Early Executive Function of Preschoolers: Role of Maternal, Paternal and Teachers' Mental State Talk and Quality of Parenting

BY

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Quaid-i-Azam University, Islamabad

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EARLY EXECUTIVE FUNCTION OF PRESCHOOLERS: ROLE OF MATERNAL, PATERNAL AND TEACHERS MENTAL STATE TALK AND QUALITY OF PARENTING

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Prof. Dr. Rubina Hanif

Supervisor

Dedicated

To

My Zaina, the Shining Star in My Life,

Ami & Abu, Whatever I am today,

is all because of you.

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Acknowledgment

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ABSTRACT

There are limited numbers of research on executive function of preschoolers in a non-western context such as Pakistan. Therefore, the present study attempted to determine the role of early relational experiences of maternal, paternal and teacher mental state talk and the quality of parenting on the developing executive functioning skills. The present research primarily comprised of two studies. Study I comprised on finalization and try out of the study instruments through three successive phases. In phase I, verbal instructions of the Executive Function Touch Battery (Willoughby et al., 2012) to measure the executive function of the preschoolers was translated into Urdu Language. In Phase II, Indigenous picture story books (Nayar, 2010, 2017; Nazar, 2010) were selected and modified for the assessment of maternal paternal and teacher mental state talk (cognition, emotion, desire). In phase III, two independent tryouts were carried out, *first,* the tryout of the executive function touch battery was carried out at schools with the preschoolers (*N*=30). Besides, their parents (*N*=30) were contacted for the assessment of quality of parenting using two subscales of HOME inventory (Caldwell & Bradley, 1984). *Second,* the tryout of modified wordless picture story books was carried out with the teacher-preschooler dyads (*N*= 10) at the school; and father-child, mother-child dyads (*N*=10+10) at home settings. The results indicate good psychometrics, demonstrating that the preschoolers understood the translated instructions and these can be applicable to a wider sample. Further, the story narrative session showed effectiveness of story books and variation in maternal, paternal, and teacher mental state talk.

Study II, the main study determined the feasibility, dimensionality, and validity of each task of the Executive Function Touch Battery using modern testing theory i.e., Item Response Theory (IRT). The sample of the main study was drawn in two phases, the executive function of the preschoolers (*N*=120; *Girls* =57, *Boys* = 63) and their teachers' (*N* = 67) mental state talk in story narration session was assessed in school setting from 23 public and private schools. Home visits were made to assess the quality of parenting and maternal and paternal mental state talk during two independent mother-child and father-child story narration sessions. The rating on quality of task supported the feasibility and performance matrices of the direct

assessment of the preschoolers. Moreover, the results demonstrated the unidimensionality of the EF touch battery. Further, Test Information Curves in IRT showed the item characteristics of each item on all the tasks of the battery, and shows how the reliability varies as a function on level of ability of the preschoolers. Besides, it graphically presented the efficiency and precision of executive function touch battery over the range of latent ability of the preschoolers. Noteworthy, the Differential Item Functioning presented that overall tasks of the executive function touch battery exhibited no measurement invariance i.e., battery works equivalent for preschoolers living in low and middle household income. The present research extends the past findings by comparing the three significant contributors of maternal, paternal and teachers' mental state talk with the preschoolers. The Cohen Kappa values for the three talks were found to be substantial. The research revealed that father, mother and teacher not only differ in terms of content of mental state talk (cognition, emotion, desire) but also in frequency with which they employ mental state terms. Pakistani mother converse more frequently than teacher and father but there found no parental difference when accounting for proportion of mental state talk employed by father and mother of the preschoolers. However, contrary to the expectations the teachers were found to employ less mental state talk than father and mothers. Moreover, the mother employs more emotional terms, whilst teachers and father employ more cognitive terms while interacting with the preschoolers. One of the key findings of the present research indicated that along with the covariates of preschooler age, and mother education; the maternal, paternal mental state talk and quality of parenting contributed to the executive function skills of the preschooler. Moreover, the quality of parenting moderates the relationship between mother's mental state talk and preschoolers' executive functioning. The teacher mental state talk and years of experience contributed to executive function but their contribution in the presence of maternal and paternal input may not be significant. Additionally, the results showed that girls outperformed the boys on executive function tasks, older preschoolers performed better on the executive function tasks; and the preschoolers from low household income performed poorly as compared to preschoolers from better income household. Also, father and mother with more educational qualification and better monthly household income employed more mental state talk with their

children, and they talk more frequently with the girls as compared to boys. Besides, in Pakistan, most of the father and mother are involved in storytelling practice with or without books than assumed. The present research concurs with the need to study the contribution of familial factors to assess their children's executive function. The theoretical and practical implications of the research findings for language and parenting input on child's executive function are discussed.

INTRODUCTION

Chapter I

Introduction

Preschool years are a time of remarkable physical, emotional, social, and cognitive development. The preschoolers enter the world with a restricted variety of skills and abilities. They develop new motor, social, cognitive, and language skills, which is a source of wonder for parents and caregivers. Across this period, such growth and change happen at a rapid pace, they also make tremendous leaps in how they process, store, and use information, and during this phase preschoolers' development is greatly influenced by their parents (Maccoby, 2000). This parent-child relationship in the early years effects the later social, cognitive, and social-emotional development of the child (LeRoy, Mahoney, Pargament, & DeMaris, 2013).

During the preschool period, through interaction with the environment, important changes in child self-sufficiency, autonomy, and development of other skills take place (Howes & Lee, 2006). Parents exert enormous influence over children in the preschool years to achieve critical goals like the development of complex independent problem-solving skills that are essential to guide the child's learning (Dahlquist et al., 2015). These skills may include the child independently chalking out a plan to reach a goal, showing flexibility to adapt if the goal is not achieved, constraining inappropriate behavior, and planning for problem solving situations, such skills are referred to as *Executive Functions* (EF) by cognitive psychologist. Executive function plays a central role in the development of a child's cognitive skills and refers to higher-order cognitive processes, which are linked to the

prefrontal cortex that helps to achieve goal-directed behavior (Carlson, Zelazo, & Faja, 2013).

EF is a set of mental processes that are needed when a person has to pay attention or concentrate, when working mindlessly and depending on intuition or instinct is not suggestible (Burgess & Simons, 2005) . It manages goal directed behavior that entails holding programs, ideas, and information online until they are executed, preparing a series of actions, and constraining irrelevant and unrelated actions (Pennington & Ozonoff, 1996). The dominance of the parent-child interaction in young children's lives suggests that, on executive function skills, the family is the significant most sources of environmental influence (Sameroff, 2010); which suggest that interpersonal interaction with the parents and significant others may facilitate child's attention to how to deal with the goal-directed behavior, consequently learned or internalized by the child (Moriguchi, 2014).

Recent literature (as cited in Ackerman & Friedman-Krauss, 2017) has shown great emphasis on the family processes on the development of the executive function of preschoolers. However, the importance of social agents and early family relations in the development of preschoolers' executive function did not translate in research in non-western countries like Pakistan, with few exceptions (Obradović et al., 2019; Tarullo et al., 2017). Due to social, political, and religious factors, familial factors like parenting practices, language input, monthly income household, etc. differ in non-western cultures. The present study addressed this issue, and endeavored to fill the gap by assessing the contribution of social agents e.g., not only mothers but bridging the research gap by including factors related to fathers and teachers that influence the

executive function of preschoolers in Pakistan, following the importance of their contribution suggested by some recent literature (Baptista et al., 2017).

Executive Function

In past, Executive Function (EF) as a construct, has not been defined properly, according to Zelazo, Carter, Reznick, and Frye (1997), it often used to include a diverse and wide range of processes, related to self-regulation, covered sustained attention to planning an action. However, over the years, research on EF and its development during the early years of life has led to more focused and comprehensive definitions. Researchers in general, describe the construct of executive function as a set of specific attention regulation skills that are required in goal directed actions. It is complex and interrelated set of high level cognitive processes, which underlie the ability to anticipate and start actions; hold information in mind for a short period of time; override or inhibit behaviors, emotions, or, thoughts. It involves the tendency to utilize working memory, control overrides inappropriate behavior, and adapt to new situations quickly (Zelazo, Blair, & Willoughby, 2016). These skills comprise working memory, cognitive flexibility, and inhibitory control (Carlson et al., 2013; Hughes, 2011; Meuwissen & Zelazo, 2014).

Executive function develops from childhood through adolescence (Barkley, 2012). Substantial literature stated that rapid development of EF skills are in the preschool period and during adolescence it reaches adult level performance. EF is among the last cognitive abilities to mature and it shows prolonged development throughout childhood (Anderson, 2002). Furthermore, research (e.g. Diamond, 2013; Moriguchi & Hiraki, 2009) demonstrated that, the growth of EF skills is associated

with maturation of the prefrontal cortex, which is not fully developed until the late adolescence period. According to Miyake et al. (2000), the EF skills may refer as neurocognitive skills as they rely on the neural circuits present not only in the prefrontal cortex but the area of the human brain. The EF skills are considered to be ways of accomplishing a goal by intentionally controlling attention; moreover, with the help of these skills, attention can be specified, shifted, or maintained over a period of time.

According to Cicerone et al. (2000), executive functioning is integrated cognitive processes that regulate meaningful and goal-directed behavior which are superordinate in the organized execution of daily life tasks. These tasks comprise the capability to articulate goals, to take initiative, to predict the outcome of actions, to make strategies and organize actions in accordance with the logical, topical, spatial, or temporal orders and to assess and adapt the behavior according to the context and task under consideration. Whereas, Goldstein and Naglieri (2014) explained EF skills which allow people to perceive stimuli present in his or her surrounding, respond to the stimuli in an adaptive manner, alter the direction in a flexible manner, predict future goals, keeping in mind the consequences, and respond to it in a cohesively.

Many definitions of EF and its components exist but usually depending upon the specific area of the study, terminology varies. There are multiple issues identified by Miyake et al. (2000) when reviewing the literature of EF. First, different models of EF present various concepts that may overlap. Secondly, in literature researcher may utilize the same terms to indicate a function that is conceptually different, as well as, use different terms that perform the same function and finally, there exist

disagreement among different researchers whether to consider the construct of executive function as unitary or non-unitary, that is a single construct with various interrelated sub-processes or just a group of independent processes.

The literature on EF during early childhood stems from a body of neuropsychological and cognitive research that seeks to understand how information in the brain is processed. In past, it was assumed, intelligence as a single factor that explained individual differences in mental performance (Spearman, 1927). Nonetheless, in recent years, researchers have argued that certain cognitive processes that are not tied to a single factor of intelligence and may facilitate or hamper individual learning processes. For instance, the concept of fluid intelligence, suggests that there are skills (e.g., attention shifting or inhibition control) that help an individual to organize his world and may assist in learning new information. On the other hand, crystallized intelligence, that involves knowledge that is acquired from prior learning experiences (Kane & Engle, 2003). the skills that fall under the category of fluid intelligence are not bound to a specific situation or domain specific, instead, they work across various learning situations, particularly situations when one way of problem solving isn't working and adapting to task in hand is required (Blair, 2002).

Furthermore, multiple researchers (e.g. Jurado & Rosselli, 2007; Lucassen et al., 2015; Moriguchi, 2014) argued that there is an agreement that adult research on executive function has revealed that executive function is not unitary construct. There exist sub-components or domains e.g., updating, shifting, working memory, inhabitation. According to Toplak, West, and Stanovich (2013), in literature, the most

common domains of executive function are working memory (updating), inhibition control (conscious effort to override the dominant response) and attention shifting also known as cognitive flexibility.

On the other hand, various literature on early executive function of the children suggests that in the finest way executive function may be considered as a single factor (Fuhs & Day, 2011), on the other hand, other researches may define executive function as distinct and discrete factors (van der Sluis, de Jong, & van der Leij, 2007; van der Ven, Kroesbergen, Boom, & Leseman, 2013). Keeping in view these point of view, the research of Jurado and Rosselli (2007) gave a reconciling finding and suggest that executive function may start to develop as a unitary factor in the early years of children's life and it starts to evolve as a separable, distinct control process late in life.

Components of EF

When defining EF, there is overlap in the way components of EF are defined and operationalized. Harvey (2011) argued that many researchers (e.g. Hughes, 1998; Miyake et al., 2000; Pennington et al., 1997) have used path models and confirmatory factor analysis to define the components of EF.

One theory of EF addresses its related skills or areas into three categories (see figure 1), these are *inhibitory control* which involves the ability to inhibit dominant attentional or behavioral responses that are not required to the task in hand, *cognitive flexibility* also known as set shifting, and *working memory* that involves the process of holding information in mind and use this information for a short period of time.

Researchers generally agree that there are three core domains of EF (as cited in Diamond, 2013).

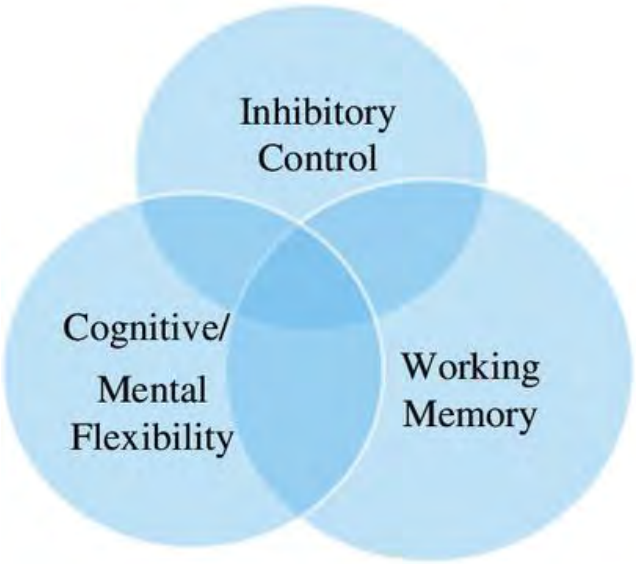

Figure 1. Three category model of executive function

Working memory (WM). One of the core components of EF is working memory (WM), which involves holding information in mind and working with the information, in another word working with the information that is not present perceptually (as cited in Diamond, 2013). Generally, WM is the tendency to retain and manipulate information for short period of time without depending upon external cues (Huizinga, Dolan, & Van der Molen, 2006). Recent research trends such as neuroimaging suggest that WM differs by how much the task underhand elicit prefrontal cortex activity, furthermore, it also varies in the degree to which executive control is required (Luciana, Conklin, Hooper, & Yarger, 2005). These findings suggest that more complex WM task requires more effort to hold and manipulate the information e.g., backward digital span, requires more executive control and

accordingly more prefrontal cortex activity, than forward digit span, which only requires holding on to information.

There are two types of working memory, that are differentiated by the content; the verbal WM and the non-verbal WM often known as visual WM. Over the period, the WM is important for understanding what is happening at the moment, which requires holding information in memory, utilizing the information and relating it to what comes later. It facilitates in translating the information in the surrounding into actions; updating i.e., incorporating new fragments of information into a plan of action, looking for substituting and relating information, and to make connection among ideas (Diamond, 2013).

WM is distinct from the construct of short-term memory, which just holds information in mind as compared to WM which not only holds information in mind but also manipulates the information. According to Alloway, Gathercole, Willis, and Adams (2004), working memory and short term memory group onto distinct domainson factor analyses conducted on young children, adolescents, and adults, also they are linked to distinct neural subsystems.

Several studies (e.g. Gathercole, Pickering, Ambridge, & Wearing, 2004) reported improvement in WM during early years of life; reported that at the age of 6, during the complex task, WM as the component of executive function is adequately developed that needed coordination of subcomponent of WM.

Inhibitory control (IC). Inhibition control is considered as one of the foundation components of executive function (Miyake et al., 2000); as the name implies it encompasses the ability of an individual to control his or her attention,

thoughts, emotions, and behavior to override strong internal inclinations and external temptation and rather do what is the demand of the situation and suitable. In the absence of inhibitory control, an individual would be inclined to inner impulses, the habitual thinking processes, and the external tempting stimuli present in the surrounding. Hence IC enables us to decide and alter our behavior pattern to achieve a goal directed behavior and to refrain from external lures and temptations. IC requires exercise and practice as it's hard to achieve in early childhood (Diamond, 2013).

Although, IC is considered as one of the core EF component, however, research (Simpson & Riggs, 2005) has pointed out that most of the IC tasks that measure inhibition are not a true form of measuring task. Additionally, they do not fall into a single or an independent measure of IC (Nigg, 2001). In the same line, Garon, Bryson, and Smith (2008) tried to assess that for the completion of IC task whether working memory is required or not, the researcher distinguished IC task from simple to complex, they found out that only simple response inhibition needs a nominal amount of working memory, which is considered as purest kinds of IC (Cragg & Nation, 2008); these findings suggest the working memory is essential during early years of life, complex responses of IC requires considerable more working memory than simple tasks. According to Best and Miller (2010) during preschool years the child starts to attain the process of inhibitory control. By the age of 4, on both the pure response inhibition and complex inhibition tasks, the preschooler started to display the sign of successful sign of performance.

There are multiple types or interference of IC, one of them is the, control at the level of an individual's perception that is the inhibitory control of attention,

which allow us to give selective attention to the stimuli and to choose to overriding the attention to other stimuli that are not is not required for the goal directed behavior. Sometimes, the properties of the stimuli itself drive our attention, we are exposed to visual motion or stimuli with loud attributes such as noise or attractive colors, which involuntary grabs our attention, these stimuli driven attention is called exogenous or bottom up attention (Posner & DiGirolamo, 1998). On the other hand, we can voluntarily pay attention to a particular stimuli and avoid other depending upon the goal directed behavior, this voluntary or selective attention is called as endogenous or the top-down attention (Theeuwes, 2010). Similarly, another aspect of the IC is controlling the mental or cognitive processes. This may include resisting undesirable thoughts and memories; it also includes intentional forgetting (Anderson & Levy, 2009) ; controlling the proactive interference from the earlier attained information as well as, from the later attained information controlling the retroactive interference (Postle, Brush, & Nick, 2004).

Cognitive flexibility. The third core component of executive function is cognitive flexibility, which builds on working memory and inhibition control, also develops much later than the other two components (Davidson, Amso, Anderson, & Diamond, 2006). According to Best and Miller (2010), there seems to be extensive requirement for working memory and inhibition control for effective working of cognitive flexibility. In reaction to demand of endogenous and exogenous tasks, it is the ability to modify the attention, working memory and response selection (Deák & Wiseheart, 2015). To continuous changing surrounding, it is considered as the ability that help us to adapt flexibly (Cools, 2015).

One of the features of cognitive flexibility is to alter perspective spatially as well interpersonally. However, it is very important to inhibit the perspective we already have and sent the information to working memory to activate a different or a new perspective; suggesting the core of cognitive flexibility need and develop on the core of working memory and inhibition control. Moreover, it involves thinking out of the box, if one way of attaining a goal is not working, do we have the ability to conceive another way of reaching a goal (Diamond, 2013).

Multiple research and paradigms (Zelazo & Frye, 1998) advocate the idea that cognitive flexibility progress substantially from the age of 3 to 6 years. Moreover, if it progresses equally on multiple tasks, it suggests generalizing cognitive ability, which is known as the executive control process that functions over a variety of tasks and context.

Assessment of EF

According to (Shallice, 1990) in a complex or novel situation an individual's EF skills are activated as it requires the formulation of strategies and plans to work effectively, on the other hand, simple tasks are performed based on intuition and instincts, without stimulation of EF skills. Following this proposition, researches (Alexander & Stuss, 2000; Walsh, 1978), state that the assessment tools need to integrate information, should be novel and complex. Nevertheless, it is not easy to achieve complexity and novelty as definition of novelty and difficulty may vary, for one person task may be simple but complex for another. Furthermore, researcher (Alexander & Stuss, 2000; Della Sala as cited in Anderson, 2002) claim that to some degree all cognitive test have EF.

During the past recent years, there has been development in the assessment procedures related to measurement of EF in early childhood. The main areas of improvement over the year of time includes the tasks that are child friendly; development of computer based task; issues addressing the ecological validity; modern statistical analyses; focus on assessment procedures that includes neurophysiological and neuropsychological measures (Hughes, 2011).

One of the factors, in scarcity of research on developmental EF, specifically in Pakistan, was developmentally feasible and appropriate tool for the measurement of EF. According to Hughes and Graham (2002), availability of researches on early EF, utilizing simpler and child friendly measures, addressed many of the issues related to measurement of EF. One of the developments in the assessment of EF research in early years is the computerized measures for the assessment of measurement of EF skills. Researchers are increasingly utilizing computer based test in their practices, this could be explained by advantages that include standardized administration, automated scoring and reaction time, precision and accuracy, portability, collection of data from larger trials trails (De Marco & Broshek, 2016; Plourde, Hrabok, Sherman, & Brooks, 2018). There are variety of computerized batteries and test available for the measurement of EF during early years of life, it is recommended to utilize performance based computerized battery, which has ecological validity and is sensitive enough to assess EF in clinical groups as well (Hughes, 2011).

