+	-	T-	R-	30 S	9	//	1
	+	-	T-	R-	30 S	10	//	1
F-I					∞	S2	//	2
F	+	-	T-	R-	30 S	11	//	2
	+	-	T-	R-	30 S	12	//	2
G	+	-	T-	R-	30 S	13	//	2
	+	-	T-	R-	30 S	14	//	2
H	+	-	T-	R-	30 S	15	//	2
	+	-	T-	R-	30 S	16	//	2
I	+	-	T-	R-	30 S	17	//	3
	+	-	T-	R-	30 S	18	//	3
J-L					∞	S3	Cube Demo	4
J	+	-	T-	R-	45 S	19	//	4
	+	-	T-	R-	45 S	20	//	4
K	+	-	T-	R-	45 S	21	//	4
	+	-	T-	R-	45 S	22	//	4
L	+	-	T-	R-	45 S	23	//	4
	+	-	T-	R-	45 S	24	//	4
M-O					∞	S4	Photo only	3
M	+	-	T-	R-	30 S	25	//	3
	+	-	T-	R-	30 S	26	//	3

N	+	-	T-	R-	30 S	27	//	3
	+	-	T-	R-	30 S	28	//	3
O	+	-	T-	R-	30 S	29	//	3
	+	-	T-	R-	30 S	30	//	3
P-Q			T-	R-	∞	S5	//	4
P	+	-	T-	R-	45 S	31	//	4
	+	-	T-	R-	45 S	32	//	4
Q	+	-	T-	R-	45 S	33	//	4
	+	-	T-	R-	45 S	34	//	4
R	+	-	T-	R-	45 S	35	//	4
	+	-	T-	R-	45 S	36	//	4
S	+	-	T-	R-	60 S	37	//	6
	+	-	T-	R-	60 S	38	//	6
T	+	-	T-	R-	90 S	39	//	9
	+	-	T-	R-	90 S	40	//	9
U	+	-	T-	R-	90 S	41	//	9
	+	-	T-	R-	90 S	42	//	9
(+): Pass						(-): Fail		
(T-): Time Failure						(R-): Reversal Failure		

Calculation of Raw Score RS	
A- Highest Paragraph Score	
B- Total No. of (-),(T-),(R-)	
Raw Score RS (A-B)	

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II- Abstract/visual reasoning (A/VR)- الاستدلال البصري المجرد

5- Copy (Cop) – النسخ

Draw Circle on (+) or (-) – Starting from G use white papers for drawing

Level	Cubes		Cop	Response
	3-4 Cubes need for both of you (Green color)			
A	+	-	1	
	+	-	2	
B	+	-	3	
	+	-	4	
C	+	-	5	
	+	-	6	
D	+	-	7	
	+	-	8	
E	+	-	9	
	+	-	10	
F	+	-	11	
	+	-	12	
G	+	-	13	
	+	-	14	
	Draw Object			
H	+	-	15	
	+	-	16	
I	+	-	17	
	+	-	18	
J	+	-	19	
	+	-	20	
K	+	-	21	
	+	-	22	
L	+	-	23	
	+	-	24	
M	+	-	25	
	+	-	26	
N	+	-	27	
	+	-	28	

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(+): Pass	(-): Fail

Calculation of Raw Score RS	
A- Highest Paragraph Score	
B- Total No. of (-)	
Raw Score RS (A-B)	

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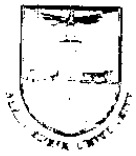
III- Quantitative reasoning (QR)- الاستدلال الكمي

6- Quantitative (Q) – الاختبار الكمي					
Record Answers – Draw Circle on(+) or (-)					
Level	Cubes		Q	Wright Answers	Response
	Explain The Cube and Dotes on each side				
A-C	+	-	1	Cube –Upper side with 1 Dote	The same Cube
	+	-	2	Cube –Upper side with 6 Dotes	The same Cube
D	+	-	3	Cube –Upper side with 3Dotes	The same Cube
	+	-	4	Cube- Upper side with 2 Dotes	Count Dotes
E	+	-	5	Cube- Upper side with 5 Dotes	Count Dotes
	+	-	6	3 Cubes- each -Upper side with 1 Dotes	Count Dotes 1+1+1
F	+	-	7	2 Cubes- each -Upper side with 1 ,2 Dotes	The same Cubes
	+	-	8	2 Cubes- each -Upper side with 2,5 Dotes	The same Cubes
G	+	-	9	3 Cubes- each -Upper side with 2,4,3 Dotes	Count Dotes2+4+3
	+	-	10	2 Cubes- each -Upper side with 4 ,6 Dotes	The same Cubes
H	+	-	11	2 Cubes- each -Upper side with 2 ,4 Dotes	Count Dotes 2+4 =Cube Dotes
	+	-	12	4Cubes- each -Upper side with 1,2, 3,4 Dotes	Complete rank= 5,6
	Q				
I	+	-	13	3 Child	
	+	-	14	4 Pencils	
J	+	-	15	6 Cm	
	+	-	16	C	
K	+	-	17	50 قرش	
	+	-	18	B	
L	+	-	19	B	
	+	-	20	2- 1/2 [4- 1/4 [1-1/2,2-1/4 [10 -1/2 ريال [20- شلن;	
M	+	-	21	8 Kg	
	+	-	22	10 week	
N	+	-	23	1-5 or 20%	
	+	-	24	1- 1/4, 2-1/2شلن , 1ريال [2- 1/4 [5- شلن-10 [ريال 1/2 -5 [1-1/4 ,1/2ريال	
O	+	-	25	6	



	+	-	26	120 Pounds	
P	+	-	27	يملاء اولا الجردل 5 لتر ثم يملاء الثاني 3 لتر من الاول حيفضل 2 لتر في الاول	
	+	-	28	4 Lines	
Q	+	-	29	تملي 3 لتر في الاول وتفرغة في الجردل الثاني وتكرر ها مرتين اخر مرة سيتبقي عندها لتر واحد في الجردل الاول	
	+	-	30	24	
R	+	-	31	Type 2 Chees	
	+	-	32	0.4	
S	+	-	33	4 Years	
	+	-	34	5 Hours	
T	+	-	35	175 Km	
	+	-	36	275 قرش	
U	+	-	37	18 Lines	
	+	-	38	900 بلاطة	
V	+	-	39	48 Oranges	
	+	-	40	50 Minutes	
(+): Pass				(-): Fail	

Calculation of Raw Score RS	
A- Highest Paragraph Score	
B- Total No. of (-)	
Raw Score RS (A-B)	