One of the recent advancement in the assessment producers of EF in early years of life is the rigorous statistical analyses, which utilize modern testing techniques. Such as Confirmatory Factor Analysis; instead of utilizing Classical Test

Theory (CCT), the modern testing theory which includes the Item Response Theory (IRT) is preferred e.g. Willoughby, Blair, Wirth, and Greenberg (2010) used IRT. The advantage of using IRT is that it allows the researcher to assess item parameters e.g., item discrimination, item difficulty by analyzing Item characteristic curves. Furthermore, it allows assessing the item differential functioning across subgroups of population. The present study also followed the modern test theory. Furthermore, in past age related progression in performance of EF during preschool were often overlooked, recent researches (e.g. Best, Nagamatsu, & Liu-Ambrose, 2014; Willoughby, Wirth, & Blair, 2012), latest analyses addressed this issue by using Latent Growth Models, which shed light on individual differences by which preschooler improve in EF skills.

Considering advancement in assessment procedures of EF skill in preschool years, researchers have also recommended few concerns. Diamond (2013) has stated that there are terms that have similarities with EF or overlaps extensively with components of EF skills. For example self-regulation, it is often misinterpreted with inhibitory control; self-regulation is the process that helps the individual to maintain optimal level of emotional, cognitive and motivational state, it deals with the controls and regulation of individuals' emotions (Liew, 2012), EF skills are related to prefrontal cortex on the other hand self-regulation skills are more related to medial prefrontal cortex. Furthermore, Diamond (2013) argued that name of the tasks, often are misleading, for instance, working memory span task intends to measure EF in general, the name implies that it measure working memory, so not all tasks that assess what the their names indicates in the literature of EF skills.

Another concern while utilizing EF measures for preschoolers that are developed in high income countries is its generalizability and utilization in Low Middle Income Countries (LMIC). Recently (Semrud-Clikeman et al., 2017; Willoughby, Piper, Kwayumba, & McCune, 2019) addressed the issue, suggesting that EF skills are domain-general construct, the assessment tools that were constructed in high income countries are feasible to be used in LMIC. Furthermore, recent studies in LMIC e.g., Pakistan (Obradović et al., 2019; Tarullo et al., 2017), and other countries (Chasiotis, Kiessling, Hofer, & Campos, 2006; Willoughby, Piper, Kwayumba, et al., 2019) demonstrated data that support the feasibility of utilizing EF task based batteries in LMIC, that were developed in high income countries. However, the researchers are encouraged to select the assessments procedures that are best fit for research question under study.

Social Development Approach to Executive Function

Despite the literature highlighting the significance of developing EF during early years of life and powerful part of genetics on child EF skills; the influential role of environmental input on the development of child cannot entirely be rejected. Child EF skills are molded by interplay between multiple environmental factors such as father, mother, teachers and child own contributing factors like age (Kochanska, Philibert, & Barry, 2009). Considering the role of several environmental input, research suggests that the role of parents' direction and assistance is one of the major contributing experience in child early EF skills (Landry & Smith, 2010).

The research on the parental dynamics that contributes to executive function in early years and brings in individual differences remains scare, however a good deal of

literature has highlighted the contribution of distal proxies such as parental years of education, family income or socioeconomic conditions (Ardila, Rosselli, Matute, & Guajardo, 2005; Rochette & Bernier, 2014). At close proximity, parent-child relationship constitute the most enduring and powerful relation in early childhood. Recent studies have noticed the importance of early relations in understanding the differences in executive functioning; and further recommend that for the development of these skills the early caregiver relationship offer prospects and support (Bernier, Carlson, Deschênes, & Matte-Gagné, 2012; Carlson, 2009; Lucassen et al., 2015).

Lev Vygotsky's sociocultural theory provides a theoretical framework for the present study. He placed substantial emphasis on the contribution of social factors to cognitive development, suggesting that EF skills develop in the context of child social interactions (Luria, 1961; Vygotsky, 1980), which present the children with cultural tools, which include spoken words and language of the caregivers; these regulatory speech parents/ caregivers and spoken words are the mental tools for the child, which facilitate the children's memory and attention skills. During interpersonal interaction, these mental tools are internalized by the child, and help them to manipulate and regulate his/her own thoughts and actions, allowing them to progress from external to internal form of self-regulation (Baptista et al., 2017).

Taking direction from Vygotksy's approach that words by significant others specifically the mental state references such as desire, thoughts and emotions used by the parents are key factors of the speech, which is significant for the development of child EF skills during early years of life. In every day interaction, parents expose the child with these mental state words, consequently the children get the prospect to

acquire these terms and to show their feelings, desires and need, accordingly, helps the child in attaining the goal directed behavior in a novel or complex situation (Baptista et al., 2017; Hughes, 2011; Vallotton & Ayoub, 2011).

Consistent with this theoretical framework, Carlson (2003) also mentioned three important parental interactive behavior that is likely to play facilitative role in the development of executive functioning skills of the child: parental scaffolding, sensitivity and the verbal dimension, that pertain to the ability to employ mental state terms during the interaction with the child. For the development of child executive function skills the contribution of language input from the significant other, mostly the adult is likely to be of great importance. The caregivers of the child expose their children with discourse to mediate their children actions, behavior and problem solving through the use of words, in the form of rules or they verbalize the logic as a fragment of inductive discipline, and loudly thinking to the problems their children face.

Similarly, (Hammond, Müller, Carpendale, Bibok, & Liebermann-Finestone, 2012) stated that at early age parental scaffolding was found to have a positive relationship for the development of children's executive function. Research evidence showed that punishing as well as supportive environment can influence the executive function, however, research suggest that other than these influences there are various familial and demographic variables that can effect the child developing executive function (Rhoades, Greenberg, Lanza, & Blair, 2011). In general, parents and other significant others provide scaffolding, or task based assistance, that helps the child to achieve a goal, what the child may not achieve alone.

Concluding with reference to the (Vygotsky, 1980) and Carlson (2003) work, the verbal language of the significant others specifically parents provide mental tools for the preschooler to regulate their behavior, While father and mothers are central to providing these opportunities, other caregivers such as teachers also provide children with mental words that help in contributing EF skills of the preschooler. Furthermore, the quality of parenting that creates a punitive environment for the preschooler also contributes to the development of child EF skills. This gives direction to assess the role of mental state language of father, mother and teacher and the quality of parenting in development of EF skills of the preschoolers for the present study.

Mental State Talk (MST)

Mental state language or mental state talk comprise of the words that represent the individuals' mental world (Jenkins, Turrell, Kogushi, Lollis, & Ross, 2003; Ruffman, Slade, & Crowe, 2002). This include the vocabulary that represents the content of one's mind or their cognitive processes (Barnes & Dickinson, 2018). These words includes emotions, desires, thoughts. Understating MST facilitate the children analyze the motives and objectives of others as well as their own motives and goals (Bretherton & Beeghly, 1982).

According to Shatz, Wellman, and Silber (1983), these are the terms refer to abstract, invisible referents like beliefs, desires, and intentions. Moreover, MST are the terms used by people to attribute cognitive terms e.g., knowing; perceptual terms e.g., look, see ; physiological for instance being hungry; willing terms e.g., desire; emotional terms e.g., anger; moral terms e.g., judge, and socio-relational words e.g., helping state to others (Symons, 2004).

According to Perkins (2011), mental states are unobservable; children in early years of lives learn the names of the things around them ostensively. For instance, children are shown an object, while the object is already given a name. However, according to definition of mental state, individual's mental states are not observable. Frampton, Perlman, and Jenkins (2009) stated that MST is verbal discourse that reflects the internal states. There are terms that are used to indicate mental state talk, and are usually categorized into cognitive terms such as think, believe, decide; desire terms which includes want and hope ; perception terms that include hear, look and the emotion terms such as happy, angry, sad.

Literature (as cited in Moore, 2007) make distinction between mental and physical attributes, that are associated with psychology and philosophy. Mental states are associated with internal psychological experiences such as emotions, desires, intention, cognitions. People cannot perceive these experiences directly in the exact way, as they perceive the physical body. Moreover, one cannot define mental state in isolation. It needs to be interpreted with reference to individual who experienced the mental states and the context where they are experienced the mental states. Therefore, mental states are defined in terms of intentional relations, where mental states mediates the relation between the object and the subject (Barresi & Moore, 1996). For example: Hafsa *thinks* she has completed her research, Hafsa *wants* to complete her research work, and Hafsa *likes* her research work.

Category of MST. There are three category of MST (Jenkins et al., 2003). Emotion, cognitive and desire terms.

Emotion terms. Emotional terms are the words that a person reflects his direct or indirect feelings towards an individual, object or a situation. These terms contains words such as sad, angry, happy, hurt etc. (Symons, 2004). During the parent child interaction, expression of these terms are of great importance; Jenkins et al. (2003) suggested that expression of terms that reflects emotions like love, happiness or sadness helps the child to express emotional terms. Further, it helps in developing the child's knowledge of emotional situation, i.e., the ability that helps the person to precisely indicate other persons' emotion; helps increasing prosocial actions and decrease physical aggression in children (Garner, Dunsmore, & Southam-Gerrow, 2008). It is very important for children to understand other's emotions in everyday situation, however, these skills are particularly important in classroom settings for children, for the reason that identifying other emotions is considered to facilitate behavioral and social regulation in children, as well as academic success in future (Denham et al., 2012; Garner et al., 2008). Additionally, teacher utilize the emotional mental state terms during classroom interaction with the child, it acts as a mechanism which assist the child to socialize, express and talk about their emotions, consequently the teacher thus create an environment which is emotionally supportive and responsive (King & La Paro, 2015).

Cognition terms. These are the terms that are related to memory, knowledge, belief and various mental events that are linked to mind, cognition, imagination or metacognition. The cognitive state words include understand, forget, remember, think, look, believe, know. Parents and teachers use variety of these words in their daily routine with their children, and researches (e.g. Adrián, Clemente, & Villanueva,

2007; Baptista et al., 2017; Taumoepeau & Ruffman, 2008; Ziv, Smadja, & Aram, 2014) indicated that parents use of these cognitive terms are related to various child related outcome such as emotional understanding, executive function, self-regulation and friendship interactions. Additionally, McElwain, Booth-LaForce, and Wu (2011) stated that mother use of cognitive terms with their children is related to their children use of mental state talk later in life. This suggests that the child's exposure to parents and teacher cognitive mental state terms helps to understand them about others and their own mental state. During the class room interaction, it facilitate in children's as well as teachers' cognitive perspective taking.

Desire terms. The desire mental state terms symbolize meaning of an individual's desire for something; it comprises of terms such as desire, wish, want and prefer. According to (Symons, Fossum, & Collins, 2006) during the play interaction, mother use desire terms with their children which was found to be associated with their children's understanding of theory of mind. The desire terms are of great importance, the parents' and teachers' use of desire terms are studied in early childhood literature, as research (Bartsch & Wellman, 1995) have stated that before the cognitive and emotion terms, the desire words have been reported in children's speech and are most frequent type of terms that are used during early years (until three years). Since, in comparison to other type of mental state terms, the desire terms are understood far earlier in children's life, subsequently potentially help the children understanding other type of mental state terms. During the classroom, teacher use desire terms to promote child-centeredness and facilitate the child in understand that their needs and wants are given attention and understood.

Besides the emotion, cognitive and desire terms, few researchers (Bretherton & Beeghly, 1982), categorize the perception terms as a separate type of talk, which include terms such as to look or see, during early childhood interaction. These researchers create wide ranging coding system which includes 6 categories of mental state terms, which includes physiological, affect, perception, obligation, volition and cognition terms.

Theory of mind. Mental state talk is important for various facet of early child development. One of which is the theory of mind. During the past few years, research has focused on theory of mind (ToM) development (Miller, 2012). It is a socio-cognitive ability to ascribe to understand mental state talk such as cognition, desire and emotion of one's self as well of other people (Devine & Hughes, 2018; Perkins, 2011). The children's age between, three to five, is considered to be important for the development of ToM ability. During this preschool period the child gain this understanding that individual's behavior are the result of their belief, desires and emotions, and that different people have different emotion, desires and emotions (Wellman & Liu, 2004).

ToM is crucial as it permits children during early years to comprehend and predict the behaviors of others around them; as ToM helps in understanding others, for children it plays a facilitative role in adapting to social life (Carr, Slade, Yuill, Sullivan, & Ruffman, 2018). Additionally, it is claimed that during early years of life there are two components related to social interactional experiences, the preschooler interactional experiences and the experiences during the family interaction (Wu, Liu, & Lin, 2021). These findings suggest that the development of ToM during early days

of life support in understanding others' MST; where the role of teachers and parents are very important, in facilitating the ToM and consequently the development of EF of the child.

Measurement of MST. Various methods have been devised for assessment of MST. During the interactive context, parents and teachers discourse regarding their emotions and MST (Misailidi, Papoudi, & Brouzos, 2013; Tompkins, Benigno, Kiger Lee, & Wright, 2018), Mental state language was captured in naturalistic observation for mothers (e.g. Brown, Donelan-McCall, & Dunn, 1996) and both parents (Jenkins et al., 2003; Nawaz, 2015), during pretend play (Kavanaugh, 2005; Nielsen & Dissanayake, 2000), wordless picture books and pictures were employed to study the mental state talk (Baptista et al., 2017; Brownell, Svetlova, Anderson, Nichols, & Drummond, 2013; Doan & Wang, 2010; LaBounty, Wellman, Olson, Lagattuta, & Liu, 2008; Tarullo et al., 2016; Taumoepeau & Ruffman, 2006, 2008; Toor & Hanif, 2020), during free play (Farkas et al., 2018; Laranjo, Bernier, Meins, & Carlson, 2014; Slaughter, Peterson, & Carpenter, 2008), during reminiscing about the past and future (Andrews, Van Bergen, & Wyver, 2020; Lagattuta & Wellman, 2002; Rudek & Haden, 2005; Taumoepeau & Reese, 2013), meal preparation (Ensor & Hughes, 2008). Mental state language can also be measured by requesting the mother to 'describe the child' (e.g. Lok & McMahon, 2006) ; or requesting a friend 'describe your friend (Hughes & Dunn, 1998; Meins, Fernyhough, Johnson, & Lidstone, 2006). Measurement of child's own psychological talk can also be used through free play session with friends (Huges & Dunn, 1998) .

Book Sharing, Mental State Talk and Cognitive Development

One of the contexts that facilitate interaction between children and their parents is the common practice of book reading. Numerous research utilized wordless picture books for the assessment of MST (Ruffman et al., 2002; Tompkins, 2015). Wordless book has been defined by Dowhower (1997) as "books that tell a story through a series of illustrations without written text." Picture books, without text may also provide information that is of great importance, it may be biographical, general knowledge or historical or other genres. According to Salisbury and Styles (2012) the word less picture story books do not have words that usually represent textual structure which are supposed to encode the meaning. Nevertheless, wordless story books are meaningful enough and present the art of visual storytelling. Wordless picture books may not portray words or text, but these books are not independent from portraying language as a means of understanding the meanings and the structures. In the same line (Cohn, Jackendoff, Holcomb, & Kuperberg, 2014) suggested that linguistic process are used by the readers to read the order of images to comprehend the meaning.

Picture book reading has been found to generate utterance that are similar that were observed during other contexts, for instance Gelman and Tardif (1998) compared parent-child conversation across toy play time and picture book sharing session, and found that the generic utterances and words were common during the picture book sharing session as compared to toy play.

Considerable numbers of researches have utilized the book sharing activity with their children during early years to assess the parents and teachers' MST and its

effect on ToM development both concurrently and longitudinally (Adrián et al., 2007; Slaughter et al., 2008; Symons, Peterson, Slaughter, Roche, & Doyle, 2005; Wu et al., 2021), story book session with children to assess the maternal and paternal MST its relation to EF in early childhood (Baptista et al., 2017), and to assess maternal MST relates to child MST and emotional understanding (Taumoepeau & Ruffman, 2006, 2008).

Reading book to a child has great importance, according to Coates et al. (2017), during infancy, reading books with a child may play a facilitative role to improve reading skills and vocabulary after preschool years. These research findings were assessed in comparison with quantity of book in the home and shared book reading sessions per week; as well as, quality of book reading practice was also assessed by asking parents whether they converse with their children during book reading routine, related to pictures and emotions and feelings of the characters in the story books; or whether the story books were age appropriate or not. The research findings indicated several positive outcomes later in preschool years.

According to Ziv et al. (as cited in Dowdall et al., 2017), picture books with rich mental state content can be significant tool for stimulating mental state conversation among young children and their parents, further, they cited that intervention research in higher income countries where caregiver have been trained in skills that support book sharing activity, and have found that considerable improvement in their children cognitive abilities.

Story telling is suggested as one of the methods that help in promoting EF of the child. Gallets (2005) randomly assigned preschool and grade 1 students to

storytelling and story reading conditions twice a week, for 12 weeks, and found that children in both conditions improved on different cognitive skills, nevertheless, the children in storytelling condition improved on working memory and other skills. In the same line Diamond (2016) stated that storytelling calls for child ‘s focused attention for longer period of time, and the child utilizes his working memory, to hold in the details of the story, story characters and relate it to new information that will going to be revealed by the story teller. Consequently, suggesting that storytelling practice improve the EF of the child.

Role of Mental State Talk in Executive Functioning

Moore, Mealiea, Garon, and Povinelli (2007) state MST as intentional relations. *Conative* relations comprise of acts of desire or intention such as Hafsa *wants* to complete her research work, these intention or desires are either fulfilled or unfulfilled. *Epistemic* relations are related to one’s cognition such as knowledge, thoughts, belief; for instance Hafsa *thinks* she has completed her research; which may and may not to be true. Lastly, the *affective* or *emotional* relations; e.g., Hafsa *likes* her research work; which may or may not be true or fulfilled.

Social interaction is important for cognitive development, especially for abstract concept (Howley & Howe, 2004). The manner in which parents interact with their child substantially contribute to their cognitive and learning development (Bornstein & Bruner, 2014). One potentially important contributor to cognitive development especially to executive functioning is the parents’ discourse related to mental state terms, other people’s emotion during the interaction with their children.

Parents employ variety of mental state terms during conversation with their children during early childhood; for instance imagine, need, think, happy, know, sad, want (Ensor & Hughes, 2008); subsequently these terms facilitate the development of executive functioning (Baptista et al., 2017).

Most of the daily interaction is dependent on verbal or sign language. Variations of the language environments account for the differences in children's verbal ability (Nawaz, 2015). An appreciable amount of research is conducted so far on the importance of mothers' mental state references for child's social cognition (Taumoepeau & Ruffman, 2008), and child EF, however, there are only few researcher that assessed the role of maternal and paternal mental state language on the development of cognitive function specifically to EF of the child, with the exception of work of Baptista et al. (2017); the pioneer to assess the interaction of both parents independently, to uncover the common and unique contribution of mother's and father's MST on the development of early EF in preschoolers, which is considered to be the critical stage for growth of such abilities (Garon et al., 2008). The work of (Baptista et al., 2017) assessed parenting dimension in terms of maternal and paternal mental state talk, they found that maternal but not father's MST suggested to contribute to preschoolers' overall executive function at second preschooler year. Moreover, considering the component of EF, it showed that maternal mental state language predicted set shifting and no significant contribution was evident for working memory and inhibition control. These findings reflect that maternal MST is favorable for the progression of flexible thinking process as compared to other components of executive function of the child.

Furthermore, the research (Baptista et al., 2017) recommended that parents by giving exposure of different content of MST to children, and shifting from one mental state term to another actually provides opportunity to their children to comprehend words to manipulate their own thinking processes, and facilitates in adjusting to demand of the novel situations. Although research (Garon et al., 2008) suggest that preschooler years as important phase for the development of early executive skills, but these processes have not been yet explored in depth.

The work of LaBounty et al. (2008) is important, paternal and maternal mental state references were investigated during the parent and child picture book session and predicted to influence the development of their children various sociocognitive abilities such as emotional understanding and ToM. Similarly, Bernier et al. (2012); Bernier, Carlson, and Whipple (2010) conducted longitudinal study, assessed various parenting dimensions in 12 and 15 months old children and found that later at 18 and 26 months, along with sensitivity and scaffolding, mother use of MST contributed to EF of the child. And further during the age of three. The research suggested that mother use of MST enhanced the performance of EF between two time points. The researchers argued that among various parenting dimension, the contribution of mothers' MST is meaningful as it provide verbal tool for the children, so they may reflect and mindful of their own behavior (Bernier et al., 2012).

Quality of Parenting

Recently the research begin to assess the child EF that reflect the ecological perspective, which recognize that EF characterize group of processes that develop as the result of multifold system (Fay-Stammbach, Hawes, & Meredith, 2014).

According to ecological models, EF is rooted within biological as well as contextual processes (Zelazo, 2013). Among contextual processes, environmental experiences assumed to have direct impact on development of the brain, where unfavorable environmental experiences are considered to challenge the development of brain on both functional and structural level (De Bellis, 2001; Rutter & O'Connor, 2004), on contrary, positive environmental experiences, within early social interactional context have constructive effect on brain development (Schore, 2001).

An appreciable number of researches have suggested that high quality and positive parenting plays significant contribution in various spheres of Child Development (Rochette & Bernier, 2014); suggesting that quality of parenting is related with cognitive, social emotional outcomes in children (Steinberg, 2001). There are various dimension of parenting associated with individual differences in executive functioning (Landry & Smith, 2010).