IV- Short-term memory (STMR)-الذاكرة قصيرة المدى

7- Bead memory (Bm) – اذاكرة الخرز				
Draw Circle on (+) or (-) a-e, S1,2,3 not counted Explain Beads with different colors and shapes				
Level	Beads only		Cop	Response
	Show bead shape – let him point on the exact photo			
a	+	-		خرزة زرقاء كروية
b	+	-		خرزة حمراء قرصية
c	+	-		خرزة بيضاء اسطوانية
d	+	-		خرزة زرقاء مخروطية
	Show bead shape hid it – let him point on the exact photo			
A-C	+	-	1	حمراء اسطوانية
	+	-	2	زرقاء قرصية
D	+	-	3	بيضاء كروية
	+	-	4	حمراء كروية
E	+	-	5	بيضاء مخروطية
	+	-	6	حمراء كروية وزرقاء كروية
F	+	-	7	بيضاء كروية وبيضاء مخروطية
	+	-	8	زرقاء مخروطية وزرقاء اسطوانية
G	+	-	9	حمراء قرصية وبيضاء كروية
	+	-	10	زرقاء اسطوانية وحمراء مخروط
	Bead, Stand			
H-K			S1	
H	+	-	11	
	+	-	12	
I	+	-	13	
	+	-	14	
J	+	-	15	
	+	-	16	
K	+	-	17	
	+	-	18	
L-N			S2	
L	+	-	19	
	+	-	20	
M-N	+	-	21	

	+	-	22	
O-Q			S3	
O-P	+	-	23	
	+	-	24	
Q	+	-	25	
	+	-	26	
R	+	-	27	
	+	-	28	
S	+	-	29	
	+	-	30	
T	+	-	31	
	+	-	32	
U	+	-	33	
	+	-	34	
V	+	-	35	
	+	-	36	
W	+	-	37	
	+	-	38	
X	+	-	39	
	+	-	40	
Y	+	-	41	
	+	-	42	
(+): Pass				(-): Fail

Calculation of Raw Score RS	
A- Highest Paragraph Score	
B- Total No. of (-)	
Raw Score RS (A-B)	

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IV- Short-term memory (STMR)-الذاكرة قصيرة المدى

8- Memory for sentence (Ms) – ذاكرة الجمل				
Draw Circle on (+) or (-) – S1,2,3 not counted				
Level			Ms	Sentence
A-F			S1	بنت طويلة
A	+	-	1	حصان كبير
	+	-	2	اشرب اللبن
B	+	-	3	عاوزك تبص لي
	+	-	4	العربيات تجري بسرعة
C	+	-	5	الاشجار الخضراء كبيرة
	+	-	6	انا رحت البيت
D	+	-	7	عاوزك تروح لغاية الدكان
	+	-	8	روح شوف البلياتشو المضحك
E	+	-	9	سميرة عندها كلب وقطة
	+	-	10	التياترو جاي بلدنا بكرة
F	+	-	11	هاني هو صديق سامي الجديد
	+	-	12	سارة تحب البسكليتة الجديدة بتاعتها
G-I			S2	ممدوح لعب مع الكلب
G	+	-	13	الولد الصغير الشقي مش ممكن يبطل عياط
	+	-	14	الشمس بتخلي النهار دايما دافي ومنور وجميل
H	+	-	15	جه وقت نوم الطفل الصغير في سريرة
	+	-	16	ابراهيم رسم صورة حلوة لامة بمناسبة عيد ميلادها
I	+	-	17	نصر ما كانش عايز يخرج من السينما قبل ما ينتهي الفلم
	+	-	18	عصام من النوع الي ما يحبش يقضي وقت كثير قدام التلفزيون
J-Q			S3	حبل الطيارة الورق الطويل اتقطع مني
J	+	-	19	الناس ما قدرتش تشوف الطيارة النهاردة الصبح علشان الضباب الكثيف في السما
	+	-	20	مديحة ادت اخوها بمناسبة عيد ميلادة قميص علية خطوط حمرا وبيضا
K	+	-	21	وهو بيجري للاتوبيس وقع علي الارض وجا لة كسر في رجلة اليمين
	+	-	22	صحيح البحر باين هادي النهاردة لكن ممكن يكون العوم فية خطر
L	+	-	23	نيفين وهي بتلعب برة رجليها تزحلقت ووقعت وكل هدومها تغطت بالطين
	+	-	24	حصل النهاردة عطل في موتور الطيارة وعشان كدة عملت هبوط اضطراري
M	+	-	25	امبارح هطول المطر كان غزير وعمل بركة في الشارع بيلعب فيها الاولاد
	+	-	26	توقع جيش العدو الهزيمة ولذلك رفع الراية البيضاء عالية اعلانا

				للاستسلام
N	+	-	27	فريد جري وراء الكلب حول المنزل ولكن لم يتمكن من الامساك به
	+	-	28	كانت الطيور تحلق ف بالسماء وتغرد حين استيقظ خليل هذا الصباح
O	+	-	29	امطرت السماء هذا الصباح ولذلك حمل التلاميذ المظلات في طريقهم الي المدرسة
	+	-	30	كان الحراس نائمين الليلة الماضية نوما عميقا ولذلك تسلل اللصوص الي المصنع
P	+	-	31	توجة فريق اللاعبين الي الملعب ولكن هطل المطر بغزارة مما ادي الي تاجيل المبارة
	+	-	32	الجو الحار الرطب الذي كان سائدا في معظم اواخر الصيف الطويل جعل الناس يشعرون غالبا بالضيق
Q	+	-	33	بفضل الحكمة والنظرة البعيدة والتخطيط استطاع الاشقاء تدبير امور حياتهم رغم ضيق ذات اليد
	+	-	34	منصو راستطاع اصلاح نافذة الحجرة قبل عودة ابية ولذلك فانة افلت من العقاب
R	+	-	35	اقلعت السفينة مبكرة من الميناء قبل موعدها بساعة وتركت وراءها صلاح يندب حظة السي
	+	-	36	لم يستطع السائق التحكم ف بسيارتة بفعل الرياح والامطار فهوت السيارة الي قاع النهر
S	+	-	37	كان من اعظم الامور مشقة وهي وحدها في رحلتها الطويلة وفي يوم حار هو التغلب علي الشعور بالملل
	+	-	38	كان الجو شديد الحرارة والجفاف ف بالصيف فوصل الحال في سبتمبر الي مستويات بالغة الخطورة هلك معها الزرع
T	+	-	39	كلما تقدمت السن بالرياضيين فانهم بعامة يجدون ان الاحتفاظ بحالتهم البدنية في مستويات عالية يتزايد صعوبة عاما بعد عام
	+	-	40	بقدر ما اعرف وطبقا للسجلات المحفوظة فان مستوي فضيان النهر لم يبلغ هذا الحد من الارتفاع خلال العشرين سنة الاخيرة
U	+	-	41	حين يكون الاطفال صغارا فانة من السهل العثور علي هدايا ترضيهم ولكن حين يكبرون ويزداد مدى التنوع فيما يحبون ويكرهون يصبح الامر اكثر صعوبة
	+	-	42	ليس من الغريب ان تتباين ميول الناس وان تختلف هوياتهم والالعاب التي يفضلون ممارستها تبعا لمستويات اعمارهم وقدراتهم وتعليمهم وتبعا لتنوع ثقافاتهم وبيناتهم
(+): Pass			(-): Fail	

Calculation of Raw Score RS	
A- Highest Paragraph Score	
B- Total No. of (-)	
Raw Score RS (A-B)	

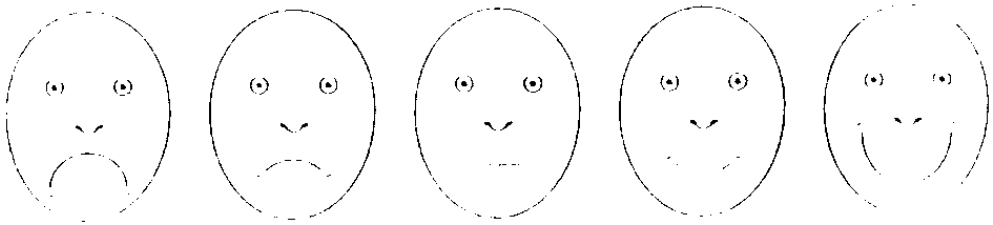
APPENDIX III

Alexandria University
Faculty of Dentistry
Department of Pediatric and Dental Public health

Appendix III

Facial Image Scale (FIS) (Buchanan and Niven, 2002)

Child Name: **Age:** **Gender:** **Address:** **Phone NO:**



٥ ٤ ٣ ٢ ١

5	4	3	2	1
Very Unhappy	Unhappy	Moderate	Happy	Very Happy

APPENDIX IV

Alexandria University
Faculty of Dentistry
Department of Pediatric and Dental Public health

Appendix VI
Frankl's Behavior Rating Scale (FBRS)
(Frankl, Shiere and Fogels, 1962)

Rating		Behavior	
1	Rating no. 1	– –	• Refusal of treatment • Forceful crying • Fearfulness, • Or any other overt evidence of extreme negativism.
2	Rating no. 2	–	• Reluctance to accept treatment • Uncooperativeness • Some evidence of negative attitude but not pronounced (sullen, withdrawn).
3	Rating no. 3	+	• Acceptance of treatment • Cautious behavior at times • Willingness to comply with the dentist, at times with reservation, but patient follows the dentist's directions cooperatively.
4	Rating no. 4	++	• Good rapport with the dentist • Interest in the dental procedures • Laughter and enjoyment.

PROTOCOL

Effect of Preschool Children's Intelligence on Dental Fear and their Behavior in the Dental clinic using Parental Active/ Passive Presence Technique

تأثير مستوي الذكاء علي مدي الخوف عند اطفال ما قبل المدرسة وعلي سلوكهم في عيادة الاسنان باستخدام اسلوب وجود الوالدين الايجابية/السلبية

Thesis Proposal

Submitted to the Faculty of Dentistry, Alexandria University,
in partial fulfillment of the Requirements of
the Doctorate Degree in
Pediatric Dentistry

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لجنة أخلاقيات البحث العلمي

Faculty of Dentistry,
Alexandria University
2011

Introduction

Many practicing dentists have considered the fearful uncooperative child patient to be among the most troublesome of problems in their clinical works. [1] Children who knew that they had a dental problem were more likely to exhibit negative behavior at the first dental appointment. [2]

Fear is a reaction to real or imagined threat and is considered to be an integral and adaptive aspect of normal development. [3] Anxiety and fear have been defined in many ways in the literature. Spielberger in 1983 has made a distinction between the more temporary condition of 'State Anxiety' and the more general and longstanding quality of 'Trait Anxiety'. State anxiety reflects a 'transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity'. On the other hand 'Trait anxiety' denotes relatively stable individual differences in anxiety proneness and refers to a general tendency to respond with anxiety to perceived threats in the environment'. [4]

Both aspects have been combined in dental fear and anxiety (DFA). A common occurrence characterized by an essential and inevitable emotion that appears as a response to various dental procedures. [5] Dental fear has been constantly among children younger than three years, but it also appears in older children and adolescents. [5]

Dental fear in children has continued to generate a lot of interest in pediatric dentistry. Various measures have been developed in a bid to develop a uniform method of assessing and grading dental fear in children. Examples of these measures include the Children's Fear Survey

Schedule (CFSS) developed by Scherer and Nakamura[6], and Dental Subscale of Children's Fear Survey Schedule (CFSS-DS) developed by Cuthbert and Melamed. [7] These include a questionnaire filled by the child or his parent. [8]

A degree of bias has been reported, due to the doubt that the child could not fill out a questionnaire. So various techniques have been developed to circumvent this problem. The child level of anxiety can be indicated when he/she picks out or points to a picture that illustrates his/her perceived emotion.[8]

These picture scales allow for limited cognitive and linguistic skills. They can be easily administered and scored in a clinical context.[8]The most developed picture tests are the Facial Image Scale (FIS), and Children's Dental Fear Picture test (CDFP).[9, 10]

The Facial Image Scale uses faces as an indicator of fear. It is also suitable for young preliterate children. [11] The tool has found to show a high correlation with the Venham Picture Test (VPT) when tested for validity [9, 12]

Another issue that is worth discussing is child intelligence. This may have an effect on the child's behavior in the dental clinic.