Specifically, parental *Cognitive Stimulation* is considered as didactic efforts that parents made to enhance language and cognitive development of their children by involving them in activities using rich language environment that enhance the learning processes (Lugo-Gil & Tamis-LeMonda, 2008). Cognitive stimulation has been considered as facilitative factor that promote cognitive function of the child (Crosnoe et al., 2010). Similarly, Bradley, McKelvey, and Whiteside-Mansell (2011) suggest that cognitive stimulation are the prospects that parents offer during parent child interactions, for instance completing puzzle together, reading a story book, these activities are consider to influence the cognitive abilities of the child. (Clark et al., 2013) suggested that in the home environment, parental use of cognitive stimulation is

related to positive gain in the children's working memory, attention shifting and inhibitory control. However, Blair, Raver, and Berry (2014) argued that stimulation may not be strong predictor for growth of executive function skills in comparison to other parenting dimension such as responsiveness or sensitivity. Parental *Responsiveness* is comprises of parenting behavior that are warm and have positive affect, whereas absence of these behavior may define as hostile and rejecting practices by parents (Bernier et al., 2012).

The parenting dimension are assumed to link to the EF of the children, (Helm et al., 2020) stated attachment theory as the possible theoretical explanation regarding the association between dimension of parenting and EF of the children. Bernier et al. (2012) indicated that secure attachment of the children during early years of life is associated with better performance on the executive function task, as well as, teacher reports fewer early executive function related problem in preschool. In the similar line, recent study (Dowdall et al., 2017) suggested that children from low and middle income countries may face lack of parental cognitive stimulation, continuous aggression, harsh parenting practices in early childhood, consequently are at risk for the problems in their behavioral, social and cognitive development.

Role of Quality of Parenting in Executive Function

Great deal of research has initiated to focus on quality of early environmental and relational experience of a child for the development of executive function abilities. Latest research have argued that the cognitive ability of the children as a product of social interaction they have with the significant others around them, and conceptualized that particular parenting behavior are assumed to assist the child

cognitive functioning (Tucker-Drob & Harden, 2012). The impact of parenting practices on the executive function of the child is fairly new domain under the spotlight of child cognitive development. Hughes & Ensor (as cited in Monn, 2015) referred to it as *'terra incognita,* the unexplored or unknown territory.

The role of environment is of great importance, for the development of child EF. Talwar, Carlson, and Lee (2011) has suggested that children who are raised in non-punitive environment demonstrated better on executive function than children who are raised in punitive home conditions. Likewise, (Hammond et al., 2012) suggested that in early childhood, parental scaffolding plays a contributing role in the child EF development. Similarly, an investigation found that early caregiving as crucial source for the development of self-regulation which is signifies executive function of the child (Kopp, 1982).

The work of Vygotsky (1980) and Luria (1966) has great influence on studies conducted later on the development of children higher order functioning skills within the framework of social interaction. Following their studies (Carlson, 2003, 2009) stated that parental scaffolding is believed to impact the EF of the child by providing support, reassuring perseverance during failure, enhancing self-directed discourse, nurturing confidence by directing to positive output. Similarly, numerous longitudinal studies also established that the parental scaffolding has a predictive role across various domains of executive function; during a parent-child problem solving task, the high scores on EF domains involving working memory, cognitive flexibility were found to be related with maternal autonomy support (Matte-Gagné & Bernier, 2011); parental verbal scaffolding that includes praise and elaboration at the age of 2

predicted child working memory and cognitive flexibility late at the age of 4, while controlling for language and previous score on EF (Hughes & Ensor, 2009); maternal behaviors that sustained redirected attention of the child (Conway & Stifter, 2012); and physical and verbal promoting (Hammond et al., 2012).

A study of early child studies showed that early childhood is crucial period to recognize the influence of parenting of the EF, during this period, the development is influenced by the environmental experiences, further, children are reliant on their caregivers for nurturance, regulation and stimulation (Fay-Stammbach et al., 2014). Moreover, not only the parental practices but also the physical surroundings also play significant role in the child development. Preschoolers, who have rich toys and books at home, intellectually develop well; there is need to investigate the effects of environment on the behavior of a developing child (Van Voorhis, Maier, Epstein, & Lloyd, 2013). In the same line, longitudinal studies have found that the parents who provide stimulating environment, books and educational toys in early childhood of a child, is consider to reflect the positive impression later in life. Additionally they have found that exposure of cognitive stimulation in early years of life (at the age of four), positively influence the growth of parts of brain later in life that is dedicated to cognitive and language development of the child (Avants et al., 2012).

According to Center for developing child, Harvard University, adults can influence the positive development of EF skills of the child by creating and maintaining reliable and supportive relationship, following routines, demonstrating social behaviors. Further it is also significant for the young children to practice their skills by engaging them in actions that promote creative play, impart them skills that

help them handle stress, build social relationship, engage them in vigorous exercise, and with the passage of time, offer prospect to governing their own behavior to achieve a goal directed behavior without adult supervision (Stachel, 2015).

A large body of research has documented association between parental stimulation and early executive function of the children. Clark et al. (2013) assessed Parental stimulation was assessed by HOME Inventory (Home Observation for Measurement of the Environment) (Bradley et al., 2011) and found during longitudinal study that parental stimulation has been linked to predict gradual growth in domains of EF ; inhibitory control and cognitive flexibility while controlling for the prior EF. Similarly, Mezzacappa, Buckner, and Earls (2011) found increased attention control in early childhood; in the same line, Hackman, Gallop, Evans, and Farah (2015) longitudinally found progressive increase in working memory, impulsivity, planning and attention. In addition to this, NICHD Early Child Care Research Network (2005) reanalyzed the old data and mentioned that during early years of life parental sensitivity and cognitive stimulation predicted working memory and attention and later at the age of four and half the parental stimulation partially mediated the unfavorable effect of low socioeconomic for all the components of executive function. In contrast, in cross sectional study (Blankson, O'Brien, Leerkes, Marcovitch, & Calkins, 2011) showed no association of EF of the children and parental stimulation.

Quality of Parenting and Mental State Talk

Research has also demonstrated the relationship between the quality of parenting specifically parental sensitivity are related to father and mother use of

mental state talk. Arnott and Meins (2007); Meins, Fernyhough, Fradley, and Tuckey (2001) indicated that mothers who are sensitive and responsive, who engage their children in warm relationship and have secured attachment with their children employ more mental state talk as compared to mothers who insecurely attach their children. Reynolds et al. (2020) suggest that these mothers may show their ability to recognize their children as cognitively independent. Furthermore, Mcquaid, Bigelow, McLaughlin, and MacLean (2008) also support the reason that mother ‘s acknowledge their children as cognitively self-govern.

Role of Demographic Variables on EF

During the last few decades, the literature on individual differences in preschooler EF has extensively increased (Zelazo, Carlson, & Kesek, 2008), covering age related changes (Buss & Spencer, 2014), the role of brain associated with child EF (Carlson et al., 2013). However, the role of environmental input in the development of EF has emerged recently (Hughes & Ensor, 2009). Family income or socioeconomic status has found to be one of most important antecedents of differences in child EF skills. The notion that SES has crucial role in child development is significant, however, the basic question that arises is how the construct of SES is defined and how it influences the child development specifically EF. The idea of *Capital* works behind it (McLoyd, 1998), which states that the more access that child has to various kinds of capital, such as income, education, parental education etc.; the better the child has environment which facilities the optimal growth and development of EF skills (Yeung, Linver, & Brooks–Gunn, 2002). On the other hand, children having less access to material resources, are exposed to various

environmental, biological or psychological stressors which influence the development of EF of the child (Haft & Hoeft, 2017).

The construct of socioeconomic status is composite of multiple variables, it not include family income but also other variables such as place of residence, parental educational level, their occupational status etc. (Ardila et al., 2005), which influence the child development. Likewise, the parental level of education is not an isolated variable; it also reflects other variables associated with it, consequently influence child cognitive development. According to (Hoff-Ginsberg, 2003), parents with more years of education create an environment which is cognitively stimulating for their children. Furthermore, it's not just years of parental education that contributes but also array of associated factors and thought process, level of intellect, family system etc.

Another variable which is discussed in past studies with varied results on EF of the child is gender of the preschooler. Previous researches provided inconsistent data regarding the role of gender on EF of the child. Recent studies (e.g. Holmes, Kim-Spoon, & Deater-Deckard, 2016; Yamamoto & Imai-Matsumura, 2019) showed no gender differences. However, individual component of EF showed differences on gender such as, teacher and parents reported EF of the child reported that girls out performed boys on inhibitory control and behavioral regulation (Gestsdottir et al., 2014; Wanless et al., 2013).

Considering gender differences, Grissom and Reyes (2019) concluded that one gender may outperform the other on particular component of EF, but there is no systematic advantage of this enhanced performance; further, these differences in

abilities of EF depend upon the modality and parameters of testing, and that these difference reflect the various strategies that are employed by each gender while dealing with goal directed behavior or any challenge. Moreover, EF of the child can be effected by environmental adversity during early phase of life, which may effect each sex /gender differently depending on the severity of the adversity, age of the child. Concluding that the gender of the child may influence how he/she deal with the challenge, consequently result in the differences on component of EF skill.

Ecological System Theory: Role of Demographic Variables on MST

It is important to understand that during social interaction, whether it is parent-child or teacher-child interaction, child, parents and teachers brings in characteristics such as gender, their family income, age, educational level etc. According to ecological system theory, which suggest the significance of examining these variables as these individual differences on these variables influences the social interaction and consequently child related outcomes (Bronfenbrenner & Morris, 2007). In the same line, Pianta (1999) stated that teacher and child are part of individual system, during the context of teacher child interaction both adjust and change, both the children and teacher bring their unique characteristics and their experiences into the interactive system which influence aspects of child development. Concluding that, it is important to study the teachers as well as parents characteristic on their use of MST during interaction with the child.

Support from recent studies showed that child own characteristics may influence the paternal and maternal use of MST. Following the gender socialization of language, mother are believed to use more words while talking to their daughters

than their son and subsequently during discourse with their daughter they use more MST as compared to their sons (McHale, Crouter, & Whiteman, 2003). Parents not only vary in frequency with use MST with male and female child but also the kind of talk. Clearfield and Nelson (2006) found that with female child mother use language that covers feelings, wish, and needs on the other hand with male child they use words for naming and labeling.

Similarly, the age of the preschoolers has found to be one of the child characteristics that influence the social interaction between the child and their significant others. Research suggests that parents use MST with the children according to their children development of social understanding (Jakubowska, Szpak, & Białecka-Pikul, 2018). Two factors are considerably important while using MST with the children, the complexity of the talk and the content. According to (Ruffman, Taumoepeau, & Perkins, 2012) following the Vygotksy's zone of proximal development, the parents recognize the child social understanding and employ MST that signify concepts which their child is about to develop; by using casual or contrastive MST (Peterson & Slaughter, 2003). The parental expected progress in complexity and frequency of parents use of MST with older preschoolers usually bring change in the content of MST, children understand the parental use of desire before the cognitive and emotional talk (Bartsch & Wellman, 1995). These finding suggest that parents of the preschoolers match their mental state terms according to their children's comprehension according to their age.

Recent research (Reynolds et al., 2020) indicated that as a means of cultural context the father and mothers' language input varies. The Pakistani culture context,

the income conditions are far different from other countries, father, mother or teacher language may stem and influenced by their unique social, cultural or economic conditions. Father and mother plays unique roles in the life of the preschooler and may differ in their use of MST (Garrett-Peters et al., 2008; Garrett-Peters et al., 2011), and they may contribute their children outcome differently (Baker, Vernon-Feagans, & Investigators, 2015).

Literature in the past (Ebert, Peterson, Slaughter, & Weinert, 2017) suggested family income may influence the parents use of MST with their children, both in quality and quantity with which parents expose their children with the mental state language. Similarly, (Garrett-Peters et al., 2011) found that the family income was related to use of negative emotional talk by the father in African American sample. According to (Conger et al., 1990), psychological stress due to restricted financial recourses, may limit the exposure of paternal and maternal MST quantity and quality for their children. In low income countries parents may use less emotional state language while interacting to their young child as compared to parents from higher income (Eisenberg, 1999). Moreover (Rowe, Coker, & Pan, 2004) stated that unlike parents from higher income countries, the parents from low income countries are less likely to involve their children in back and forth conversation. These studies advocate the idea that parents' ability to exchange mental state talk may undermine due to emotional and psychological stress related to limited financial circumstances.

Likewise, another important parental characteristics and environmental influence is the parent's education. According to (Hoff-Ginsberg, Laursen, & Tardif, 2002), parents with more years of education may interact differently with their

children while using language than parents with less years of educational qualification. Moreover, they create more cognitively stimulating environment (Hoff-Ginsberg, 2003); read more frequently and use richer language and vocabulary with their children (Hoff-Ginsberg, 1991) and consequently related to child related outcome such as cognitive development (Ganzach, 2000). In the same line, (Andrews et al., 2020), suggested that educators and teachers with formal training and more years of educational qualification use rich language while interacting with the child.

Rationale of the Study

Early executive functioning among children is one of the widely research areas especially in the Western context. Subsequently, in past two decades a substantial amount of research is dedicated to comprehend the development of early executive functioning among preschoolers that lasts from childhood through adolescence (Barkley, 2012). Although, a significant and fast growth of executive function occurs in infancy, however, a 'preschool age' is considered as a primary developmental period for executive functioning. Besides, there is a robust connection between the environmental and genetic factors in determining the brain development, therefore, child's cognitive development and the quality of parent child relationship requires an in-depth exploration and empirical testing (De Bellis, 2001; Schore, 1996). Given the small number of executive function research available for non-Western cultures, especially, Pakistan, the present study investigated early relational experiences related to the development of executive functioning and the contribution of both maternal and paternal mental state talk (desires, cognitions, emotions) and quality of parenting during the preschool years. Substantial research evidence indicates that executive function development accelerates during the preschool years and in adolescence it attains higher level of performance (Anderson, 2002; Cuevas & Bell, 2010; van de Weijer-Bergsma et al., 2010; Zelazo, Müller, Frye, & Marcovitch,

2003). Moreover, as EF is categorized as a fluid cognition, therefore fluid cognition is prone to environmental influences as compared to the crystallized cognition (Blair, 2002). It is thus inclined to undergo the prompt variation in early childhood (Garon et al., 2008; McArdle, Ferrer-Caja, Hamagami, & Woodcock, 2002).

Research on executive function highlights the significance of understanding social factors like socioeconomic status, parents education, gender and age of the child, as major factors contributing to the executive functioning skills (e.g. Ardila et al., 2005; Hook, Lawson, & Farah, 2013; Rochette & Bernier, 2014; Sarsour et al., 2011a). This study aims to extend such social factors and will include gender, parents' education (Baptista et al., 2017) by controlling these factors.

Nevertheless, quality of relations and family experiences in early years of life are the core mechanism for the growth of executive function skills. These include parental sensitivity (e.g. Towe-Goodman et al., 2014), parental scaffolding (e.g. Bernier et al., 2012; Bibok, Carpendale, & Müller, 2009; Hammond et al., 2012; Landry, Smith, Swank, & Miller-Loncar, 2000; Lowe et al., 2014); harsh and sensitive parenting (e.g. Bernier, Matte-Gagné, & Bouvette-Turcot, 2014; Blair et al., 2011; Kok et al., 2014; Pettit, Bates, & Dodge, 1997) and quality of parenting (e.g. Blair et al., 2014; Herbers, Cutuli, Supkoff, Narayan, & Masten, 2014; Rochette & Bernier, 2014; Towe-Goodman et al., 2014). However, little consideration has been given to the contribution of paternal and maternal mental state language in the development of executive function abilities of the child. Keeping in view the importance of the parental extensive use of mental state terms while conversing with their preschooler the present study endeavored to investigate the mental state talk (desires, cognitions, emotions) of both parents (Carr et al., 2018; Drummond, Paul, Waugh, Hammond, & Brownell, 2014). Furthermore, physical surroundings as well as the child rearing practices play acknowledgeable part in the development of child

cognitive skills and consequently well develop intellectual preschoolers possess variety of rich books and toys (Van Voorhis et al., 2013). Further, there is a need to comprehend the contribution of environmental influences on children' behavior and actions. Therefore, this study will conceptually and empirically assess ways the parent-child interaction have been linked to the language and cognitive development of the child (Bloom & Capatides, 1993; Bornstein & Bruner, 2014; Feuerstein, Klein, & Tannenbaum, 1991; Tomasello, 1992)

Another important dimension this study aims in understanding is a teacher–child interaction and mental state talk in preschool classrooms. However, until of late only few empirical studies have given attention to teacher's mental state talk while sharing a wordless storybook. For example, studies suggest that children, specifically preschoolers who have supportive, rich interaction with their teachers show higher level of cognitive, behavioral, emotional development than preschoolers in classroom with less supportive classroom (La Paro, Williamson, & Hatfield, 2014; Mortensen & Barnett, 2015; Ruzek, Burchinal, Farkas, & Duncan, 2014). Furthermore, research suggest that positive and sensitive teacher child interaction (Curby et al., 2009; Hamre & Pianta, 2001) and teacher use of mental state terms (La Paro et al., 2014; Wu et al., 2021) in preschool setting play facilitative role in various child development related outcomes. Therefore, present research aims to study the teacher's mental state talk using wordless story book. As mental state talk of teacher during early education classroom warrants the association with child early development.

Despite the previously mentioned researches highlighting the importance of parenting, and tendency to use mental state terms in story book reading activity, only one study (Baptista et al., 2017) to our knowledge have investigated the relationship of mental state talk and executive functioning for preschooler, In addition, Fay-Stammbach et al. (2014) reviewed influence of parenting on early executive

functioning of the child in multiple cross-sectional and longitudinal research and found that parental sensitivity (Blankson et al., 2011; Hackman et al., 2015) and responsiveness (Blair et al., 2011; Rhoades et al., 2011) were associated with the development of executive function abilities of the child during preschool. Baptista et al. (2017) recommended replicating and extending the longitudinal research not only to mother and father mental state language but also with assessment of quality of parenting. The present study endeavors to test hypotheses and extend not only the current understanding of the role of mental state talk (desire, thoughts, and emotions) but as well the role of teacher's mental state talk and the quality of parenting in the development of EF skills of preschoolers of Pakistan.

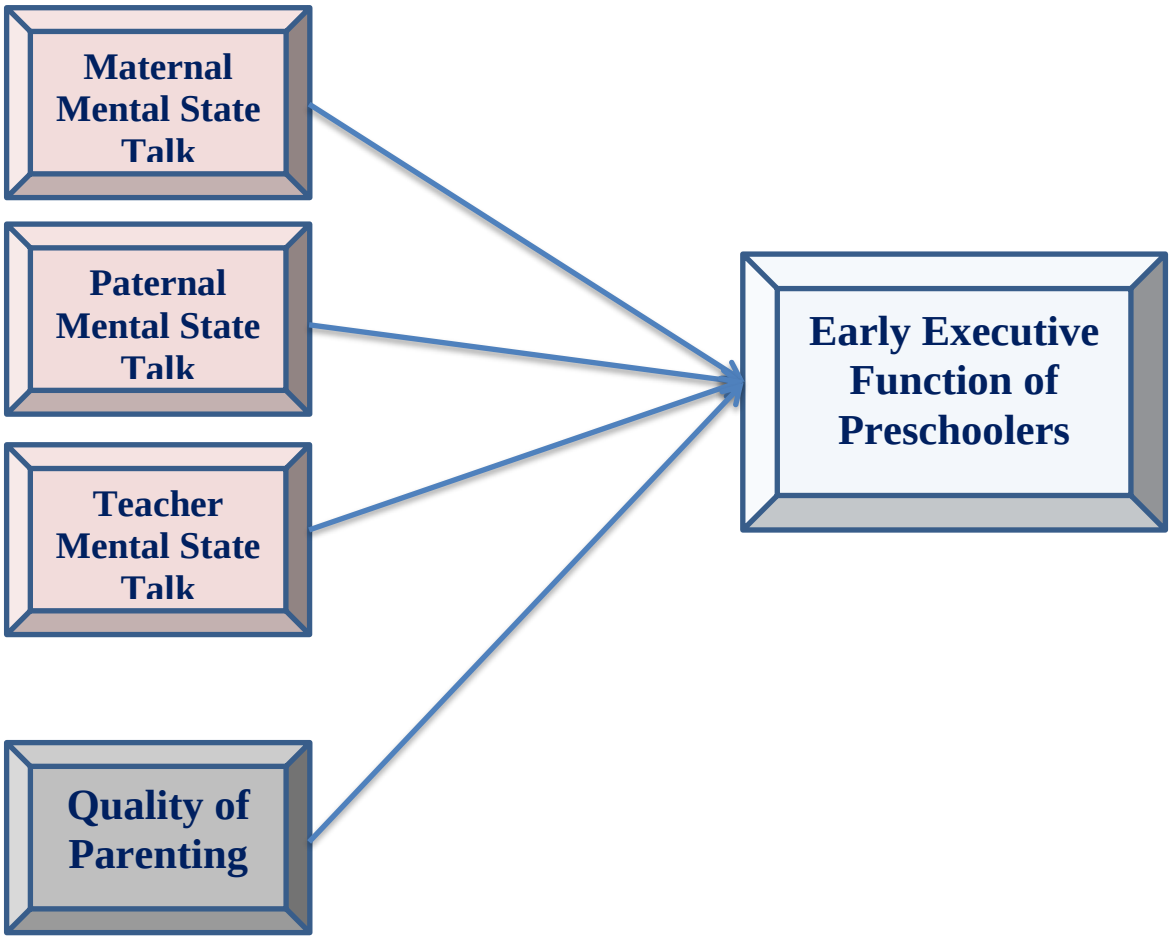

Figure 2. Conceptual model of the study

METHOD

Chapter II

Method

The present study was cross-sectional research, to determine the role of relational experiences i.e., maternal, paternal and teachers' mental state talk (MST), quality of parenting on executive function (EF) of the preschoolers. The present research has following objectives:

Objectives

The broader objectives of the present research are:

1. To investigate the Executive Function of Pakistani Preschooler (3-5 years old)
2. To investigate association of paternal, maternal and teacher's Mental State Talk, quality of parenting and Executive Function of Preschoolers.
3. To find out the role of sociodemographic variable of parents (i.e., income, father, mother and teacher education, age, teacher experience) and the role of preschoolers' age, and gender on the variables of the study.