The development of intellectual capabilities occurs in a series of relatively distinct stages. From the perspective of Jean Piaget and his followers, the development of intelligence is another example of the widespread phenomenon of biologic adaptation. In Piaget's view, adaptation occurs through two complementary processes, ***assimilation*** and ***accommodation***. [13]

Piaget has believed that intelligence is the ability to adapt to the environment. Thought does not develop as do height and weight, which only increase in magnitude with age. Thought assumes qualitatively different patterns at succeeding age levels. [14] So from Boeree review

Piaget has developed the idea of stages of cognitive development, which are sensori-motor stage, preoperational stage, concrete operations stage, and, formal operations stage. This cognitive theory has constituted a lasting contribution to psychology. [15]

The preoperational stage lasts from about two to about seven years old. Now that the child has mental representations and is able to pretend, it is a short step to the use of **symbols**. On the other hand, the child is quite **egocentric** during this stage (mountains study). The most famous example of the preoperational child's centrism is what Piaget refers to as their inability to conserve liquid volume. [15]

The term cognition refers to the highest levels of various mental processes such as perception, memory, abstract thinking , reasoning, and problem solving as well as the more integrative and control processes related to executive functions such as planning, choosing strategies, and the enactment of these strategies.[16]

Individuals differ from one another in their ability to understand complex ideas, and to adapt effectively to the environment. [17] Experts have defined intelligence according to two themes. The first theme focused on the individual learning from experience. The second theme focused on the individual's ability to adapt to the environment. [18]

Tests of intelligence itself come in many forms. Some use only a single type of item or question; such as the Peabody Picture Vocabulary Test (PPVT), and Raven's Progressive Matrices. The more familiar measures of general intelligence-such as the Wechsler Tests and the Stanford - Binet Test include many different types of items, both verbal and nonverbal. [19]

The Stanford – Binet Test (Fourth edition) is based on a hierarchical model of intelligence. The four main areas assessed are Verbal reasoning, Abstract/Visual reasoning, Quantitative reasoning, and

Short-term Memory. [20] Fifteen subtests are partitioned in to four main reasoning.[21]

The Stanford-Binet IV is a useful test in assessment of a broad range of intellectual abilities. [22] The full battery test is not necessarily used to measure the intelligent Quotient (IQ), an item-reduction short form proved to be a more comparable estimate of the full battery composite. [23]

Simpson and others (2002) evaluated intellectual giftedness in 20 gifted children and 20 non-gifted children. They examined the extent of the difference in IQ scores obtained on the two tests and whether order effects were present using The Wechsler Intelligence Scale for Children–Third Edition (WISC-III) and the Stanford-Binet Intelligence Scale 4th Edition (SB-IV). Results showed that the SB-IV Composite Score was significantly higher than the WISC-III Full Scale IQ for both groups. [24]

A study of children's individual characteristics (including age, sex, and intelligence quotient and personality variables) may help in the understanding of their dental anxiety and dental fear, their problems and special needs. [25] Some researchers have tried to assess and evaluate the correlation between child's intelligence and dental fear, beside that they correlate between child's intelligence and their behavior in the dental clinic.

Rud and Kisling (1973) investigated the influence of mental development on children acceptance of dental treatment, by using Banit's, Cattells's, and Leiter's methods on 108 individuals with age of (3-9 years). They reported that children with lower IQs showed more fearful behavior. [26]

Toledano and others (1995) investigated children aged 8-16 years with no previous experience of dental treatment. Three psychological variables were determined: anxiety (State-Trait Anxiety Inventory of

Children), personality (Eysenck Personality Questionnaire-Junior) and intelligence (Wechsler Intelligence Scale for Children). The relationship between personality and intelligence factors and the levels of anxiety at the beginning of the first dental visit (before treatment) and at the end of the third visit (after treatment) were determined. There was no significant relationship between personality variables and dental anxiety levels. [25]

Savin, and Maxim (2008) carried out a study on 88 subjects (54 girls and 34 boys) aged between 6-8 years old: They divided them into 64 normal subjects from psycho-mental viewpoint and 24 subjects with audio sensory disabilities. They made a complex assortment of investigations: projective draw test (thematic projective test), Raven's progressive matrix test and a questionnaire. The results of all the tests showed that there was a significant correlation between the IQ level and the behavioral conduct manifested by the child. The subjects with higher IQ level presented a normal conduct. [27]

Communicative management is an ongoing subjective process that becomes an extension of the personality of the dentist. Associated with this process are the specific techniques of Tell Show-Do technique, Parental presence/absence, [28] and others. [11]

Little is known about the parenting style, and research on the influence of parenting styles on children's cognitive development is one of the most common studied factors these days. Baumrind [29] developed a parenting style typology which consists of three parenting styles in her original work: authoritative, authoritarian, and permissive. Authoritative parenting style is associated with warm and responsive parents in addition to high control and demand. Authoritarian parenting style is associated with low measures of warmth and responsiveness and high levels of control. Permissive parenting style varies in degree of warmth with some being very warm and indulgent while others lack interest in the child. The

importance of Baumrind's work is firmly established by her findings showing that different parenting styles are associated with different child outcomes [29]

Maccoby and Martin have suggested the addition of a fourth parenting style and have called it neglectful. They have described these parents as emotionally detached. Indifferent uninvolved, or neglectful, parents tend to keep their children at a distance, responding to child demands only to make them cease. [30]

Parents exert a significant influence on their child's behavior, especially if they have had previous negative dental experiences [31, 32] The presence or absence of the parent sometimes can be used to gain cooperation for treatment. [11]

Parents' desire to be present during their child's treatment does not mean they intellectually distrust the dentist. It might mean they are uncomfortable if they visually cannot verify their child's safety. It is important to understand the changing emotional needs of parents because of the growth of a latent but natural sense to be protective of their children. [33] The question of a parent's presence should not cause conflict within the dentist, as long as dentists understand why they can so easily be emotional about it. [33] Parent's presence can be divided into either active or passive. This strategy might change parents' mind and encourage them to do an active part during management of their children. [33]

It is evident that a strong relationship between dental fear and behavior of children exists. [15, 8, 34, 35] However, limited research has dealt with the effect of children's intelligence on their fear and consequently on their behavior in the dental clinic. [36] In addition, no research has investigated active versus passive presence of parents in the dental

operatory and its effect on the child's behavior. These problems have furnished the stimulus for the present investigation.

Hypotheses:

Null Hypothesis: there is no effect of Parental Active/ Passive Presence Technique and Tell Sow Do (TSD) Technique on the behavior of preschool children with different levels of intelligence and fear.

Alternative Hypothesis: there is an effect no effect of Parental Active/ Passive Presence Technique and Tell Sow Do (TSD) Technique on the behavior of preschool children with different levels of intelligence and fear.

Aim of the Study

This study will be conducted to:

1. Investigate the effect of preschool children's intelligence (IQ) on dental fear in the dental clinic.
2. Investigate the effect of preschool children's intelligence (IQ) on their overall behavior in the dental clinic.
3. Investigate the effect of Parental Active/ Passive Presence Technique on the behavior of preschool children with different levels of intelligence.
4. Investigate the effect Parental Active/ Passive Presence Technique on the behavior of preschool children with different levels of fear.

Material and Methods

Study Design

The study which will be conducted is a randomized controlled clinical trial with an allocation ration 1:1. The children enrolled in the study will be stratified based on their IQ into three groups; high, average and low IQ groups. In each of these three groups, children will be randomly and equally allocated into test and control subgroups. The study will thus include 6 subgroups.

Setting and location

The children will be recruited from the Outpatient clinic of Pediatric Dentistry in Faculty of Dentistry at Alexandria University.

Sample

Sample size estimation

A total of 150 children will be included in the study with 25 children per subgroup. The following assumptions were made for sample size estimation:

Alpha error= 0.05

Beta error= 0.20

Allocation ratio between test and control subgroups in each of the three study groups = 1:1

Probability of positive behavior in control subgroup in low IQ group = 0.25[37]

Probability of positive behavior in test subgroup in low IQ group so that the behavior score would be similar to healthy children in the same age group= 0.87[38]

A logistic regression of a binary response variable (positive/ negative behavior) on a binary independent variable (test/ control subgroups) with a sample size of 25 children (of which 50% are in the test subgroup and 50% are in the control subgroup) achieves 84% power at a 0.05 significance level to detect a difference between both subgroups. An adjustment is made since a multiple logistic regression of the independent variable (behavior) on the other independent variables in the logistic regression obtained an R-Squared of 0.2.

Inclusion Criteria

1. Age ranging from 3-6 years (the preoperational stage).
2. Patients with at least one sound quadrant.
3. Patients with no history of previous dental treatment and no history of pain
4. Patients with no medical, psychological or mental problems

Exclusion criteria:

1. Multiple dental problems with pain
2. History of previous dental therapy
3. Medical problem
4. Any degree of mental retardation

Visual Screening and parent meeting will be carried out to identify children who will fulfill the inclusion criteria.

The study will be explained to the parents and informed consent will be obtained. [Appl). (39)]

Randomization

Randomization will be achieved by using a computer random number generator to produce the sequence needed to allocate the children to one of the study groups.

To implement the random allocation sequence, a number of closed envelopes corresponding to the number of children in the study will be prepared. The order of the child enrolled in the study will be written on the envelope and a piece of folder paper will be included inside the envelope which will be sealed until the time of allocation. The group to which the child will be allocated will be written inside this folded paper. The random allocation sequence will be generated by a biostatistician not participating in the study, the researcher will enroll the children in the study after ensuring that they fit the inclusion/ exclusion criteria.

Interventions

Children who fulfill the inclusion/ exclusion criteria will be evaluated for IQ then divided into 3 equal groups according to their level of intelligence IQ in the first visit. In the second visit, fear will be measured followed by random allocation into test and control groups and implementation of the intervention.

After that, all procedures will be explained to the child using the *Tell Show Do* (TSD) Technique. [140] Standardized exact words will be used for each child during the procedure in the dental clinic. Children in Subgroup A (control group) will be accompanied with their parent who will sit in passively in the dental operatory behind the patient with no eye contact. Children in Subgroup B (test group) will be accompanied with their parent who will stand in close proximity to their child with hand holding and may help in explaining the dentist's instructions. [33]

Dental treatment will follow including:

1. Oral hygiene instruction [41]
2. Fissure Sealant [41]*
3. Prophylaxis and Topical Fluoride applications [42,43]†

All procedures will be non-pain provoking.

For ethical consideration; if the child has any decayed tooth indicated for restoration, it will be restored in another visit.

Measurements and outcomes

1. IQ Test measure: Stanford Binet Intelligence Scales, Fourth Edition (SB: IV) - Arabic version. [44, 45] This is used to classify children into the three study groups.
2. Fear Measure: Facial Image Scale (FIS) [9] this is used to account for fear state and is entered into the analysis as a confounder.
3. Overall Behavior: Frankl's Behavior Rating Scale (FBRS) [46]. This is the outcome measure.

By means of Stanford Binet Intelligence Scales, Fourth Edition (SB: IV) - Arabic version (after taking a special course how to use this scale).‡ It is a standardized test that measures intelligence and cognitive abilities in children and adults, from age two through mature adulthood.[45]

* bioscal ® Pit and Fissure Sealant,Biodinamica, Madrid, Spain
† Sorbet ® Fluoride gel , Keystone Industries, Hollywood Avenue, Cherry Hill,USA
‡ Stanford Binet Intelligence Scales, Fourth Edition - Arabic version: Assessment Course, Steps Training Center, Alexandria, Egypt

Administration of the Stanford-Binet Intelligence Scale typically takes between 45 to 90 minutes (including full battery test). The intelligent quotient (IQ) of children will be measured and evaluated to distribute their groups accordingly. [45]

The test is grouped into four area scores. The four main areas to be assessed are verbal reasoning, abstract/visual reasoning, quantitative reasoning, and short-term memory. There are 8 subtests selected from the total subtest of Stanford Binet Intelligence Scales according to the age group. [45] The reasoning and the subtests links to [45]:

I- Verbal reasoning (VR):

1. Vocabulary (V)
2. Comprehension (Com)
3. Absurdities (Ab)

II- Abstract/visual reasoning (A/VR):

1. Pattern (P)
2. Copy (Cop)

III- Quantitative reasoning (QR):

4. Quantitative (Q)

IV- Short-term memory (STMR):

1. Bead memory (BM)
5. Memory for sentence (MS).

Verbal reasoning (VR):

The Verbal Reasoning area score measures verbal knowledge and understanding obtained from the school and home learning environment and reflects the ability to apply verbal skills to new situations. Examples of subtests comprising these factor measure skills which include: word

knowledge (Vocabulary), social judgment and awareness (Comprehension), and ability to isolate the inappropriate feature in visual material and social intelligence (Absurdities).[45]

Abstract/visual reasoning (A/VR):

The Abstract/Visual Reasoning area score examines the ability to interpret and perform mathematic operations, the ability to visualize patterns, visual/motor skills, and problem-solving skills through the use of reasoning. An example of a subtest which determines the Abstract/Visual Reasoning score is a timed test that involves tasks such as completing a basic puzzle and replicating black and white cube designs (Pattern and Copy).[45]

Quantitative reasoning (QR):

The Quantitative Reasoning area score measures: numerical reasoning (Quantitative).[45]

Short-term memory (STMR):

The Short-Term Memory score measures concentration skills, short-term memory, and sequencing skills. Subtests comprising this area score measure visual short-term memory and auditory short term memory involving sentences sequences (Memory for sentence). In one subtest that measures visual short-term memory, the participant is presented with pictures of a bead design, and asked to replicate it from memory (Bead memory).[45]

Test administration

The study will comprise two visits:

1st visit:

Stanford Binet Intelligence Scales will be used to determine the IQ level for each child [Appl1].