Research Design

Present thesis comprised of two studies.

Study I: Finalization of study instrument and tryout. This study was purported to finalize and try out the study instruments. It comprised of three phases. Phase I aimed at identification of cultural relevance and translation of the verbal instructions of the Executive Function Touch Battery (Willoughby, Blair, & Kuhn, 2012) to assess the early executive functioning of the preschoolers. In Phase II

indigenous picture story books were identified and adapted for assessment of maternal, paternal and teachers' mental state talk of preschoolers. The other study variable for the assessment of quality of parenting was already developed, and need no translation. Phase III comprised of the tryout of the study instruments. The tryout of Executive Function Touch Battery was carried out in school setting with the preschoolers. The tryout of adapted wordless picture story books were carried out one in school setting with preschoolers (*N*=10) and their teachers and other in home setting with preschooler and their father and mother in two independent sessions along with quality of parenting was carried out. Two subscales of HOME inventory (Caldwell & Bradley, 1984) were selected for present study.

Study II: **Main study**. The purpose of the this study was twofold, firstly it determined the feasibility of EF touch battery, assessed the dimensionality of each task of EF touch battery and examined the validity of the battery using modern testing theory; Item Response Theory (IRT) for the present sample of preschoolers. Secondly, the main study investigated the relationship of paternal, maternal and teachers' mental state talk and quality of parenting on executive functioning of preschoolers. Furthermore, various literature based assumptions about demographics (e.g., age and gender of the preschooler, parental, teacher education, monthly household income etc.), which were considered to contribute to EF of the child and MST of the parents and teacher were tested in the study. The sample of the present study was carried out in two phases. During the first phase, the EF of the preschoolers (*N*=120) and MST of their teachers (*N*=67) were assessed in the school settings. During the second phase, the home visits were carried out to assess the maternal and

paternal MST (*N*=120+120) in two independent sessions and quality of parenting was assessed either by observation or by interviewing using the instruments that were finalized in the study I. Considering the existing literature as well as indigenous perspective, the findings and limitation of the present study were discussed. Recommendations for future research were suggested.

STUDY I: FINALIZATION OF INSTRUMENTS AND TRYOUT

Chapter–III

Study 1: Finalization of Instruments and Tryouts

Study I was aimed at finalization of the study instrument, it was carried out in three phases. Phase I of the study was intended to identify the cultural relevance and translation of verbal instruction of EF Touch Battery. In the second phase identification and modification of indigenous story books were carried out for the measurement of maternal, paternal and teacher s' MST and in the last phase tryout of study instruments were carried out.

Phase I: Identification of Cultural Relevance and Translation of the Executive Function Touch Battery

EF touch battery (Willoughby, Blair, & Kuhn, 2012) has been reviewed and the translated into Urdu language after the permission of the authors (See *Appendix* A). The details of this phase are as follows:

Objectives

Particularly the present phase aimed at:

1. To content review of all the tasks (in English) of Executive Function (EF) Touch Battery for the cultural relevance to use with preschoolers in Pakistan (3- 5.99 years old).
2. To translate the verbal instructions for administrator of EF Touch Battery to use with preschoolers (3-5.99 years olds).

Executive Function Touch Battery

The Executive Functioning Touch Battery (Willoughby, Blair, & Kuhn, 2012) is a computerized version of a number of widely-used EF tasks that have previously been developed and have been used with preschoolers. The tasks that make up the battery tap into the three core components of EF (cognitive inhibition, working memory, and cognitive flexibility). See page 58, for detailed description of each task of EF touch battery.

Procedure

Following steps were followed during this phase of the study

Step 1: Identification of cultural relevance.

Content review of tasks with Pakistani preschoolers* (*3-5 years old). First, a review study was conducted with preschoolers to see whether children can understand and can identify the items and pictures of EF Touch Battery intended for the tryout, as well as the appropriate age for the investigation of EF. Twenty preschoolers (3-5 years old) were contacted in schools and at their home. After rapport building they were presented with different colors, symbols, sound and pictures of animals, that are present in EF Touch Battery, to ensure that task stimuli, verbal instructions, and general assessment approach for EF tasks were culturally appropriate for Pakistani preschoolers.

Content review of tasks by expert. A content review of all tasks (in English) was conducted by multiple experts with extensive experience in early childhood assessment and research in Pakistan, to ensure that task stimuli, verbal instructions,

and general assessment approach for EF tasks were culturally appropriate for Pakistani preschoolers.

Step 2: Committee approach. After the identification of cultural relevance by the preschoolers and experts, a committee approach was conducted, consisted of the researcher, supervisor and subject matter experts. Keeping in mind the suggestions during the content review of the EF touch battery; the committee suggested the need to translate the verbal instructions of the battery in national language Urdu.

Step 3: Translation of verbal instructions.

Stage I: Translation into Urdu. At first English version of the instructions of EF Touch Battery (See *Appendix* B) for the use of researcher was translated into Urdu by four bilingual (one M.Phil and three PhD scholars each from Quaid-i-Azam University Islamabad, having excellent bilingual understanding. Each of the translators were approached individually and requested to translate the task instructions. The selected bilingual of present study fulfilled the criteria suggested by Brislin (1986). Translators were briefed about the purpose (to develop an Urdu version of verbal instructions suitable for the Pakistani preschoolers) and the age group of potential sample. They were requested to consider the content equivalence of the Urdu and English version.

Stage II: Committee approach. After completing the initial translation, all the translations were reviewed from three experts (having good bilingual understanding), experts comprised of one PhD faculty member and two PhD scholars from Quaid-i-Azam University, Islamabad were set up to select the best translation. The members

were given a brief introduction about the purpose and participants of the study. The translation was selected item by item, based on the highest agreement between the judges. After the items were selected, they were transcribed and subjected to back translation.

Stage III: Back translation. To explore the appropriateness of the Urdu translation further, this version of the verbal instructions of the task of EF Touch battery was back translated into English. The Urdu version was given to three bilingual MPhil and PhD students each from Quaid-i-Azam University, Islamabad. Translators were proficient in both English and Urdu and had no exposure to the original English version of the verbal instructions of the tasks of EF Touch battery.

Stage IV: Committee approach. After completing the back translation, final committee approach was conducted for selection of back translated items. This committee also comprised of three experts (one Ph.D faculty member and two Ph.D scholars from Quaid-i-Azam University, Islamabad). The back translated items were then scrutinized by judges. In this process judges matched the back translated items with the original one to verify the semantic and contextual equivalence of both the original English and translated Urdu version of verbal instructions of EF touch battery.

Stage V: Finalization of translation. After the committee approach of the back translation, the items of Urdu verbal instructions were finalized (See *Appendix* C) for the software of EF Touch battery.

Step 4: Transaction of translated instructed into EF touch software. The translated verbal instruction of the EF touch battery was transferred from the Urdu writing software to MS word file with the help of online program of Unicode text, which was then added in the text file, where each instruction was added in the programming language file provided by the author and developer of the EF touch battery (See *Appendix* D and E). No technical and administrative assistance was provided by the developer of software during this phase.

Conclusion

This phase of the study utilized multistep process to review each task of EF touch battery, to be used with Pakistani preschoolers. It involved the direct feedback from the preschoolers and then the reviews on task content and verbal instructions of the battery by the subject matter experts (SMEs). The content review process suggested the need for translation of the verbal instruction that not only translate the instruction in the national language Urdu but also translation must reflect the intent of each task. Also, the SMEs and the feedback from preschoolers suggested that Pakistani preschoolers understood the task stimuli well. During the review of the tasks, the SME recommended minor suggestions, which were not incorporated due to copyrights. For example, they recommended replacing the animal *pig* with some other animal since the pig is not a very common animal in Pakistan. Further, people even dislike listening to or speaking the word 'pig' due to their religious ideas and cultural values; further it was suggested that during the tryout phase researcher should keep this concern in mind while examining the EF of the preschoolers and should report any compromise in assessment procedure. The translation procedure followed the

rigorous practice of forward and backward translation, which was then incorporated in the computerized version as a verbal instruction for the computerized EF touch battery and was ready for the tryout.

Phase II: Modification of Picture Story Books for Measurement of MST (Maternal, Paternal and Teacher)

Particularly the present phase aims:

1. To identify the indigenous picture story books to use with father, mother and teacher for the measurement of mental state talk.
2. To content review the identified story books.
3. To modify the picture story books for the use of present study.

To obtain the objective of this phase following steps were carried out

Step I: Identification of Picture Story Books

Multiple national and international picture story books were identified for the purpose to identify an appropriate and valid tool for measurement of the mental state talk of father, mother and teacher. Multiple national and international authors were contacted. Literature, multiple subject matter experts, parents, teachers and social media influencers who work with children book reading activities were contacted to identify the picture story books. List of few story books that were identified are attached in *Appendix* F.

Step II: Subject Matter Experts for Review the Content of Picture Story Books

The selected books were presented to three Subject Matter Experts (SMEs) to ensure the selection of effective wordless picture storybook which stimulate rich discourse on mental state talk. The experts were from the field of early childhood education and psychology. On the basis of literature, selection criteria of effective wordless picture story book were directed to the SMEs; further they were briefed about the purpose to identify picture story books that (1) contain rich reference about the mental states of others conveyed through the interplay of pictures only that were describing the story; (2) Moreover that provides explicit and elaborative information about the mental state process of character of the story (3) Further, the experts were asked to select the story where narrator (mother, father or teacher) attributes mental state to story characters and engage the preschooler, at its best (4) They were also requested to check the appropriateness and cultural relevance of the story characters, dresses/ clothing, or situation so that child can relate to story characters (5) and lastly that each story pictures book has the capacity to elicit equal amount of mental state words and books were comparable in terms of page numbers and type. Four picture story books were selected by the SMEs.

Step III: Modification of the Picture Story Book Following SMEs Feedback

Four picture story books that were selected named as:

i) “Where Is Amma” by Nandini Nayar

ii) “Raima and Rehan” by Nandini Nayar

iii) “Babloo: The Little Boy Who Didn’t Like Books!” by Nigar Nazar

iv) “The Garbage Monster” by Nigar Nazar

Permission from the authors and publisher of the story books were taken for utilization and modification of story books for the research purpose (See *Appendix* G). These identified picture story books were modified by omitting the words from the story books to make them wordless picture books to fulfill the purpose of present study.

Step IV: Face Validity of the Wordless Picture Story Books

For face validity, the wordless picture story books were presented to panel of SMEs (*N*=4) including education psychologist, child psychologist, experts in early Child Development; also to 4 mothers and father in their homes, and 3 teachers at school. Parents and teachers were asked to read the wordless picture story books.

The SMEs and the potential users (father, mother and teachers) suggested that according to the selection criteria apparently only three of the wordless picture story books fulfilled the requirements. It was suggested by the panelist that one of the indigenous wordless picture story book *Babloo: The Little Boy Who Didn't Like Books!* (Nazar, 2010a) has less potential to stimulate rich discourse on mental state content after omitting the words from the original version of the story book. For validating the suggestions given by the SME, content validity ratio was computed.

Step V: Content Validity and Pretesting

The content validity was computed out through quantitative measurement procedure by Lawshe (1975) by calculating Content Validity Ratio (CVR). For this purpose the selected four wordless picture story books were presented to SMEs (*N*=3) and sample of father, mother and teachers (*N*=3+3+3) and were asked to evaluate the appropriateness on overall composition of book on the three point rating scale, which is (1) essential, (2) useful but not essential and (3) not necessary. Furthermore, Parents

and teachers were requested to read the wordless picture story book to the preschoolers before evaluating the overall composition of modified picture storybook. This pretesting procedure helped to identify whether the indigenous books elicit rich reference about the mental states and suitable for preschoolers in Pakistan. In addition to this, the parents and teachers were asked independently if they faced any difficulty in narrating a story with pictures only (without text).

On the basis of SMEs suggestion and CVR values, only three wordless picture story books with were selected, which were in accordance with the selection criteria and was falling within the acceptable minimum CVR values (see Table 1).

Table 1

Content Validity Ratio of Wordless Picture Story Books as a Measure of Mental State Talk for Mother, Father and Teacher of Preschoolers

Wordless Picture Story Books	CVR
Book 1	1.00
Book 2	.83
Book 3	-.66[a]
Book 4	.83

Note. *$CVR_{12;0.05}$=.56 ; [a] values below the significant minimum.

For the three selected wordless picture books, both the pictures and overall composition of wordless storybooks had acceptable CVR values, with CVR indices of .83 to 1. The wordless picture story book with negative CVR value -.66 was rejected. Lawshe (as cited in Cohen, Swerdlik, & Phillips, 1996) recommended that if the amount of agreement of each item observed more than 5% of occurring by chance, such item should be eliminated. There were 12 panelists for showing agreement of

item selection, so acceptable minimum CVR was .56. Based on the criteria story book 3 was eliminated due to negative CVR.

Three wordless picture storybooks that were selected named as:

i) "Where Is Amma" by Nandini Nayar (Nayar, 2010)

ii) "Raima and Rehan" by Nandini Nayar (Nayar, 2017)

iii) "The Garbage Monster" by Nigar Nazar (Nazar, 2010b)

After the committee approach and pretesting of the storybooks with parents and teachers, the wordless picture books were finalized to administer for the tryout to measure the mental state talk.

Conclusion

During the present phase, multiple books were presented to SMEs; they reported that though most of the story books contained rich content about mental state references and were fulfilling the requirement of the present study however, the basic apprehension they reported was the indigenous perspective and cultural relevance. The story books that were shortlisted were representing the story characters that the preschoolers could easily relate to. The major concern was that the teacher, parents and children should feel a sense of belonging with story character, the environment. The parents, teacher should relate and acknowledge the character when narrating the picture book and finds it convenient to elicit rich mental state words.

The procedure of establishment of face validity, pretesting and computation of content validity ratio of the story books helped to identify any difficulty faced by the father, mother and the teachers while narrating the story books without the written content. One of the story books "Babloo: The Little Boy Who Didn't Like Books!" which initially thought to attain attention because of the title and the story character showed least favorable results; during the process of pretesting the feedback from the

SMEs, parents, and teacher suggested that after the omission of written text, the pictures without text in the story book failed to elicit rich mental state words for father, mother as well as teachers; which resulted in exclusion of this book from the final list of instruments.

The modifications performed in the present phase provided a valid indigenous tool to assess mental state words of significant others of the preschoolers, which need pilot testing before going in the field to be utilized on larger sample.

Phase III: Tryout of Study Instruments

This phase of the study comprised of tryout of the study instruments; the EF Touch Battery for preschoolers, wordless picture story books that were finalized during initial phase of the research, for measurement of maternal, paternal and teachers' use of MST and the quality of parenting.

Objectives

Tryout was carried out with following objectives:

1. To access the understanding of preschoolers on verbal instruction of Executive Function (EF) Touch Battery in Urdu.
2. To investigate the patterns of MST (desires, cognition and emotions) of father, mother and teacher of preschoolers on modified indigenous story books.
3. To assess psychometric characteristic of study instruments.

Sample

This phase of the study comprised of two independent sample. The details of the two independent samples are as follows:

Sample I. The sample I of the present phase included 30 preschoolers (*boys*= 15, *girls*=15) with an age ranged from 3 to 5 years (*M*= 4.67, *SD*=.72) for measurement of executive functioning. The sample was collected from private and public schools in Rawalpindi. The sample also included the parents (*N*=30) of the preschoolers to measure the quality of parenting of the preschoolers, the parents were contacted at their homes; who gave the consent to conduct the research.

Sample II. For the tryout of MST, the sample comprised of 10 father-preschooler, mother-preschooler and teacher preschooler dyads. Age range of preschoolers was 3-5years (*M* = 4.05, *SD* = .45). There were 5 boys (50%) and 5 girls (50%) in the sample. Mother father and teacher education varied from matric to masters (10- 16 years of education). Mostly the teachers have up to 14 years of education. For most of mothers and fathers the education level was up to 12 years of education.

Following (Table 2) is given the frequencies and percentage of demographic specification of the tryout of this phase.

Table 2

Frequency, Percentage, Mean and Standard Deviation of Different Demographic Variable of Preschooler and Their Parents (N =30)

Variables	Categories	Sub-Categories	*f*	*%*	*M*	*SD*
Age of the preschooler	-	-			4.67	.72
Gender of the preschooler	Boy	-	15	50		
	Girl	-	15	50		
School Type	Private	-	5	83.3		
	Public	-	1	16.6		
Family Type	Nuclear	-	11	36.7		
	Joint	-	19	63.3		
Physical Illness of preschooler	Yes	-	0	0		
	No	-	30	100		
Psychological Illness of preschooler	Yes	-	0	0		
	No	-	30	100		
Mother age	-	-	-	-	33.03	3.6
Mother's Education	1-10	Primary	1	3.3		
		Secondary	2	6.7		
	11-16	High School/ College/ Graduation	14	46.7		
		Masters	10	33.3		
	Above 16	Postgraduate (Above)	3	10.0		
Mother working	Yes	Full time	4	13.3		
		Part time	1	3.3		
	House wife	-	25	83.4		
Father age	-	-	-	-	36.93	4.025
Father's Education	5 years and below	Primary	2	6.7		
		Secondary	1	3.3		
	11-16	High School/ College/ Graduation	8	3.3		
		Masters	11	36.7		
	Above 16	Postgraduate (Above)	8	26.7		
Father working	Yes	Full time	28	93.3		
		Part time	2	6.7		

Note. % = Percentage, f = Frequency, M = Mean and S. D = Standard Deviation each variable

Instruments

Following instruments were used in the tryout phase:

Demographic sheet. A demographic sheet along with the consent form (See *Appendix* H) was sent to the father, mother through school authorities to obtain willingness of the parents and necessary information of the preschooler. This information included, age, gender, family system, paternal maternal and education etc.

Executive Function Touch Battery (Urdu Version). The Urdu version of EF touch battery that was translated in Phase I was used for the tryout of the study. The Executive Functioning Touch Battery (Willoughby, Blair, & Kuhn, 2012) is a computerized version of a number of widely-used EF tasks that have previously been developed and have been used with preschoolers (See *Appendix* I for few screen shot of the EF touch battery). The tasks that make up the battery tap into the three core components of EF (cognitive inhibition, working memory, and cognitive flexibility). There are eight tasks in the EF Touch program, to complete administration of all of the tasks takes between 45-60 minutes. Each individual task takes approximately 5 minutes to administer. Often not all of the tasks are administered together due to the age of the child. Each task takes about 4-7 minutes to complete. There are eight tasks in the EF Touch battery, brief description of each task of EF touch battery are as follow:

Arrows. This is a task of inhibitory control, measuring children's ability to override a dominant response. It is adapted from a task developed by (Gerardi-Caulton, 2000). Children are presented with two "buttons" on the bottom of the screen

and various trials of individual arrows, that appear on the top of the screen. Children are asked to follow the rule of touching the button in whichever direction the arrow is pointing. The arrows vary in their orientation (facing left or right) and position (on the left or right side of the screen). Children are instructed to touch the button that the arrow points to. Inhibition is most strongly activated on incongruent trials (e.g., when the arrow is on the left side, but pointing to the right). At the end of the task the task administrator is prompted with a question regarding children's hand preference. There are 36 items. This task works well with all age groups.

Pig. This is a task intended to assess inhibitory motor control. And is a standard go no-go task (Durston et al., 2006). Children are presented, on screen, with a large green button. Children are instructed to touch the button every time that they see an animal, except when that animal is a pig. The child is then presented with various items in which one of seven animals appears on the screen. The child must touch the button (for all animals, except the pig) or inhibit touching the button (when it is a pig).

In the pretest phase, children are asked to identify all of the animals. During administration items, the task is presented in varying numbers of go trials prior to each no-go trial, including, in standard order, 1-go, 3-go, 3-go, 5-go, 1-go, 5-go, 7-go and 7-go. There are 40 items. This task works well with all age groups.