Each selected child will be seated in a private quiet room. The Stanford Binet Intelligence Scale will be applied and explained step by step starting from the first Reasoning and its items until the last one.

The first step in this test is to apply the first subtest which is the vocabulary (v) to estimate the ***entry level*** of the examined child. The child chronological age will be matched with a suitable paragraph (represents a vocabulary photo) according to a placement test's paper in a vocabulary subtest (V). If the child is successful in the paragraph, he will be moved to the next one to finish this level (each level contains 2 paragraphs). This will be considered the ***basal level***. [47]

The child will be moved from one level to another until he fails in 5 from 6 paragraphs (fail in 3 consequent levels), which represent the ***ceiling level*** (cut-off point). The level with right answers in both paragraphs will represent the entry level. It will be considered the starting level in all tests for each subtest. [47]

The test will stop at the ceiling level. Calculation will be counted by subtracting all wrong answers from the number of the last paragraph. A score will be given for each subtest (Raw Scores). [47]

From the Standardized Tables; [48] after finishing all items, the Raw Score (RS) will be changed to Standard Age Score (SAS) by using first type of table. These Scores for each subtest will be collected and change to Reasoning Standardized Score(R-S-S) by using another table. Finally, by using the last type of tables the score will be changed to Compound Score (C-S) which represents the IQ of the examined child.

Children will be divided into 3 groups according to their level of intelligence IQ as follows:

1. High IQ Children group(HIQ): with score of (110 and above)
2. Average IQ Children(AIQ): with score of (90-109)
3. Low IQ Children (LIQ): with score of (70-89)

2nd visit:

1- This visit is starting by application of Facial Image Scale (FIS) with every child in each group. It is a visual analog scale comprising of a row of five faces ranging from very happy to very unhappy. Children will be asked to point at which face they feel most like at the moment. The face is scored by giving a value of one to the most positive affect face and five to the most negative affect face with faces 4 and 5 indicating high dental fear. [Appendix (9)]

2- All procedures will be explained to the child using the *Tell Show Do* (TSD) Technique. [46] Then the other proper technique will be applied according to their groups (Control/test group).

3-Dental treatment will apply to the children.

4- At the end of the second visit, each child behavior in each group will be evaluated according to Frankl's Behavior Rating Scale (FBRS). [Appendix (6)]

Grouping: (see the table below).

Groups	Group I		Group II		Group III	
IQ Level	High IQ Children (HIQ)		Average IQ Children (AIQ)		Low IQ Children (LIQ)	
IQ Score	110 and above		90-109		70-89	
Number	50 Children		50 Children		50 Children	
Subgroups	**HIQ_A**	**HIQ_B**	**AIQ_A**	**AIQ_B**	**LIQ_A**	**LIQ_B**
Intervention	25 Child TSD + Parental Passive Presence	25 Child TSD + Parental Active Presence	25 Child TSD + Parental Passive Presence	25 Child TSD + Parental Active Presence	25 Child TSD + Parental Passive Presence	25 Child TSD + Parental Active Presence

Blinding

For the researcher, outcome assessment will be blinded by videotaping the clinical sessions and shuffling the sequence of cases. Assigning a behavior score for each child will thus be done irrespective of the management technique used. In addition, the biostatistician will also be blinded to the actual status of the children as regards to which group they belong by recoding the groups for analysis purposes.

Calibration and reliability of examiner

Prior to the study, the researcher will be calibrated by conducting training sessions with the supervisor for the application of the three measurement scales. Intra-examiner reliability will be assessed by the Application of Facial Image Scale (FIS) and Frankl's Behavior Rating Scale (FBRS) to 10 children then these children will be re-evaluated after 5 days. Then the results will be assessed using Kappa statistics.

Statistical Analysis

Descriptive statistics will be calculated to describe the sample and the outcome (behavior) as well as relevant confounders such as fear. Logistic regression analysis will be done to assess the effect of groups (based on IQ level), subgroups (test or control) and confounders (fear and other variables such as age, gender...) on the outcome (behavior dichotomized into positive and negative behaviors).

References

1- Ingersoll BD. Distraction and Contingent reinforcement with paediatric dental patients. J Dent Child 1984; 51: 203-207.

2- Wright GZ , Alpern GD. Variables influencing children's cooperative behavior at the first dental visit. J Dent Child 1971; 23: 124-128.

3- King NJ, Hamilton DI, Ollendick TH. *Children's phobias: A Behavioral Perspectives.* Chichester. Wiley; 1988.

4- Spielberger CD. *Manual for the State-Trait Anxiety Inventory (STAI).* Palo Alto, CA: Consulting Psychologists Press; 1983.

5- Chapman HR, Kirby NC. Dental fear in children: a proposed model. Brit Dent J 1999; 187: 408-412.

6- Scherer MW, Nakamura NY. A fear schedule for children: a factor analytic comparison with manifest anxiety. Behav Res & Therapy 1968; 6:173-182.

7- Cuthbert ML., Melamed BG. A screening device: Children at risk for dental fear and management problems J Dent Child 1982; 49:432- 436.

8- Folayan MO, Kolawole KA. A critical appraisal of the use of tools for assessing dental fear in children. Afri J Oral Health 2004. 1: 54-63.

9- Buchanan H, Niven N: Validation of a Facial Image Scale to assess child dental anxiety. Int J Ped Dent 2002; 12:47-52.

10- Klingberg G, Vamias Lofqvist L., Hwang CF. Validity of the Children's Dental Fear Picture test (CDFP). Eur J Oral Sci 1995; 103: 55-60.

11- American Academy of Pediatric Dentistry. Guidelines on Behavior Guidance for the Pediatric Dental Patient. 2011 accessed at: http://www.aapd.org/media/policies.asp

12- Buchanan H, Niven N: Further evidence for the validity of the Facial Image Scale .Int J Ped Dent. 2003 13:368-369.

13- Piaget J. *The Child Conception of Physical Causality*. London: Routledge and Kegan, Ltd; 1966.