Silly sounds game* (*SSG). This task measures inhibitory control and is a simple Stroop-like task in which the child must overcome a highly learned response (derived from Gerstadt, Hong, and Diamond (1994) Day-Night task). In this task, the child is presented with side-by-side pictures of a cat and a dog (in random order). For each trial, either a dog bark or cat meow sound is played. Children are required to

touch the picture of the cat when they hear the dog barking and to touch the picture of the dog when they hear the cat meow. The task becomes more difficult with time, as children may forget to override their dominate response.

During the pretest phase, the experimenter introduces the idea that, in the Silly Sounds game, dogs make the sounds of cats and vice versa. Scripted coaching and elaboration is provided. The verbal prompts (i.e., "what sound does this animal make in the Silly Sounds game?") are discontinued after the first 8 items (the experimenter just lets the program run). A total of 17 items are presented. This task works well with all age groups

Houses. This task measures working memory and is based on work from Kane and Engle (2003). Working memory involves holding information in short-term storage and attending to one item while overcoming interference from the other. In this task, children are presented with pictures of houses with animals and colors in them. The child is asked to name the type of animal and color in each of the houses and then, after a short delay, the house is presented again - but this time the house is empty. The child is asked to recall only one piece of information (e.g., either the color or the animal that was in the house). The task requires children to perform the operation of naming and holding in mind two pieces of information simultaneously and to activate one while overcoming interference occurring from the other. The task becomes more difficult as the number of houses increases. The task is made still more difficult by binding the stimulus properties, that is, coloring the animal and asking the child to name the color or the animal.

In the pretest phase, it is established that children can name both the colors and the animals in the task. Children then receive three 1-house trial, three 2-house trials, and three 3 house trials. There are 18 items.

***Pick the picture* (*PTP*).** This task measures working memory and is adapted from a self-ordered pointing task (Cragg & Nation, 2007; Petrides & Milner, 1982). Children are presented with a series of progressive larger (2, 3, 4, 6) sets of pictures. For each set, the child is initially instructed to touch any picture of their choice. Each set of pictures is repeatedly presented, with the location of the pictures changing in a randomized order. Children are instructed to continue to touch a new picture in the set so that "all of the pictures get a turn". For example, in the 2-picture condition, they might see a screen with pictures of an apple and a dog. On the first screen, they might touch (pick) the picture of the apple. On the second screen, the same two pictures are presented but in a different order. Children are required to recall which picture they previously touched and to touch a new picture in this example the dog. The task requires working memory because children have to remember which pictures in each item set that they have already touched. The arrangement of pictures within each set is randomly changed across trials (including some trials not changing) so that spatial location is not informative. There are 32 items

***Something's the same* (*STS*)**. This task measures attention shifting and requires children to use flexible thinking. It was adapted from the Flexible Item Selection Task developed by Jacques and Zelazo (2001). For the initial trials in the task, children are presented with two pictures (animals, flowers, etc.) that are similar along a single dimension of color, shape, or size. Initially, the child is explicitly told how two of the pictures are the same in some way. Then, the child is then presented

with a third picture alongside the original two and asked to state how the new picture is similar to one of the original pictures (e.g., if the first two pictures were similar along the dimension of shape, the third card would be similar to one of the first two along the dimension of color or size). This task requires the child to shift his/her attention from the initial dimension of similarity to a new dimension of similarity. In the most difficult items all of the pictures are presented at once and children are prompted to identify both dimensions of similarity.

During the pretest phase it is established that children understand color and size (i.e., big and small). Items 1-20 are presented in the two-then-three picture manner. Items 20-30 are presented in a three picture manner and children can now match on the concept of category. There are 30 items. This task works well with all age groups.

Farmer. This task measures children's visual spatial working memory ability and is derived from a task developed by (Nutley, Söderqvist, Bryde, Humphreys, & Klingberg, 2009). In the game, children are presented with a 4 by 4 grid of squares depicted as a farmer's fields. One of the farmer's animals gets lose and the child is instructed to help the farmer remember which fields that the animal has "walked in" to help the farmer take him home. The child is shown a number of sequentially highlighted fields and then asked to touch them in the same order that the animal walked in them (i.e., the order in which they were highlighted). The items become increasingly difficult as the number of fields that an animal walks in increases and children are asked to recall longer strings of fields. There are 36 items.

Bubbles. This task is a measure of children's speed of processing. Children are asked to touch pictures of blue bubbles, as they appear on the screen, as fast as they can. There are 30 items. This task works well with all age groups.

Training items for each task. Children were first presented with a set of training items for each task in the battery (except for the Bubbles task). If children failed to pass the training set twice in a row, they were not allowed to administer that task. The testing time lasted approximately 40-45 minute.

Quality of rating. After completion of each task, the assessor gives subjective evaluation of data quality on single item which assess preschooler's behavior, the testing environment, engagement of the preschooler during the task. The single item was rated on three pint scale where 1 indicating *I have serious concerns about this data*, 2 indicating *I feel ok about this data* and 3 indicating *I feel good about this data.* These ratings reflected the data collectors' subjective impressions of children's comprehension of task instructions, engagement with the task, and the suitability of the testing environment.

Picture Story Books: Wordless. Maternal, paternal and teachers' mental state references were assessed using wordless picture books that were adapted in initial phase (See page 50 for details), namely *Where Is Amma* (Nayar, 2010), *Raima and Rehan* (Nayar, 2017) and *The Garbage Monster* (Nazar, 2010b). See *Appendix* J for the sample of adapted story book.

Quality of Parenting. Following the previous studies (e.g. Blair et al., 2014), the Quality of parenting of preschoolers was assessed by two sub scales (parents' responsiveness and cognitive stimulation) of The Early Childhood (EC)

HOME Inventory (Caldwell & Bradley, 1984), which were fulfilling the purpose of the present study. The subscales designed to assess the quality of stimulation and support available to a child in the home environment. Both subscales contain 7 binary-choice items plus or minus (0 and 1); it was administered to each participating family. Information needed to score the inventory was obtained through observation and interview conducted in the home with the preschooler and their parents (See *Appendix* K).

Procedure

The data was collected in two steps. In step I, the EF of the preschoolers and teachers' MST was assessed in their respective schools; followed by maternal and paternal MST and quality of parenting that was measured at their homes.

Step I. At first the schools were contacted for their permission to conduct research in their respective school. The basic demographic information about each preschooler was obtained from the school authorities and teachers, which included information about date of birth, level of preschool etc. Each preschooler was assessed individually in a quiet space at their preschool, after rapport building, children were subsequently assessed on their EF skills using the EF Touch Battery. All preschoolers were administered the assessment in their national language Urdu. Data was collected using Microsoft Windows version of EF touch battery; assessment included the use of a laptop and an external touch-screen monitor. The child responded via the external touch-screen laptop and the task directions were read by the researcher from the external laptop. External monitor was placed in a position at the level where the preschooler had ease to view and touch the monitor, to create a more uniform testing experience.

MST of the teachers of the preschoolers was assessed in school. Only those teachers, who volunteered and consented to participate and audiotape the session, were included in the current study. The demographic information about the teachers was obtained from the teachers, which included information about age, education, years of experience etc. The assignment of story books was counterbalanced among the father, mother and the teacher of the preschooler. As well as the assignment of the three books was counterbalanced among the teachers of the same school, referring to the practice that three storybooks were randomly assigned to teachers within the same school.

To assess teachers' MST, each teacher was tested individually on one of the three wordless picture story books which were finalized in initial phase of the research. The teachers were asked to engage in storytelling session with the preschoolers in a quiet room at her school. The teacher story narration session with the preschooler was audiotaped and transcribed. The transcribed interaction was coded to assess the mental state talk employed by the teachers during the story narration session.

Step II. Parents of preschoolers were contacted through school administration for their permission to visit their homes to measure MST, Visit was made only to those who gave consent to measure MST of both parents. The parents were informed about the procedure and the actual purpose of the picture book story telling was not revealed before the assessment of MST. The demographic information about child and parents was obtained from the parents. The parents were asked individually to engage in wordless picture storytelling, with their child in a quiet room in their homes in a room with no disturbance. Mother- Child and father-child interaction were audio

taped, and then transcribed according to above mentioned procedure. During the story telling session it was made sure that father-child and mother-child are at ease and they have privacy to made interaction individually. The assignment of three wordless picture story books which were finalized in initial phase of the research were counterbalanced among the father, mother and the teacher of the preschooler. The transcribed interactions were then coded to assess references to mental states. Their interactions were audiotaped, and then were transcribed by following the previous studies (Baptista et al., 2017; Ruffman et al., 2002).

Furthermore, the quality of parenting of preschoolers' parents was assessed during the visit at home of the preschoolers. It was assessed by two sub scales (parents' responsiveness and cognitive stimulation) of The Early Childhood (EC) HOME Inventory (Caldwell & Bradley, 1984), either by interviewing or observation.

Data Analysis

EF touch battery scoring. The EF touch battery automatically records the responses of the preschoolers, which are saved in CSV file, which is then exported to MS Excel spread sheet, the SPSS (Statistical Package for Social Sciences) program import the excel file for data analysis.

For each individual task/game, proportion of correct responses is provided. This score indicate the proportion from 0 to 1, zero indicates no item was responded correctly and 1 indicates all the items were responded correctly. Further, the data set also provides information regarding what proportion of items is completed for each individual task. The data file also give information about the score mean reaction time

for each item on time related tasks. The detail description of data handling can be found in the EF touch manual (Willoughby, Kuhn, & Blair, 2016).

Mental state talk coding. First the total number of words in each paternal, maternal and teacher's narrative was counted. This was the total word score, which captured paternal, maternal and teachers' verbosity; in other words, the total word score reflected their tendency to express themselves concisely and in detail when narrating a story.

The MST were then coded into one of the following mutually exclusive categories of desires, cognition and emotions. Similar to previous studies (e.g. Baptista et al., 2017; Bartsch & Wellman, 1995; Jenkins et al., 2003; Ruffman et al., 2002) utterances serving only as conversational purposes (e.g., 'I don't know'), or which were repetitions of own utterances were not coded. Previous studies (e.g. Bartsch & Wellman, 1995; Ruffman et al., 2002; Shatz et al., 1983) reported that they were not coded as mental state terms because of their possible use to mean simply "I can't answer".

Cognitive terms. Cognitive talk included terms used to denote the thoughts, memories, or knowledge of the speaker, listener, or a third person. The terms included in this category were the terms think, know, believe, wonder, remember, forget, guess, pretend, understand, and expect, and all variations.

Emotional terms. The mental state category emotion terms included those that referred to an emotional state. Consistent with previous coding criteria, we included all variations of sad, hurt, angry, happy, hurtful, bored, excited, interested, love, dislike, afraid, enjoy, fun, glad, mad, scared, upset, fed up, surprise, and fear, missed

(Dunn, Bretherton, & Munn, 1987; Jenkins et al., 2003). As in Shatz et al. (1983), desire and emotion utterances were differentiated, in part, because emotion terms often have a more well-defined behavioral manifestation.

Desire terms. Desire terms included want, hope, wish, and care, and all variations of these terms used to capture children's desires or goals (Bartsch & Wellman, 1995; Jenkins et al., 2003; Shatz et al., 1983). Specifically, want was included as a reference to a goal directed behavior, for example *the cat wants to sit down* reflects want terms, *I hope Ami* (*mother) will come soon*, reflects hope and I care about my cat is example of terms like care.

Similar to previous studies, utterances serving only as conversational devices (e.g., 'I don't know'), or which were repetitions of own or other's utterances were not coded (Baptista et al., 2017; Jenkins et al., 2003; Ruffman et al., 2002).

Each participant received a final score of mental-state talk, consisting of the overall mental state references from all three categories. To control for differences in verbosity, maternal, and paternal and teacher mental-state talk was calculated as a proportion of the total number of words, from all three categories, used during the interaction.

The coded mental state terms were then analyzed; by two independent raters to check the accuracy of codes. Inter-rater reliability was then assessed by calculating Cohen kappa for codes assigned.

Results of the Tryout

This section holds the results of tryouts of The Executive Functioning Touch Battery, MST and subscales of HOME inventory for quality of parenting and their psychometrics (reliability estimates).

Table 3

Descriptive Statistics for Study Variables (N=30)

No	Variables	*k*	*M*	*SD*	α
1.	Arr_T	36	28.90	6.27	.90
2.	Pig_T	40	37.93	4.66	.94
3.	Hse_T	18	12.40	3.26	.69
4.	PTP_T	32	26.82	2.33	.52
5.	SSG_T	17	12.53	3.53	.78
6.	STS_T	30	25.14	2.67	.51
7.	Frm_T	36	18.85	7.31	.89
8.	Bbl_T	36	29.9	.25	.89
9.	EF_T	245	196.58	16.91	.91
10.	LS_T	14	4.87	1.96	.76
11.	R_T	14	4.16	1.41	.72

Note. k= number of items, M = Mean, S.D = Standard deviation, α = Cronbach alpha reliability, C_age= Child Age, M_edu= Mother Education, F_edu= Father Education, T_edu= Teacher Education, Arr_T= Arrow Total, Pig_T= Pig Total, Hse_T= Houses Total, SSG_T= Silly Sound Game Total, STS_T= Something is The Same, Frm_T= Farmer Total, Bbl_T= Bubble Total, EF_T= Executive Function total, LS_T= Language Stimulation Total, R_T= Responsivity Total

Table 3 gives information about alpha coefficient, means, standard deviations for the scales and subscales of Executive Functioning Touch Battery and quality of parenting. Finding indicates that all study scale and subscales have high alpha coefficients except the subscales of *Pick the Picture* and *Something Is Same* and scores on all the scales and subscales.

Reliability analysis for coding of mental state references. The Cohen kappa value was calculated for assessment of content of the father, mother and teacher

mental state talk on mutually exclusive categories of: desire, emotions and cognitions by two trained raters and found to be substantial. For father (.71, .81, .82); mother (.72, .83, .81) and for teachers (.84, .83, .80) respectively for desire, emotional and cognitive talk.

Table 4

Descriptive Statistics for Mental State Talk Measures for Mother, Father and Teacher with the Preschooler (N=10+10+10*)*

	Measure	*M*	*SD*	Range
Father	Desire	5.10	1.79	2-8
	Emotions	12.30	5.22	3-21
	Cognitions	33.50	8.03	14-42
	Total MST (Raw)	50.90	12.67	25-71
	MST (Proportion)	.12	.01	.10 - .15
Mother	Desire	5.30	2.4	0-8
	Emotions	13.80	6.07	5-23
	Cognitions	32.60	11.72	10-52
	Total MST	51.70	19.03	15-81
	MST (Proportion)	.12	.01	.10 - .15
Teacher	Desire	1.70	1.82	0-4
	Emotions	9.70	2.49	4-13
	Cognitions	42.70	8.79	38-59
	Total MST	57.10	11.80	42-75
	MST (Proportion)	.14	.03	.11- .19

Note. M = Mean, SD = Standard deviation, MST= Mental state talk

Table 4 gives information about means and standard deviations and range of mental state references (desire, emotions and cognitions) of father, mother and teacher with preschoolers. It also indicates total use of MST by mother, father, and teachers, and its proportion from verbosity.

Discussion

The main objective of the tryout was pretesting of the study measures. The initial tryout of this phase was primarily aimed to assess the understanding of preschoolers on verbal instructions of EF touch battery (Willoughby, Blair, & Kuhn, 2012) in Urdu (which was translated in initial phase of this study), and to establish certainty on the translated battery and cultural appropriateness by examining the psychometric properties of Urdu translated version EF touch battery and quality of parenting.

Indigenous researchers usually translate and validate scales into local language Urdu so that these can be applied to local population with certainty and are useful to address the issues of diversity in population of local culture. For the present study, the review of cultural relevance by the experts and pre-testing on Pakistani preschoolers, during the initial phase of the study, suggested the need to translate the English instructions of EF touch in Urdu language. The objective of translating the instruction was to allow research on EF and its component among preschoolers from Pakistani sub societies. Although the medium of instructions in many private schools is English but for most of the preschoolers from government and few private schools were not able to understand the researcher English verbal instructions, for the software that guides the preschooler to play the tasks of EF touch battery. The tryout of EF touch battery demonstrates that the Urdu instructions were understandable and guided the preschoolers well.

The results of the tryout provided insight into the sample characteristics, and the objectives of this study. In order to meet the objectives of the tryout, reliability

coefficients were computed for EF touch battery and two sub scales of HOME inventory (Caldwell & Bradley, 1984). The reliability of all subscales is in acceptable range. The values of reliability of the instruments ranged from .51 to .94 (see Table 3). Alpha reliability coefficients of both the scales of the tryout showed that we can use Urdu version of EF touch battery and subscales of HOME inventory in main study and to assess feasibility report of EF Touch battery on larger sample. For the tryout, the sample of 30 preschoolers and their parents were taken. Preschoolers were taken from schools in Rawalpindi city and their parents were approached at home via school authorities.

A major objective of present tryout was to assess the pattern of MST of fathers, mothers and teachers of the preschoolers through wordless picture story books those were modified in the second phase of the study. These modified picture story books were validated by establishing the valid and reliable procedure of face and content validity, and were further pretested on fathers, mothers and teachers. The finalized picture books that promoted the MST of social agents of preschoolers without the textual support were further tried out.

The tryout studied the MST of fathers, mothers and teachers in the context of modified wordless picture story books named as *Where Is Amma* (Nayar, 2010), *Raima and Rehan* (Nayar, 2017) and *The Garbage Monster* (Nazar, 2010b). The MST were coded following previous studies (e.g. Baptista et al., 2017; Bartsch & Wellman, 1995; Jenkins et al., 2003; Ruffman et al., 2002) into mutually exclusive category of cognitions, emotions and desires. As the codes were assigned by the researcher only, for maintaining the objectivity and reliability of the assigned codes,

inter rater reliability was established. The results of the tryout indicated that Kappa value was found to be substantial. According to Cohen (1960) , the values between 0.61 to 0.82 are considered to be substantial.

The results of the tryout on MST of father, mother and teachers showed not only the effectivity of the wordless story books, moreover like previous studies (LaBounty et al., 2008), it highlighted that that mother, father and teachers differ in their use of MST like desire, emotions and cognitive terms (see Table 4). Further, the results also indicated that mother talk more frequently about mental states as compare to father. These findings are consistent with pervious findings of Jenkins et al. (2003), however, in their research; father and mother were not assessed independently.

Due to limited sample size of the tryout these differences were not significant. Consistent with previous studies (King, 2013; Misailidi et al., 2013) this study found that teachers not only use more terms with preschoolers as compare to mothers but also teachers were likely to use more cognition terms as compare to other terms. The findings of the tryout largely suggested that the modified wordless picture story books as a valid tool to measure mental state talk of significant social agents of the preschoolers like father mother an teachers and with larger sample size these books can provide insight into better picture of the indigenous findings.

Suggestions for Study II (Main Study)

The tryout of the study suggested that the EF touch battery and the adapted story books worked well and were found to be valid tool, which can be used for main study. The supervisor along with research experts suggested that as the construct of EF is a latent variable, therefore the Item Response theory must be utilize to assess the relationship between the latent trait of executive function that executive function touch battery proposes to assess and the properties of the each task of the battery, also the preschoolers' response to individual items of each task of the battery.

Furthermore, as the data of EF battery was small, and was independent of the phase two data that was designed to try out the adapted picture story books, therefore, relationship between the main studies variable were not comparable, therefore, it was recommended to assess the relationship between study variables in study II, the main study.

During the tryout, it was observed that the preschoolers were eager to use the touch screen battery. They were assessed on EF battery as fun game activity. Though the maximum time to complete all the tasks were 50-60 minutes, however, it was observed that few of the preschoolers were interested to use the touch screen even after the completion of all the tasks and were inquisitive about the touch screen gadget. These observation led to the apprehension that the involvement of the preschoolers in the EF touch battery was either due to the comprehension of the tasks or just because they had no prior exposure with the touch screen gadgets. Therefore, it was recommended that before recruiting the preschooler for the main study, they must already be acquainted with the use of touch screen gadgets. Moreover, following

previous studies (Willoughby, Piper, Kwayumba, et al., 2019; Willoughby, Piper, Oyanga, & Merseth King, 2019) feasibility of EF touch battery must be assessed which not only represent the *Rate of task completion, length of administration,* but a subjective impression of the assessor regarding the *Quality of tasks* which will give a better picture concerning the quality of performance on each task of the battery.

Additionally, during the home visit for the assessment of paternal, maternal MST; it was observed that the extended family members (e.g., Grandparents of the preschoolers) tried to intervene or be present at the father or mother storytelling session. It was an expected apprehension as most of the people in Pakistan live in a joint family structure, where grandparents or other extended family members live together. Hence, it was recommended, that during the assessment of paternal, maternal MST, the preschoolers and the parent must be on their own, in a quiet room. The researcher must make sure no other family member participated or present during the two independent story telling sessions.

STUDY II: MAIN STUDY

Chapter-IV

Study II: Main Study

Study two comprised of main study which was planned to examine the feasibility of executive function touch battery and examining the impact of paternal, maternal and teachers' mental state talk and quality of parenting on executive functioning of the preschoolers. Main study purported to achieve the following objectives:

Objectives

1. To examine the feasibility (Rate of task completion, length of administration, and Quality of Tasks) of Executive function touch battery for preschoolers.
2. To evaluate the dimensionality of Executive Function Touch battery
3. To assess the Item analysis (item parameter estimation, test information function and differential functioning) of each task of EF touch battery using Item Response theory.
4. To measure the mental state talk (desires, cognitions, emotions) of parents (mother and father) and teachers and to assess their differences in the use of mental state talk.
5. To investigate the role of father, mother and teacher mental state talk and quality of parenting on preschooler executive functioning skills.
6. To test the moderating role of quality of parenting in the relationship between father and mothers' mental state talk and executive function of the preschoolers.

7. To find out the role of demographic variable of parents (i.e., monthly income, education, age, storytelling habit), Teachers (year of experience and qualification), and the role of preschoolers' age, and gender on the variables of the study.

Hypotheses

1. Maternal, paternal and teachers' mental state talk and quality of parenting will predict to executive function of the preschooler.
2. Quality of parenting will moderate the relationship between father and mothers' mental state talk and executive function of the preschoolers.
3. Mothers will employ more mental state talk during interaction with the child than fathers.
4. Older preschooler will perform higher on executive function touch battery than younger preschoolers.
5. Preschoolers raised in home with higher monthly income will perform higher on executive function touch battery than those raised with lower monthly income
6. Girls will perform higher on executive function battery as compare to boys.
7. Preschoolers whose parents have higher education qualification will outperform on executive function battery than those preschoolers whose parents have lower educational qualification.
8. Father, mother and teacher will employ more mental state talk with the older preschooler than younger preschoolers

9. Father and mother of preschoolers with lower family income will employ mental state talk less frequently than father and mother of preschoolers with higher family income.
10. Father and mother with less educational qualification will employ lesser mental state talk with the preschoolers than father and mother with higher educational qualification.
11. Father, mothers and teachers will employ more emotional talk with girls as compared to boys.
12. Mother, fathers and teacher will employ more mental state talk with girls preschoolers than boys.
13. Teacher with less educational qualification will employ lesser mental state talk with the preschoolers than teacher with higher educational qualification.
14. Parents and teachers with more educational qualification will employ more cognitive talk than emotional or desire talk.
15. Teachers will employ more mental state talk with the preschooler than mothers of the preschoolers
16. Teachers with more teaching experience will employ more mental state talk as compare to teachers with less teaching experience.

Sample

The study comprised of three samples that are linked to each other. The details of the three samples are as follows:

Sample I. The sample I of main study comprised of 120 preschoolers, which included both boys (*N*=63) and girls (*N*=57*)* from 24 different preschools from the

city of Rawalpindi/Islamabad. The age range of preschooler was 3.1 to 5.99 years (*M* = 4.60, *SD* = .90). The inclusion criteria were preschoolers aged 3-5.99 years, for whom Urdu was primary language; preschoolers with premature birth or any physical or psychological illness, were excluded from the sample. Besides this, another criteria of inclusion was the consent from the parents for participation too, as only those preschoolers were selected whose parents were also willing to participate later in the study. initially total of 148 preschoolers were approached to participate in the current study, but 28 preschoolers either refused to participate or continue during the assessment. All the preschoolers who participated in the study were familiar with the touchscreen usage; no less than one family member of each preschooler owned a touch screen gadget. Majority of preschoolers represented low to middle-income families of the urban city of Rawalpindi/ Islamabad.

Sample II. Sample II consisted of 67 preschool teachers, who were involved with the preschoolers (*N*=120*)* in teaching and learning based activities (detailed description of preschoolers are mentioned in sample I). The teachers were recruited in to assess their MST. All the teachers were female, with mean age of 30.80 (*SD*=4.40) and worked at a full-day preschool. The teacher varied in their teaching experience and educational qualification. The teacher demographic details are given in table 5.

Sample III. The sample III comprised of father and mother of preschoolers who gave consent for participation in the study. The father-child and mother-child dyad (*N*=120+120) were involved in the study to measure the paternal and maternal MST and quality of parenting at home. The father and mother varied not only in terms of age and education but several demographic characteristics that are presented in Table 5.

Table 5

Frequencies and Percentages of Demographic Characteristics of the Sample (*N* = 120*)*

	Variables	*f*	%
Sample I	Gender of the preschooler		
	Boys	63	52.5
	Girls	57	47.5
	Age of the preschooler (Years)		
	Younger (3-3.99)	63	52.5
	Older (4- 5.99)	57	47.5
	School Type		
	Private	15	49.2
	Public	08	59.8
	Family Type		
	Nuclear	72	60
	Joint	48	40
Sample II	Teacher Education (Years) (N=67)		
	14 years	28	41.8
	16 years and above	39	58.2
	Teacher Job experience (Years) (N=67)		
	0 Up to 2	28	41.8
	2.1 to 4	27	40.3
	4 and above	12	17.9
Sample III	Mother's Education (years)		
	up to 5	28	23.3
	10 to 12	58	48.8
	14 and above	34	28.3
	Father's Education (years)		
	up to 5	28	23.3
	10 to 12	39	32.5
	14 and above	53	44.2
	Mother Working Status		
	Working	45	37.5
	House wife	75	62.5
	Father Occupation		
	Job	32	26.7
	Business	45	37.5
	Workers	43	35.8
Sample III	Mother Language		
	Only mother tongue	72	51.7
	Mother tongue and second language	48	48.3
	Father Language		
	Only mother tongue	62	51.7

Continued…

	Variables		*f*	*%*
	Mother tongue and second language		58	48.3
	Mother story telling routine			
	With books		35	29.2
	Without books		64	53.3
	Not at all		21	17.5
	Father story telling routine			
	With books		37	30.8
	Without books		47	39.2
	Not at all		36	36
	Mother talking hour			
	Per day	1 to 2	25	20.8
		2 to 4	23	19.2
		4 to 6	38	31.7
Sample III		6 and above	34	28.3
	Over the weekend			
		1 to 2	21	17.5
		2 to 4	28	23.3
		4 to 6	22	18.3
		6 and above	49	40.8
	Father talking hour			
	Per day	1 to 2	43	35.8
		2 to 4	35	29.2
		4 to 6	21	17.5
		6 and above	21	17.5
	Over the weekend			
		1 to 2	30	25.0
		2 to 4	34	28.3
		4 to 6	35	29.2
		6 and above	21	17.5
	Family income (Rs.)			
Sample III	20,000 – 40,000		45	37.5
	41,000-70,000		36	30
	71,000 and above		39	32.5

Note. % = Percentage, f = Frequency; there was no missing value for any of the variable

Instrument

Following instruments that were used in the pilot study were also used in the main study. They are as follow:

1. Demographic sheet (See *Appendix* M)
2. Executive Function Touch Battery : Urdu version (for details see p.58)
3. Modified Wordless picture story books, (details in study I, Phase II, page 50)
4. Two sub scales (Parents' Responsiveness and Cognitive Stimulation) of The Early Childhood (EC) HOME Inventory (See *Appendix* K)

Procedure

The data of the main study was conducted in three phases, the details are as follows:

Initially, public and private schools of Rawalpindi and Islamabad were approached to conduct research in their respective schools. The schools that were contacted represented low and middle income house-hold families. To meet the objective, minimum two visits were paid at the school prior to data collection. The school authorities were given a brief introduction about the aim and objective of the study and they were assured that obtained information would be used only for research purpose without losing their confidentiality and considering research ethics into account. Further, through school authorities collective meetings with the parents and teachers of the preschoolers were arranged to get the permission to assess teachers MST in phase II at school and maternal paternal MST and quality of parenting at their home in phase III of the data collection procedure. Preschoolers'

assent, parents', and authorities' written consent for their child participation were obtained before initiation of any data collection procedures. After the grant of permission from the school authorizes, the executive function of the preschooler were assessed after a session of rapport building. As suggested in study I, during the rapport building the preschoolers were also asked about the familiarity and usage of touch screen gadgets as it was apprehended that preschoolers from low income household may to be aware or familiarized with the touch screen technology. The detailed procedure of data collection using EF touch battery is already mentioned in study I (see p. 65).

Subsequently, MST of the teachers of the preschoolers was assessed at their respective schools. From each school, a list of teachers who were teaching to preschoolers (that were already assessed on EF battery) was collected from the school administration, and teachers were randomly selected from the list. The teachers who gave consent to participate and audiotape the session were included in the study. Teachers were asked to read a wordless picture story to their group of 4-5 preschoolers independently. The detail procedure of assessment of teacher's MST using modified wordless picture story is given in study I (see p. 66).

In the end, paternal maternal MST and their quality of parenting was assessed. As mentioned earlier the consent was taken beforehand. The detailed procedure of assessment of paternal maternal MST and quality of parenting is already given in study I (see p. 66). Following the apprehensions form study I, it was made sure that the picture story book were new to all father and mother of the preschoolers to generate complex mental state references and it was counterbalanced from the

teachers story book. Also ensuing the suggestion from study I, during the story telling session it was made sure that no other family member participated or present during the story telling session.

Data Analysis

Item response theory was applied to the latent construct of EF to assess the validity of EF touch battery and to assess the properties of each item and each task of the battery; using the Stata software (Version 15). The detailed description of data set from EF touch battery and mental state talk coding are explained in study I. Further data was analyzed using Statistical Package for the Social Sciences (SPSS) version 21.

Results

This section holds the results of the main study to achieve the overall objectives and to assess the formulated hypothesis. First of all the feasibility report of The Executive Functioning Touch Battery (Willoughby, Blair, & Kuhn, 2012) was established by assessing the, rate of task completion, length of administration, and the assessor impression of quality of tasks. Then, Item Response theory was utilized to assess the validity of EF touch battery computing the item parameter estimation, test information curves and Differential Item Functioning. Subsequently inter-scale correlation coefficients were computed to see the relationship and direction between the main study variables and important demographic variables which were not collectively computed in study I. Descriptive analyses were carried out to see the differences on mental state talk employed by father, mother and teachers of the

preschoolers. To analyze the impact of mental state talk of the parents and teachers on executive function of the preschoolers and quality of parenting, regression analysis was carried out. Moderation analyses were carried out to see the moderating role of quality of parenting on the relationship between father and mother mental state talk and executive function of the preschoolers. Additional analyses were carried out to examine the role of demographic variables (e.g., family income, gender, father mother and teacher educational level, age of the preschoolers, teacher years of experience) for all the study variables.

Feasibility report of Executive Function Touch Battery. To assess the performance of EF Touch Battery, feasibility report of the battery was assessed for preschoolers, where the instructions of the battery were in Urdu. Following the previous studies (Willoughby, Piper, Kwayumba, et al., 2019) descriptive analysis were used to measure the feasibility of battery. The feasibility report comprised of:

a. Rate of task completion, i.e., Proportion of preschoolers who completed a task, completion was defined by the as passing the training items by the preschoolers.
b. Length of administration, i.e., the time associated with completion of each task. These times do not include any pauses or breaks that were offered to the preschoolers in between the tasks, during the data collection.
c. Assessor subjective impression of quality of tasks of the battery.

Table 6

*Executive Function Task Feasibility Metrics. (N =*120*)*

	Task Summary			Item Summary			
	Tasks attempted (% completion)		task items Completed	Task length (min)	Task item Correct	Floor	Ceiling
Task	*f*	*%*	*M*	*M*	*%*	*%*	*%*
Arrows	116	96.7	1.00	3.5	72.6	0	7.5
Silly Sounds Game	112	93.3	1.00	1.91	71.06	0	5.0
houses	104	86.7	0.98	5.99	65.1	0	1.7
Something 's the same	106	88.3	1.00	4.24	73.8	0	0.8
Pig	107	89.2	1.00	3.44	91.8	0	21.7
Pick the Picture	117	97.5	0.97	4.6	74.4	0	0
Farmer	95	79.2	0.99	3.49	52.27	0	0.8
Bubbles	120	100	1.00	0.055	98.6	0	85

Note. f = frequency of children who were presented a task and who successfully completed the training items of a task; Floor and Ceiling refer to the proportion of children who completed 0 or 100% of test items correctly.

Table 6 depicts that between 79.2% and 100% of the preschoolers completed each executive functions tasks. Further, Preschoolers who passed the training items for a given task, typically completed the task items too (*M*= 0.97 to *M*= 1.00). For the present sample, the task took an average of 3 to 5 minutes to complete. Table also present item summary; it reveals that preschoolers completed 52.27 % to 98.6 % of the test items correctly. Floor and ceiling effect is also evident from the table, for each task 0% preschoolers' floor effect for the present sample. Ceiling effect are evident, for inhibitory control tasks especially Arrow (7.5%) and for Pig (21.7%) tasks were higher. For working memory tasks Pick the Picture, there was no ceiling effect.

Quality rating of executive function tasks. After the completion of each task of the battery, the data collector or the assessor completed a three point rating item,

which depicts the quality of data. These ratings revealed the data collectors' subjective opinion of preschoolers understanding of the instructions of the tasks, their engagement with which they were involved and the appropriateness of the testing environment.

Table 7

Executive Function Task Quality Ratings (*N*= 120*)*

Task	Quality	*f*	*%*
Arrow			
	Serious concern	5	4.2
	Feel OK	41	34.2
	Feel Good	70	58.3
	Total	116	96.7
	Missing	4	3.3
Silliy Sound Game			
	Serious Concern	3	2.5
	Feel OK	11	9.2
	Feel Good	98	81.7
	Total	112	93.3
	Missing	8	6.7
Houses			
	Serious Concern	3	2.5
	Feel OK	16	13.3
	Feel Good	85	70.8
	Total	104	86.7
	Missing	16	13.3
Some thing's the same			
	Serious Concern	6	5
	Feel OK	32	26.7
	Feel Good	68	56.7
	Total	106	88.3
	Missing	14	11.7

Continued…

Task	Quality	*f*	*%*
Pig			
	Serious Concern	5	4.2
	Feel OK	12	10
	Feel Good	90	75
	Total	107	89.2
	Missing	13	10.8
Pick the picture			
	Serious Concern	3	2.5
	Feel OK	24	20
	Feel Good	90	75
	Total	117	97.5
	Missing	3	2.5
Farmer			
	Serious Concern	3	2.5
	Feel OK	16	13.3
	Feel Good	76	63.3
	Total	95	79.2
	Missing	25	20.8
Bubble			
	Serious Concern	1	0.8
	Feel OK	2	1.7
	Feel Good	117	97.5
	Total	120	100
	Missing	0	0

Note. f =frequency, % = percentage

Table 7 presents the rating of the quality of each executive function task. On average, more than 80 % of all admisinistrations were considered to be of good quality or in accetable range. The missing values in the data represents that the training session of that particluare task was failed by the preschooer.

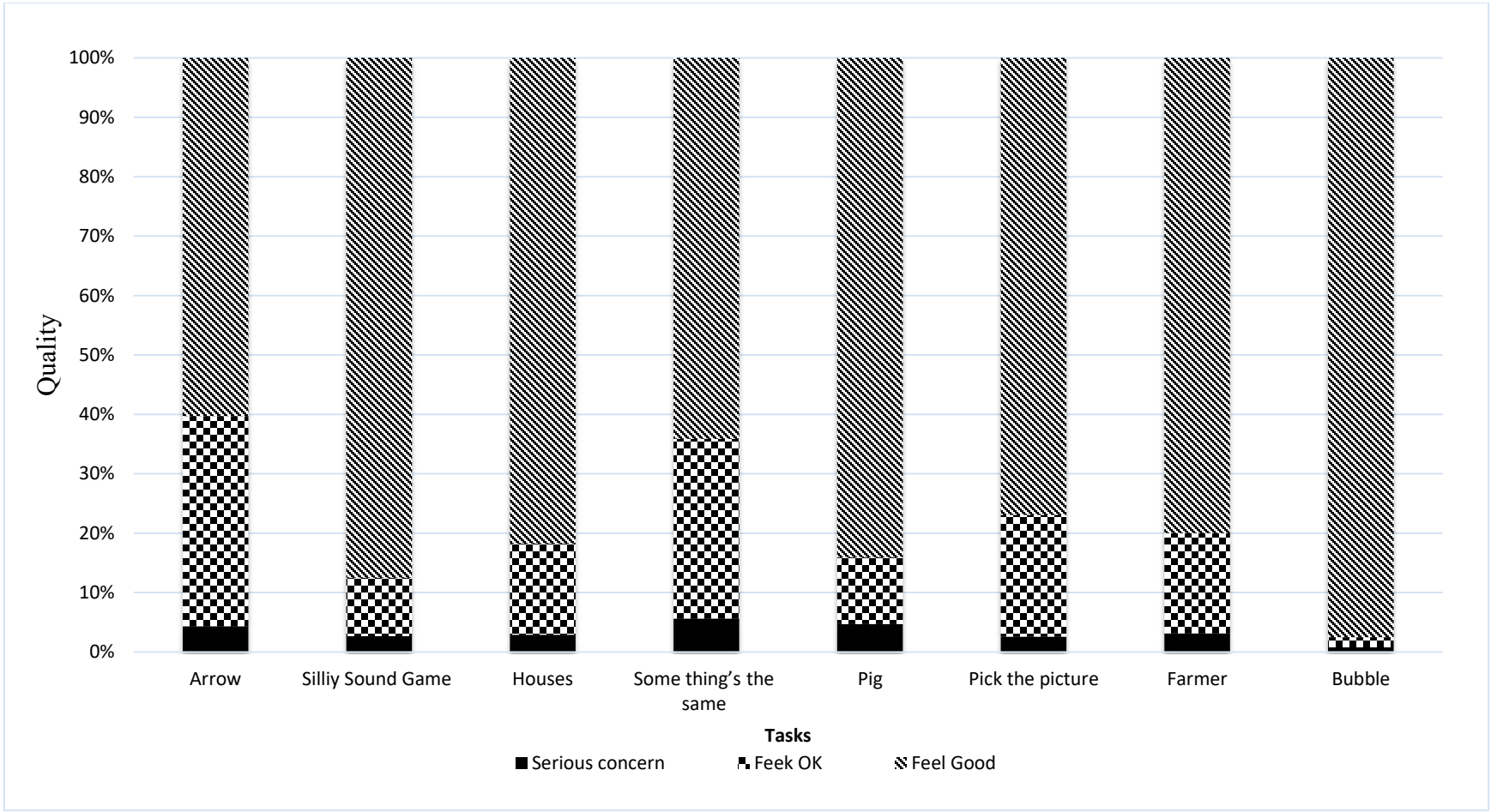

Figure 3. Executive Function task quality ratings (*N*= 120)

Figure 3 above shows the subjective evaluation of data quality in each task, on average more than 80% of all administrations were considered to be of good quality or in an acceptable range. It reveals the quality of Arrow task. It shows that 60% and 35 & of the data is of good and acceptable quality and the assessor has concern about only 4.2% of the data. For the quality of Silly sound game task it shows that 90 % of the data is of good quality and the assessor has concern about only 2% of the data. For the quality of Houses task it shows that 80% of the data is of good quality and the assessor has concern about only 2.5 % of the data. The quality of Something's the same task shows that 56.7% and 26% & of the data is of good and acceptable quality and the assessor has concern about only 5% of the data. For the quality of Pig task it shows that 75% and 10% & of the data is of good and acceptable quality and the assessor has concern about only 4.2% of the data. The quality of Pick the picture task, it shows that 95 % of the data is of good and acceptable quality and the assessor has concern about only 2.5% of the data. For the quality of Framer task it shows that 63.3% and 13.3% & of the data is of good and acceptable quality and the assessor has concern about only 2.5% of the data. The quality of Bubble task shows that 97.5% & of the data is of good and acceptable quality and the assessor has concern about only 0.8% of the data.

Structural Validation of Instruments

One of the objectives of the study was to validate the instruments and to confirm its effectiveness in our culture. Therefore for that purpose Confirmatory Factor Analysis was done.