14- Piaget J. *The Language and Thought of the Child*. 3rd Ed.New York: Routledge and Kegan, Ltd; 1959.

15- Boeree G. Personality Theories: Jean Piaget.2006 Available from: http://webspace.ship.edu/cgboer/piaget.html

16- Sparrow SS, Davis SM. Recent advances in the assessment of intelligence and cognition. J Child Psycho Psychiat 2000; 41: 117-131.

17- Stemberg, RJ, Detterman, DK. *What is Intelligence? Contemporary Viewpoints on its Nature and Definition*. Norwood, NJ: Ablex .1986.

18- Williams W.M. Consequences of how we define and assess intelligence. Psycho Public Policy and Law 1996; 2:506-535.

19 -Ulric Neisser et al. Intelligence: Knowns and unknowns. A Psycho 1996; 51:77-101.

20- Roid GH. *Stanford-Binet Intelligence Scales - Examiner's Manual: 5th Ed.* Itasca, IL: Riverside Publishing company. 2003.

21- Kline RB. Is the fourth edited Stanford-Binet a four- factor test? Confirmatory factor analysis of alternative models for ages 2 through 23. J Psycho Assess 1989; 7:4-13.

22- Johnson DL, Howie VM, Owen M, Baldwin CD, Luttman D. Assessment of three-year-olds with the Stanford-Binet Fourth Edition. Psychol Rep 1993; 73:51-7.

23- Nagle RJ, Bell NL. Validation of an item-reduction short form of the Stanford-Binet Intelligence Scale: Fourth Edition with college students. J Clin Psychol 1995 Jan; 51:63-70.

24- Simpson M, Carone DA, Burns WJ, Seidman T, Montgomery D, Sellers A. Assessing giftedness with the WISC-III and the SB-IV. Psychology in the Schools 2002; 39:515-524.

25-Toledano M, Osorio R, Agullera FS Pegalajar J. Children's dental anxiety: influence of personality and intelligence factors M. Int J Ped Dent 1995; 5: 23-28.

26- Rud B, Kisling E. The influence of mental development on children's acceptance of dental treatment. Scand J Dent Res .1973; 81: 343-352.

27- Savin C,Maxim A. The role of the psychological factor in pediatric dental management. J Prev Med 2008; 16: 132-140.

28- Frankl S , Shiere F, Fogels H. Should the parent remain with the child in the dental operatory?.J Dent Child 1962; 29:150-163.

29- Baumrind D. Child care practices anteceding three patterns of preschool behavior. Genetic Psycho Monographs 1967 75; 1: 43-88.

30- Maccoby EE , Martin JA. *Socialization in the context of the family: Parent child interaction*. In PH Mussen & EM Hetherington. *Handbook of child psychology: Vol. 4. Socialization, personality, and social development*. 4th Ed. New York: Wiley. 1983. p. 1-10.

31- Klingberg G, Berggren U. Dental problem behaviors in children of parents with severe dental fear. Swed Dent J 1992;16:27-32, 39.

32- Baier K, Milgrom P, Russell S, Manel L, Yoshida T. Children's fear and behavior in private pediatric dentistry practices. Ped Dent 2004; 26:316-21.

33- Pinkham JR. An analysis of the phenomenon of increased parental participation during the child's dental experience. J. Dent Child 1991;58:458-63.

34-Venham LL, Murray P, Kremer EG. Personality Factors affecting the preschool child's response to dental stress. J Dent Res 1979; 58:2046-2051.

35- Râducanu AM et al. Assessment of the prevalence of dental fear and its causes among children and adolescents attending a department of pediatric dentistry in bucharest. OHDMBSC 2009; 8:42-49.

36- Sawtel R.O, Simon, JF, Simonsson RJ. The effect of five preparatory methods upon child behavior during the first dental visit. J Dent Child 1974; 41:37-45.

37-Fields H, Pinkham JR. Videotape Modeling of the Child Dental Patient. JADA 1976; 55:958-963.

38-Peretz B, Gluck G. Magic trick: a behavioural strategy for the management of strong-willed children. Int J of Ped Dent 2005; 15: 429-436.

39- American Academy of Pediatric Dentistry. Guidelines on informed consent. 2011 accessed at:
http://www.aapd.org/media/policies.asp

40- Addelston H. Child patient training. Fortnightly Review of the Chicago Dental Society 1959; 38.

41- Pinkham JR, Casamassimo PS, McTigue DJ. *Pediatric Dentistry: Infancy Through Adolescence*. 4th Ed. Saunders Co: Elsevier; 2005.

42- American Academy of Pediatric Dentistry. Guidelines on the Role of Dental Prophylaxis in Pediatric Dentistry. 2011 accessed at: http://www.aapd.org/media/policies.asp

43- McDonald RE, Avery DR, Dean JA. *Dentistry for the child and adolescent.* 8th Ed. Mosby Inc.; 2004.

44- Thorndike RL, Hagen E, Sattler J. *Stanford-Binet Intelligence Scale- Guide for Administration and Scoring:* 4th Ed. Chicago: Revised Publishing Co; 1986.

45- Kamel ML. *Stanford-Binet Intelligence Scale- Guide for Administration and Scoring: Fourth Edition.* 2nd Ed. Cairo: Dar Al Nahdah Al Arabia; 1998.

46- Frankl SN, Shiere FR, and Fogels HR. Should the parent remain with the child in the dental operatory? J Dent Child 1962; 29:150-163.

47- Kamel ML. *Stanford-Binet Intelligence Scale- Record Booklet: Fourth Edition.* 2nd Ed. Cairo: Dar Al Nahdah Al Arabia; 1998.

48- Kamel ML. *Stanford-Binet Intelligence Scale- Standardized tables: Fourth Edition.* 2nd Ed. Cairo: Dar Al Nahdah Al Arabia; 1998

ESTIMATED COST: 5000 Pounds.

ESTIMATED TIME: 12 Months.

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ARABIC SUMMARY

الملخص العربى

ألملخص العربي

ما زال تاثير ذكاء الاطفال علي مدي خوف الاطفال وكذلك علي سلوكهم في عيادة طب الاسنان من الامور المشكوك في مدي صحتها خاصة مع مستويات مختلفة من الذكاء عند الاطفال.

اجريت هذة الدراسه من اجل قياس تأثير مستوي الذكاء عند اطفال ما قبل المدرسة علي مدي الخوف عندهم وكذلك علي سلوكهم العام في عيادة طب الاسنان. بالاضافة الي ذلك هذة الدراسة اجريت من اجل تقييم تاثير التقنيه المعدلة الجديدة المسماه تقنية وجود الوالدين الايجابية/ السلبية علي سلوك اطفال ماقبل المدرسة عند مستويات مختلفة من الذكاء.