Confirmatory factor analysis of Executive Function Touch Battery. Executive function touch battery is a multidimensional battery, it was constructed by Willoughby, Blair, and Kuhn (2012). In order to evaluate the dimensionality of each EF task Confirmatory factory analysis was used on the sample of 120 preschoolers. Visual presentation of each task and the factor loading is shown is figure 4

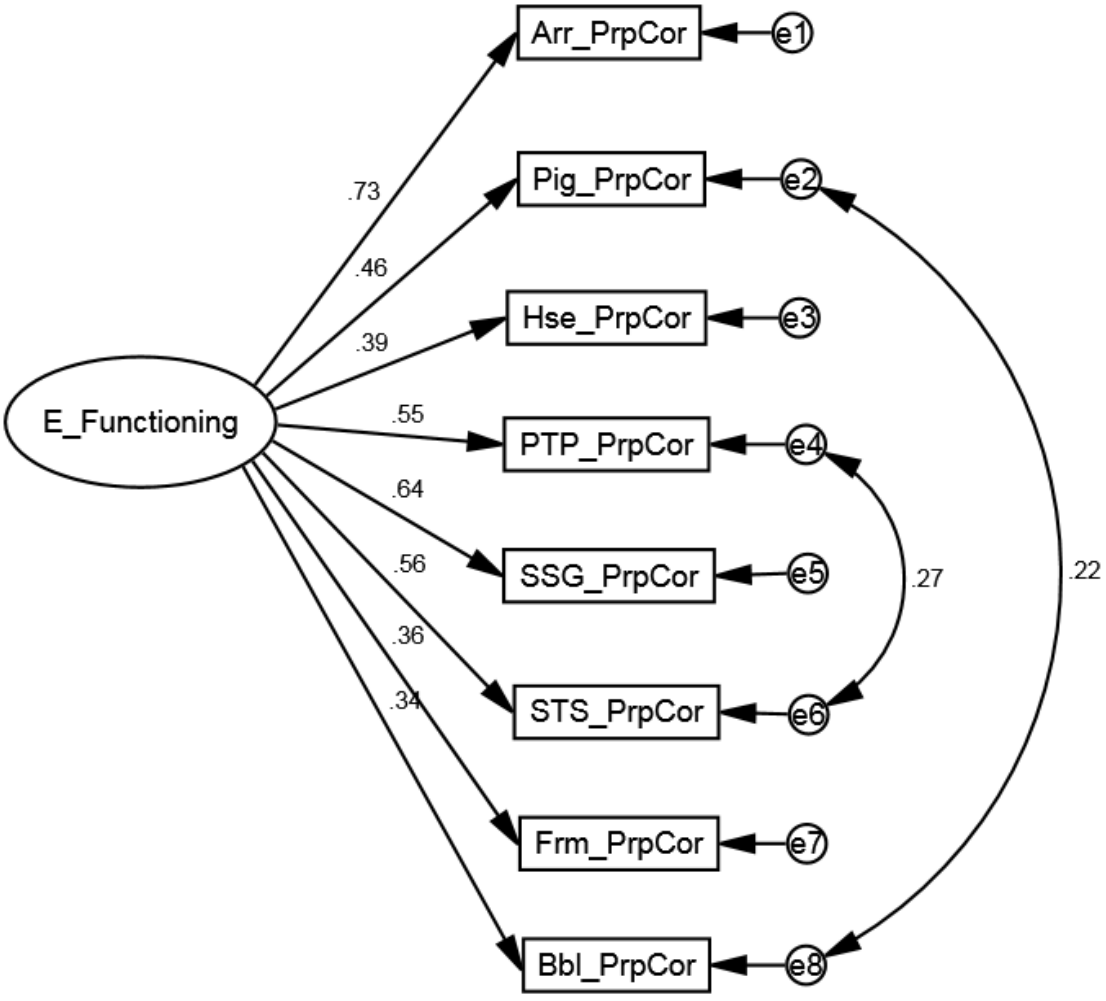

Figure 4. CFA model for Executive Function Touch Battery

Figure 4 shows CFA model of the subscales corresponding to the different subscales as well as obtained factor loadings of each subscale in the respective dimension. All the factor loadings for Executive Function Tasks range from λ=.34 to λ=.73. All items have factor loadings in acceptable range i.e., more than .30 as per criteria (Field, 2009).

Table 8

Fit indices of Confirmatory Factor Analysis for Executive Function Touch battery

	χ^2 (*df*)	NFI	IFI	TLI	CFI	RMSEA	$\Delta\chi^2$(*df*)
Model 1	36.18(20)	.81	.90	.86	.89	.08	
Model 2	24.36(18)	.87	.96	.94	.96	.05	11.72(2)

Model 1 = Default model of CFA
Model 2 = M1 after adding error co-variances

Table 8 represents the model fit indices for EF Tasks. It shows that model fit $\chi^2(df)$ = 36.18(20) is with values of CFI= .89, IFI=.90 and RMSEA =.08. The value of RMSEA was high so in order to get better fit error covariance were added on basis of content overlapping. The value of RMSEA lowered to .05 which is considered as good fit.

Item response theory: Item parameters estimation, test information function and differential item functioning. Item Response theory (IRT) is an important method of assessing the validity of measurement scales. For the present study IRT explains the relationship between the latent trait of executive function that executive function touch battery proposes to assess and the properties of the each task

of the battery, also the preschoolers' response to individual items of each task of the battery.

Item parameters estimation for the tasks for Executive Function Touch Battery. Keeping in mind the unidimensionality of each task, the present study focused on item parameter estimation for each tasks separately. Binary item model was implemented using two-parameter logistic model because the each tasks of Executive function touch battery, which involves dichotomous responses of the preschoolers, each response was either correct or incorrect. The two parameter logistic model has a discrimination parameter and a difficulty parameter, the discrimination parameter is usually referred to as the *'a'* parameter. An item with large discrimination value has a high correlation between the out latent construct i.e., executive function and the probability of answering the item correctly. The larger the discriminating parameter, the better it can distinguish between low and high levels of the executive function ability. Theoretically, the discriminating parameter ranges from 0 to infinity. But according to Wirth and Edwards (2007) values greater than approximately 4 for a unidimensional model are generally considered as problematic. Using model parameterization used for present study, values greater than 1 are desirable here. The second item parameter, the difficulty parameter, or item location is usually referred as the *'b'* parameter. This parameter is in a z metric, (i.e., they can be interpreted just like z score is interpreted), it represents the location of an item on the task of the latent trait of executive function of the preschooler. Negative values indicate easy items, values near '0' indicative average difficulty and positive values

indicate difficult items. The difficulty and discrimination parameters for items of each task of executive function touch battery are as reported in following tables.

Table 9

Item difficulty (*b), discrimination* (*a) and their standard errors for the Arrow task* (*Inhibitory Control).*

Item	*a*	*SE*	*b*	*SE*
1	1.13	.34	-1.22	.33
2	1.25	.39	-1.42	.35
3	.90	.37	-2.22	.78
4	.55	.33	-3.36	1.86
5	.27	.20	-.78	.90
6	.73	.30	-2.03	.77
7	1.53	.53	-1.73	.42
8	1.06	.43	-2.20	.72
9	.25	.21	-1.95	1.74
10	.98	.34	-1.68	.50
11	1.27	.48	-1.94	.55
12	.92	.37	-2.11	.72
13	1.25	.33	-.73	.22
14	1.74	.45	-.90	.19
15	2.66	.64	-.60	.14
16	2.69	.67	-.76	.15
17	1.25	.31	-.14	.19
18	2.47	.58	-.50	.14
19	3.14	.81	-.71	.14
20	3.50	.90	-.65	.13
21	2.10	.47	-.24	.14

Continued…

Item	*a*	*SE*	*b*	*SE*
22	3.37	.84	-.63	.13
23	2.63	.62	-.50	.13
24	2.43	.58	-.61	.14
25	1.10	.34	-1.29	.35
26	.94	.32	-1.48	.45
27	2.12	.51	-.69	.16
28	2.74	.68	-.75	.14
29	.70	.26	-1.38	.52
30	.69	.29	-1.89	.73
31	2.09	.50	-.69	.16
32	3.27	.82	-.65	.13
33	1.24	.31	-.40	.19
34	1.07	.32	-1.16	.32
35	1.03	.35	-1.56	.45
36	1.40	.42	-1.33	.31

Note. SE= standard error, *a*= item difficulty, *b*= item discrimination

Table 9 shows item discrimination parameter '*a*', item difficulty level '*b*' and their standard error, for Arrow task, computed for assessing the performance of executive function touch battery. The item discrimination parameter ranges from .25 to 3.50, explaining that preschoolers' performance on Arrow Items has substantial variability in the strength of the relationship between individual items and underlying ability. On average Arrow tasks items were easy for preschoolers' to complete, with difficulty parameter ranges from -3.36 to -.14. Moreover, Item Characteristic Curve (ICC) was also generated to see the graphical representation for each item of the task. Two exemplary items are shown below with most and least discriminant items.

Figure 5; below represent the item characteristics curve of arrow task of two items with least and most discriminant values (Item 9 and item 20 respectively). Item 20 presented it figure 4, was found to be extremely discriminant (a= 3.50) but fairly easy (b = -.65). On the other hand, the item 9, the curve is flat and represented as easy extremely easy item (b = -1.95) but least discriminant (a = .25) among the arrow task. This suggests that a preschooler, who is fairly low in executive functioning, still has a chance of getting the item correct.

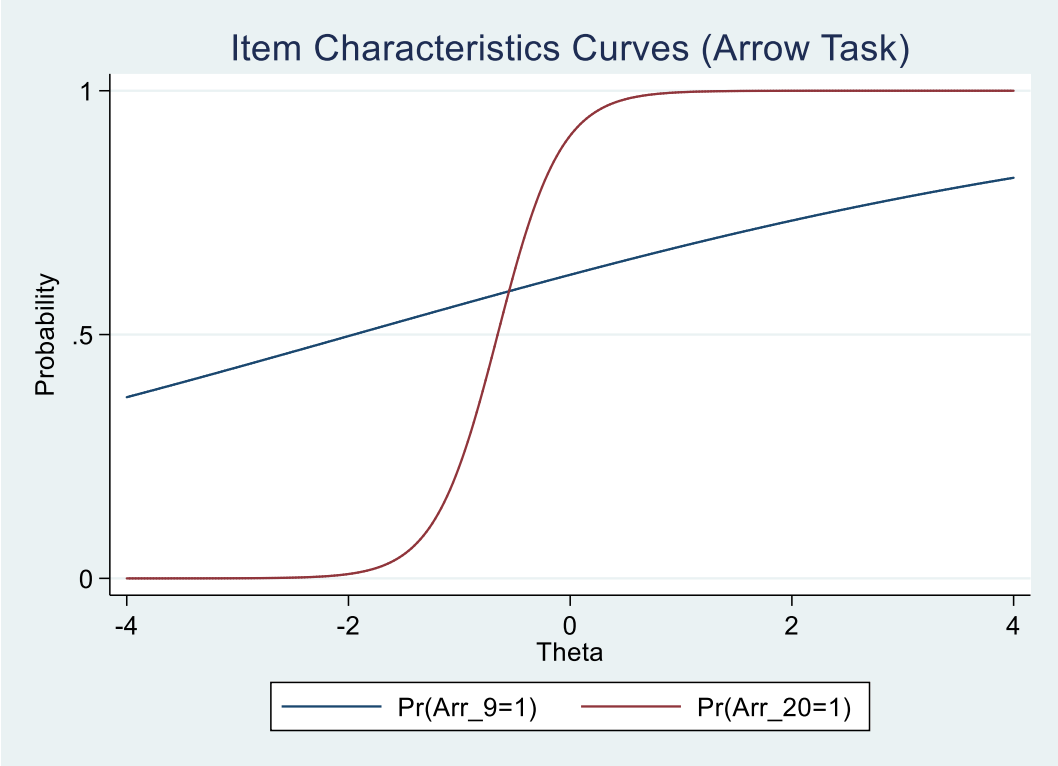

Figure 5. Item characteristics curves of two items of arrow task

Table 10

Item difficulty (*b*)*, discrimination* (*a*) *and their standard errors for the Pig task* (*Inhibitory Control).*

Item	*a*	*SE*	*b*	*SE*
1	1.27	.51	-2.33	.69
2	.95	.33	1.27	.42
3	2.88	1.03	-1.53	.26
4	-	-	-	-
5	3.03	1.28	-2.06	.36
6	1.45	.52	-1.96	.50
7	1.35	.52	-2.24	.62
8	6.49	4.63	-1.84	.26
9	.95	.57	-3.54	1.73
10	1.07	.42	-2.10	.66
11	1.86	.69	-2.07	.46
12	1.62	.66	-2.34	.62
13	3.07	1.38	-2.05	.37
14	1.39	.70	-2.90	1.03
15	1.90	.73	-2.16	.49
16	2.02	.66	-1.47	.29
17	1.20	.46	-2.21	.66
18	.57	.31	-2.48	1.24
19	1.27	.47	-2.04	.56
20	2.75	1.27	-2.27	.46
21	1.27	.77	-3.33	1.49
22	2.12	.86	-2.18	.48
23	2.54	1.18	-2.33	.50
24	1.15	.43	-2.00	.59
25	1.57	.64	-2.39	.65
26	1.68	.63	-2.08	.50
27	2.80	1.18	-2.23	.39
28	1.04	.42	-2.23	.72
29	1.82	.68	-2.09	.48
30	1.65	.68	-2.32	.61
31	1.27	.45	-1.87	.50

Continued…

Item	*a*	*SE*	*b*	*SE*
32	1.24	.40	-1.44	.38
33	1.34	.64	-2.77	.94
34	2.53	.93	-1.83	.34
35	2.95	1.38	-2.22	.43
36	1.36	.48	-1.88	.49
37	.78	.49	-3.70	2.00
38	1.07	.55	-3.05	1.24
39	1.92	.78	-2.28	.54
40	1.09	.40	-1.84	.55

Note. SE= standard error, *a*= item difficulty, *b*= item discrimination

Table 10 shows item discrimination parameter '*a*', item difficulty level '*b*' and their standard error, for Pig task. The item discrimination parameter ranges from .57 to 6.49 explaining that preschoolers' performance on Pig Items has substantial variability in the strength of the relationship between individual items and underlying ability. Preschooler's performance on the Pig task items were moderately to extremely discriminating. On average Pig tasks items were easy for preschoolers' to complete, with difficulty parameter ranges from -3.37 to -1.27. For Pig Task, item 4 does not vary in regard to responses of preschoolers; all the participants responded it correctly. Moreover, Item Characteristic Curves (ICC) were also generated to see the graphical representation for each item of the task. Two exemplary items are shown below with most and least discriminant items.

Figure 6; below represent the ICC of *Pig* task of two items with least and most discriminant values (Item 18 and item 8 respectively). Item 8 was found to be extremely discriminant (a = 6.49) and extremely easy item (b = -1.84). On the other hand, the item 18 has steeper slope (a = .57) representing the item least discriminant item of *Pig* task, that discriminate between the low and high levels of executive

function ability of the preschoolers. Further it represented as extremely easy item (*b* = -2.48). This suggests that a preschooler, who is fairly low in executive functioning, still has a chance of getting the item correct.

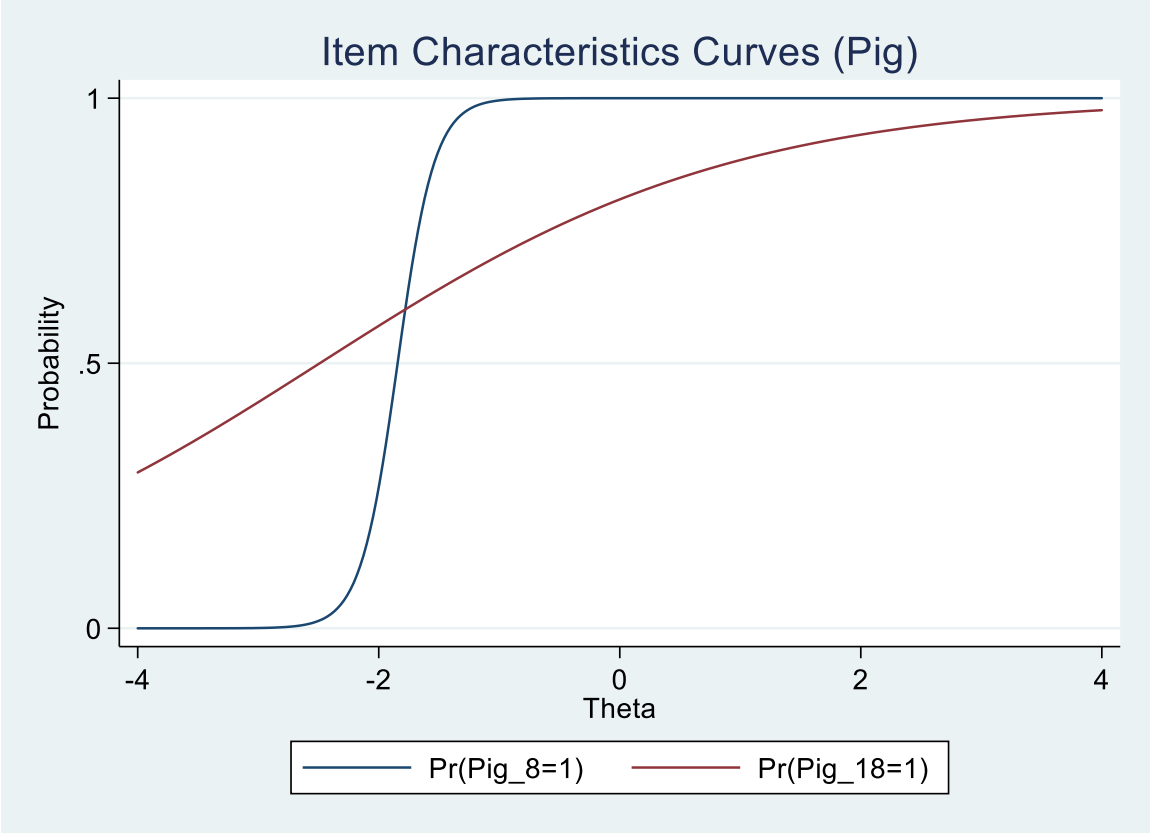

Figure 6. Item characteristics curves of two items of Pig task

Table 11

Item Difficulty (*b), Discrimination* (*a) and their Standard Errors for the Houses Task* (*Working Memory)*

Item	*a*	*SE*	*b*	*SE*
1	.56	.44	-4.03	2.90
2	-.27	.31	5.05	5.58
3	.51	.47	-4.98	4.25
4	1.14	.46	-1.54	.49
5	1.01	.46	-1.98	.73
6	1.37	.53	-.74	.26
7	.744	.35	-.87	.45
8	.77	.34	-.43	.32
9	.89	.36	-.49	.29
10	1.16	.47	-.91	.33
11	1.97	.85	-.48	.18
12	.94	.36	-.67	.31
13	.33	.28	-1.50	1.32
14	.40	.28	.24	.52
15	.43	.29	-.61	.60
16	.50	.28	.20	.43
17	.77	.33	.25	.30
18	.38	.26	1.22	.96

Note. SE= standard error, *a*= item difficulty, *b*= item discrimination

Table 11 shows item discrimination parameter '*a*', item difficulty level '*b*' and their standard error, for Houses task. The item discrimination parameter ranges from -.27 to 1.97 explaining that preschoolers' performance on Houses items has moderate variability in the strength of the relationship between individual items and underlying ability. Preschooler's performance on the Houses task items were moderately to strongly discriminating. On average Houses tasks items represented full range of difficulty for preschoolers' to complete, with difficulty parameter ranges from -4.98 to 5.05. Moreover, Item Characteristic Curves (ICC) were also generated to see the graphical representation for each item of the task. Two exemplary items are shown below with most and least discriminating item of the *Houses* Task.

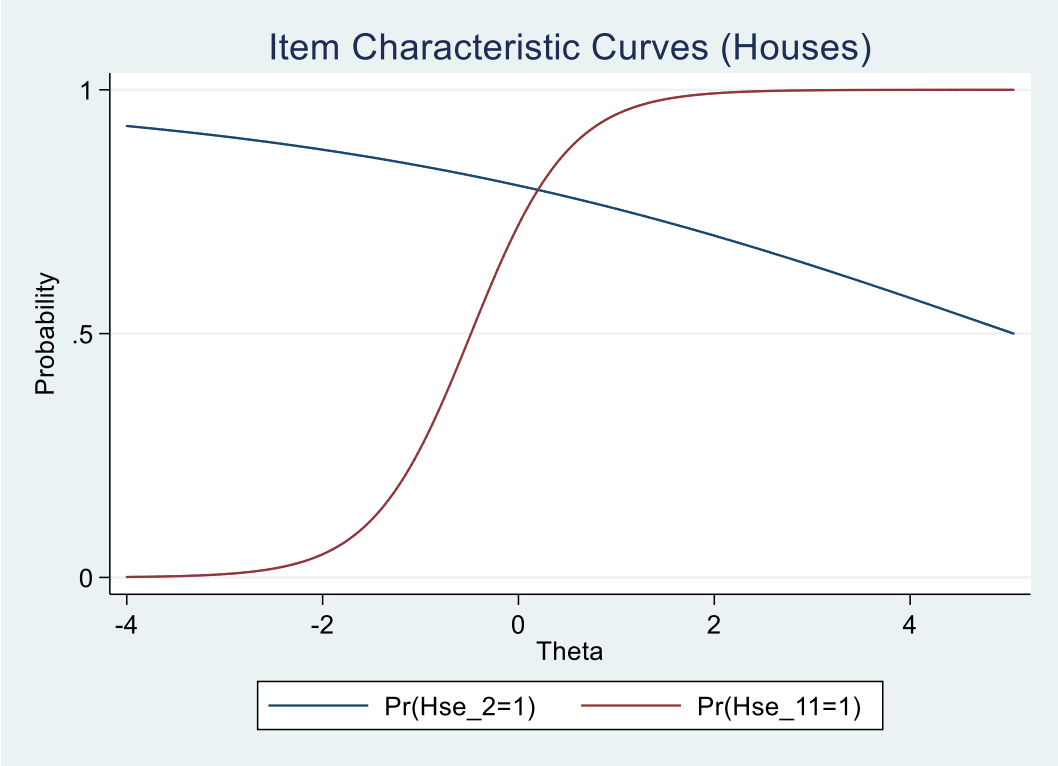

Figure 7. Item characteristics curves of two items of Houses Task

Figure 7; above represent the ICC of *Houses* task of two items with least and most discriminant values (Item 2 and item 11 respectively). Item 11 has a moderate slope (a = 1.97), and relatively easy item (b = -.48); suggesting that the item is informative but an individual who is fairly low in executive function, still has a 50 percentage chance of getting the item correct. On the other hand, the item 2 is negatively sloped (a = -.27) representing the item least discriminant item of *Houses* task. Further it represented as most difficult item (b = 5.05). This suggests that a preschooler, who is fairly low in executive functioning, still has a rare chance of getting this item correct.