ثلاثمائة طفل تطوعوا من العيادات الخارجية الخاصة بقسم طب اسنان الاطفال بكلية طب الاسنان. اعمارهم كانت تتراوح من ٣-٦ سنه. تم عرض وفحص الاطفال وتقييمهم مدي اهليتهم للدخول في هذة الدراسة. في الزيارة الاولي ١٧٠ طفل تم قياس مستوي الذكاء الخاص بهم باستعمال مقياس ستانفورد بانيه النسخه الرابعه- المترجمه للعربيه ، في غرف مغلقة و هادئه. عشرون طفل تم استبعادهم لانهم كانوا اقل من المستوي الاضافي للذكاء بالاضافه الي انهم كانوا خارج العدد المطلوب للدراسه.

مائة وخمسون طفل ادرجوا في تجربه سريرية عشوائية بنسبة توزيع ١:١ مبينة علي تحاليل تقدير حجم العينه من اجل مطابقة اهداف الدراسه الحالية. تم تقسيم الاطفال بناءا على مستويات الذكاء الخاصة بهم الي ذكاء مرتفع وذكاء متوسط و ذكاء منخفض، كل مجموعة منها تحتوي علي ٥٠ طفل. مجموعة الاطفال المرتفعة الذكاء تحتوي علي التقديرات الي تبدأ من (١١٠- فمافوق). تقديرات مجموعة الاطفال ذوي الذكاء المتوسط تبدأ من (٩٠-١٠٩) بينما تقديرات الطفال ذوي الذكاء المنخفض تبدا من (٧٠- ٨٩) وهي تعتبر ضمن مستوي الذكاء الطبيعي للاطفال . في كل مجموعة ، تم توزيع الاطفال عشوائيا بالتساوي الي مجموعة دراسة ومجموعة ضابطة كل مجموعة فرعيه تحتوي علي ٢٥ طفل. التوزيع العشوائي بالنسبة للمجموعات تم باستعمال برنامج كومبيوتر للتوليد العشوائي من اجل انتاج التسلسل المطلوب لتوزيع الاطفال علي كلا من مجموعة الدراسه والمجموعة الضابطه.

في الزيارة الثانيه ، تم قياس مدي الخوف عند الاطفال في كل مجموعة باستخدام مقياس الصورة الوجهيه واتبع بعد ذلك بتطبيق التدابير الوقائية (تعليمات نظافة الفم، ختام الشقوق، معجون الوقاية، تطبيق الفلورايد الموضعي) مع توحيد الوقت والتعليمات. خلال تطبيق التدابير

الوقائية في كل مجموعه ٢٥ طفل تم التعامل معاهم باستخدام تقنيه اخبر اظهرافعل مع تقنيه وجود الوالدين الايجابية في مجموعة الدراسه. الخمسه وعشرون طفل الاخرون تم التعامل معهم كذلك بطريقة اخبر اظهر افعل مع تقنية وجود الوالدين السلبيه في المجموعة الضابطه.

في تقنية وجود الوالدين الايجابيه يسمح للوالدين بالتواجد بجانب اطفالهم مع امكانية الاتصال الغير اللفظي (نظرات العيون و مسك يد الطفل) بينما مع تقنية وجود الوالدين السلبيه يسمح بتواجد الوالدين بصمت خلف الطفل ولا يسمح باي اتصال لفظي او غير لفظي. كل الاجراءات تم شرحها للطفل خطوة خطوة باستعمال تقنية اخبر - اظهر - افعل. بعد ان تم تطبيق التدابير الوقائية للاطفال ، تم تقييم السلوك العام للاطفال باستعمال مقياس تصنيف السلوك لفرانكل.

تم معايرة/ فحص مستوي توافق الباحث مع المقاييس المستخدمة في الرساله قبل ان تبدأ الدراسه باستعمال اختبار موثوقية ما بين الباحث ونفسة بالنسبة لمقياس الصورة الوجهيه وكذلك مقياس تصنيف السلوك لفرانكل. قبل ان تبدا الدراسه تم الخصول علي موافقة لجنة اخلاقيات البحث العلمي في كلية طب الاسنان ، جامعة الاسكندرية. كل اجراءات البحث تم شرحها للوالدين وتم الحصول علي الموافقة المستنيرة منهم كتابيا. اخلاقيا ، اي طفل يعاني من تسوس الاسنان من متطوعين الرساله تم ترتيب موعد اخر له من اجل العلاج وكذلك مراجعة تعليمات صحة الفم.

تم تجميع البيانات وجدولتها وعرضها علي الاحصائي حيث تم حجب حاله ومجموعة الاطفال عن الاحصائي وبعدها تم تحليل هذة النتائج احصائيا. اظهرت النتائج وجود فوارق ذات دلاله احصائية مهمه بين مستوي ذكاء الاطفال ومدي الخوف لديهم. وعلية فقد اثبت ان الطفل الاكثر خوفا يمتلك مستوي ذكاءا اقل. كان هناك ايضا علاقة ذات دلاله احصائية مهمه بين مستوي ذكاء الاطفال وسلوكهم العام في عيادة طب الاسنان مما يعني ان الطفل ذو الذكاء المرتفع او المتوسط يمتلك سلوكا اكثر ايجابيه في عيادة طب الاسنان. بالاضافة الي ذلك اظهرت تقنية وجود الوالدين الايجابيه تأثير ايجابي علي السلوك العام للطفال في مستويات ذكاء مختلفة.

كان للعمر تاثير ذو دلاله احصائيه علي السلوك العام علي الطفل، وعليه فان توقع السلوك السلبي للاطفال يكون مع الاطفال الاصغر عمرا. من ناحية اخرى لم يكن للجنس اي تأثير ذو دلاله احصائيه علي سلوك الاطفال العام.

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تاثير مستوي الذكاء علي مدى الخوف عند اطفال ما قبل المدرسة وعلي سلوكهم في عيادة طب الاسنان باستخدام اسلوب وجود الوالدين الايجابية/السلبية

رسالة مقدمة

لقسم طب اسنان الاطفال والصحه العامه للاسنان - كلية طب الاسنان - جامعة الإسكندرية
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الدكتوراة
في
طب اسنان الاطفال

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مدرس مساعد بكلية طب الاسنان – جامعة اب – الجمهورية اليمنية

٢٠١٤