Table 12

Item Difficulty (*b), Discrimination* (*a) and their Standard Errors for the Pick the Picture Task* (*Working Memory)*

Item	*a*	*SE*	*b*	*SE*
1	.05	.31	-29.75	181.37
2	1.04	.58	-2.77	1.20
3	.027	.38	-69.18	961.04
4	2.29	.99	-.59	.17
5	.72	.50	-3.68	2.26
6	.91	.35	-.77	.33
7	.31	.35	-5.23	5.70
8	.46	.35	-3.50	2.51
9	.40	.28	-1.95	1.37
10	.60	.35	-2.54	1.38
11	.77	.34	-1.42	.58
12	.36	.27	-.23	.55
13	.72	.84	-5.30	5.57
14	.23	.34	-6.72	9.70
15	.59	.34	-1.70	.94
16	1.69	.62	-.47	.18
17	.00	.25	149.84	29986.62
18	.04	.51	-63.10	749.03
19	.81	.39	-1.68	.71
20	.36	.29	-2.68	2.15
21	.52	.30	-1.49	.87
22	-.18	.25	.88	1.59
23	.52	.95	-7.87	13.50
24	.49	.32	-2.92	1.83
25	.29	.27	-1.99	1.90
26	.15	.27	-6.02	10.75
27	-.08	.25	3.53	10.64
28	1.17	.55	-1.89	.66
29	-.20	.40	10.34	19.83
30	.20	.27	-4.12	5.68
31	.38	.29	-1.37	1.14
32	-.55	.29	-.01	.36

Note. *SE*= standard error, *a*= item difficulty, *b*= item discrimination

Table 12 shows item discrimination parameter *'a'*, item difficulty level '*b*' and their standard error, for Pick the picture task. The item discrimination parameter

ranges from -.55 to 2.29, explaining that preschoolers' performance on Pick the picture items has substantial variability in the strength of the relationship between individual items and underlying ability. Preschooler's performance on the Pick the picture task items were moderately to extremely discriminating. Moreover, *Pick the Picture* tasks items represents full range of difficulty for preschoolers' to complete, with difficulty parameter ranges from -69.18 to 149.84. Moreover, Item Characteristic Curves (ICC) were also generated to see the graphical representation for each item of the task. Two exemplary items are shown below with most and least discriminating value.

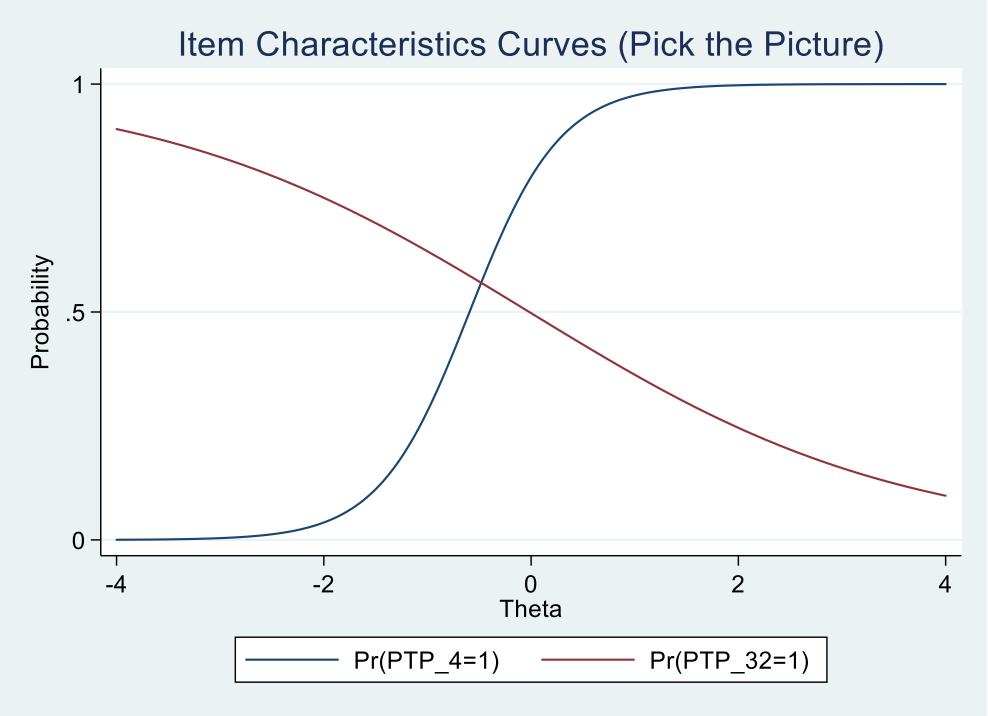

Figure 8. Item characteristics curves of two items of Pick the Picture task

Figure 8; above represent the ICC of *Pick the picture* task of two items with least and most discriminant values (Item 32 and item 4 respectively). Item 4 has a found to be extremely discriminating (a = 2.29), and relatively easy item (b = -.59);

suggesting that the item is informative but an individual who is fairly low in executive function, still has a 50 percentage chance of getting the item correct. On the other hand, the item 32 is negatively sloped (*a* = -.55) representing the item least discriminant item of *Pick the picture* task. Further it represented as quite easy item (*b* = -.01). This suggests that a preschooler, who is fairly low in executive functioning, still has a chance of getting this item correct.

Table 13

Item Difficulty (*b), Discrimination* (*a) and their Standard Errors for the Silly Sound Games Task* (*Inhibitory Control).*

Item	*a*	*SE*	*b*	*SE*
1	.99	.34	-1.37	.43
2	1.00	.33	-.75	.29
3	1.82	.53	-.56	.18
4	.84	.31	-1.18	.44
5	1.05	.34	-.91	.31
6	.91	.32	-1.05	.38
7	.96	.31	-.72	.29
8	.56	.27	-1.66	.81
9	.74	.28	-.82	.38
10	1.10	.35	-1.02	.32
11	1.18	.36	-1.02	.30
12	1.12	.35	-.87	.29
13	1.43	.42	-.91	.25
14	1.65	.51	-1.18	.27
15	1.20	.36	-.74	.25
16	.96	.35	-1.72	.54
17	.67	.32	-2.47	1.08

Note. SE= standard error, *a*= item difficulty, *b*= item discrimination

Table 13 shows item discrimination parameter *'a'*, item difficulty level *'b'* and their standard error, for Silly Sound Game task. The item discrimination parameter ranges from .56 to 1.82 explaining that preschoolers' performance on Silly Sound

Game items has moderate variability in the strength of the relationship between individual items and underlying ability, i.e., preschooler's performance on the Silly Sound Game task items were moderately to strongly discriminating. On average Silly Sound Game tasks items were easy for preschoolers' to complete, with difficulty parameter ranges from -2.47 to -.56. Moreover, Item Characteristic Curves (ICC) were also generated to see the graphical representation for each item of the task. Two exemplary items are shown below with most and least discriminating value.

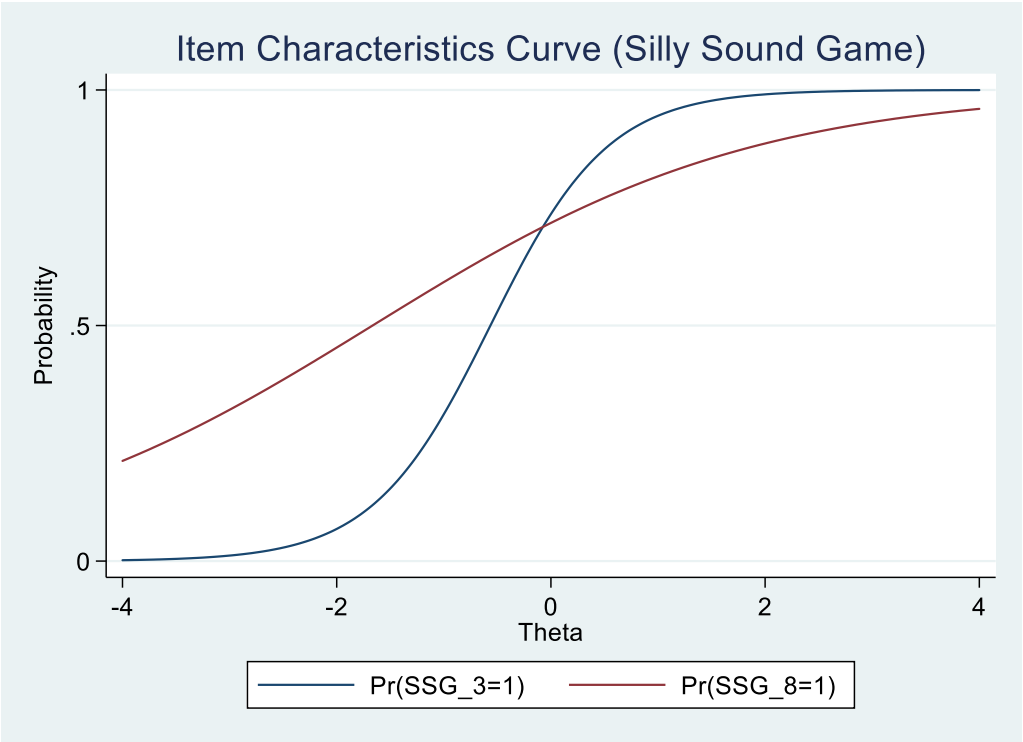

Figure 9. Item characteristics curves of two items of Silly Sound Game Task

Figure 9 above represent the ICC of *Silly Sound Game* task of two items with least and most discriminant values (Item 8 and item 3 respectively). Item 3 has a found to be discriminating (a = 1.82), and fairly easy item (b = -.56); On the other

hand, the item 8 has a moderate slope (a = .56) and it represented as quite easy item (b = -1.66). This suggests that a preschooler, who is fairly low in executive functioning, still has a chance of getting this item correct.

Table 14

Item Difficulty (*b), Discrimination* (*a) and their Standard Errors for the Something's The Same Task* (*Attention Shifting)*

Item	*a*	*SE*	*b*	*SE*
1	.06	.42	-38.86	253.72
2	1.28	.38	-1.01	.28
3	1.66	.44	-.58	.19
4	.51	.26	-1.65	.86
5	1.22	.62	-2.78	1.07
6	2.70	.80	-.22	.146
7	.92	.32	-1.26	.42
8	.48	.34	-4.09	2.78
9	.95	.50	-3.00	1.29
10	.92	.32	-1.38	.45
11	.35	.41	-6.89	7.93
12	1.81	.47	.00	.16
13	1.31	.38	-1.05	.28
14	1.92	.73	-1.71	.38
15	1.50	.43	-.98	.24

Continued…

Item	*a*	*SE*	*b*	*SE*
16	.60	.28	-1.77	.81
17	1.02	.37	-1.65	.50
18	.50	.29	-2.70	1.50
19	.61	.26	-1.20	.57
20	-.12	.22	.76	2.09
21	1.27	.41	-1.43	.37
22	.29	.24	1.49	1.33
23	.02	.28	-53.18	542.59
24	.65	.26	-.41	.35
25	-.56	.36	3.52	2.07
26	-.15	.24	5.56	8.95
27	.38	.83	-10.48	22.06
28	.20	.23	-2.87	3.31
29	1.08	.38	-1.59	.47
30	.47	.24	-.12	.43

Note. SE= standard error, *a*= item difficulty, *b*= item discrimination

Table 14 shows item discrimination parameter *'a'*, item difficulty level *'b*' and their standard error, for Something is the Same. The item discrimination parameter ranges from -.56 to 2.70 explaining that preschoolers' performance on Something is the Same items has moderate variability in the strength of the relationship between individual items and underlying ability i.e., preschooler's performance on the Something is the Same task items were moderately to strongly discriminating. On average Something is the Same tasks items represents full range of difficulty for preschoolers' to complete, with difficulty parameter ranges from -53.18 to 5.56. The difficulty parameters increased throughout the task. Moreover, Item Characteristic Curves (ICC) were also generated to see the graphical representation

for each item of the task. Two exemplary items are shown below with most and least discriminating value.

Figure 10; below represent the ICC of *Something's The Same* task of two items with least and most discriminant values (Item 25 and item 6 respectively). Item 6 has a found to be discriminating (a = 2.70), and fairly easy item (b = -.22); On the other hand, the item 25 has negative slope (a = -.56) representing the item least discriminant item of *Something's The Same* task. Further it represented as difficult item (b = 3.52). This suggests that a preschooler, who is fairly low in executive functioning, has a chance of getting this item incorrect.

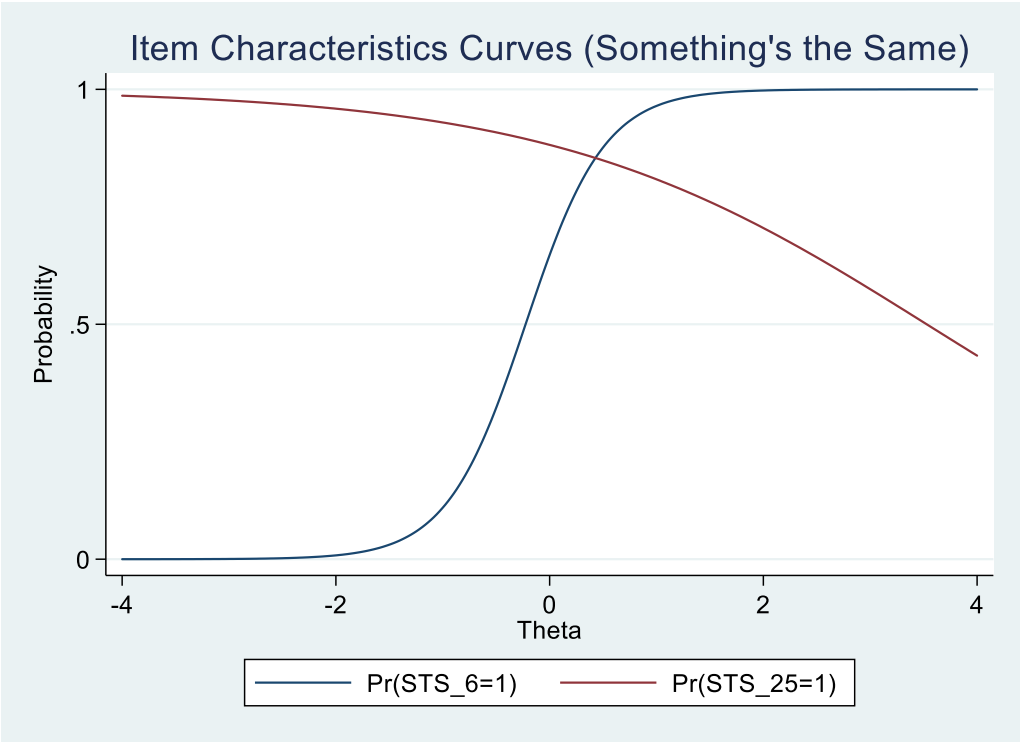

Figure 10. Item characteristics curves of two items of Something's The Same task

Table 15

Item Difficulty (*b), Discrimination* (*a) and their Standard Errors for the Farmer Task* (*Working Memory)*

Item	*a*	*SE*	*b*	*SE*
1	.74	.33	-2.49	1.03
2	.68	.31	-2.41	1.03
3	.52	.25	-.99	.60
4	.48	.24	-.97	.63
5	.77	.33	-2.19	.84
6	.32	.27	-4.34	3.64
7	1.20	.36	-.96	.30
8	.89	.31	-1.19	.43
9	1.41	.39	-.55	.22
10	1.22	.35	-.51	.24
11	1.38	.37	-.18	.20
12	1.82	.51	-.80	.22
13	1.97	.56	-.90	.22
14	.89	.29	-.52	.30
15	1.62	.42	.20	.18
16	1.32	.36	-.06	.20
17	1.09	.32	-.21	.23
18	1.09	.33	-.75	.29
19	1.16	.33	-.24	.23
20	1.42	.38	.22	.20
21	1.70	.44	.27	.18
22	1.30	.36	.10	.20
23	1.28	.36	.28	.21
24	1.14	.33	.02	.22

Continued…

Item	*a*	*SE*	*b*	*SE*
25	.92	.29	.02	.26
26	1.11	.34	.85	.30
27	1.01	.31	.64	.29
28	2.03	.57	.90	.21
29	1.54	.40	-.09	.18
30	1.87	.49	.52	.19
31	1.50	.40	.50	.21
32	1.19	.35	.67	.26
33	2.47	.76	1.07	.22
34	1.51	.44	.96	.26
35	1.61	.43	.61	.21
36	1.63	.44	.69	.22

Note. SE= standard error, *a*= item difficulty, *b*= item discrimination

Table 15 shows item discrimination parameter *'a'*, item difficulty level *'b'* and their standard error, for Farmer task. The item discrimination parameter ranges from .32 to 2.47 explaining that preschoolers' performance on Farmer items has moderate variability in the strength of the relationship between individual items and underlying ability, i.e., preschooler's performance on the Farmer task items were moderately to strongly discriminating. On average Farmer tasks items represents full range of difficulty for preschoolers' to complete, with difficulty parameter ranges from -4.34 to 1.07. The difficulty parameters increased throughout the task. Moreover, Item Characteristic Curves (ICC) were also generated to see the graphical representation for each item of the task. Two exemplary items are shown below with most.

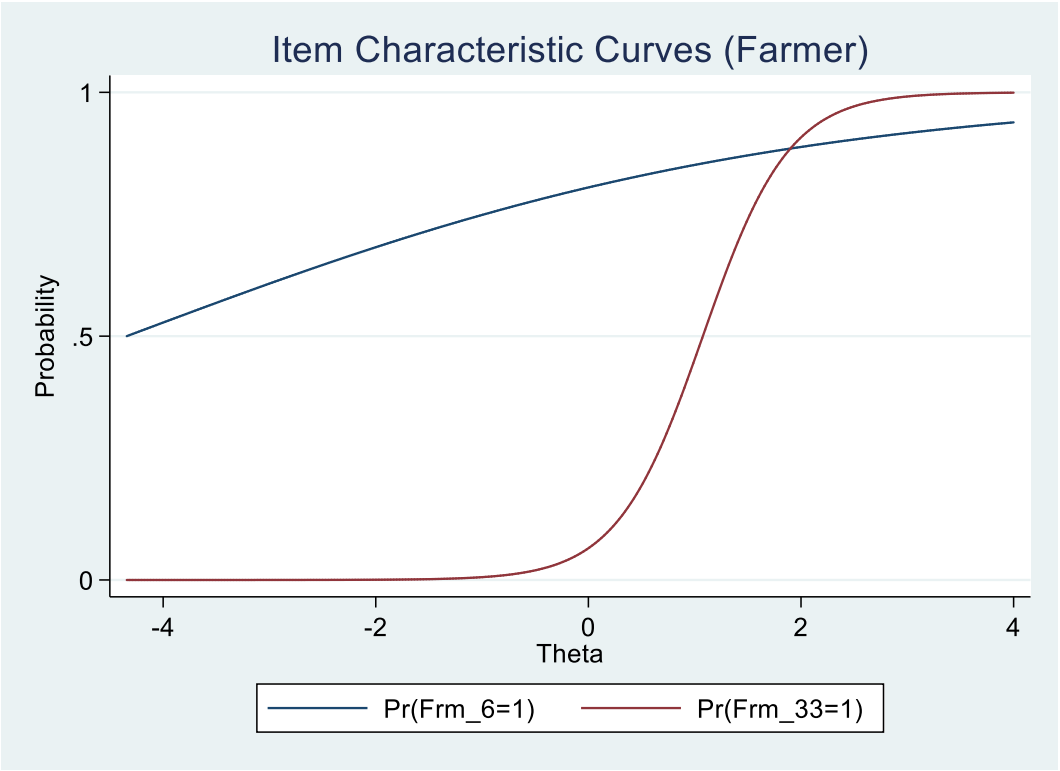

Figure 11. Item characteristics curves of two items of Farmer task

Figure 11 represent the ICC of *Farmer* task of two items with least and most discriminant values (Item 6 and item 33 respectively). Item 33 has a found to be discriminating (a = 2.47), and is difficult too (b = 1.07); On the other hand, the item 6 has negative slope (a = .32) representing the item least discriminant item of *Farmer* task. Further it represented as extremely easy item (b = -4.34). This suggests that a preschooler, who is fairly low in executive functioning, has a chance of getting this item correct.

Test Information Curves

One of the important feature of IRT is its ability to investigate how efficently a test performs over the range of its latent construct it was designed to measure. The performace of any scale can be evalutaed in terms of "test information", which can be evaluated in terms of reliability or precision of an item or complete scale scores over the range of theta i.e., the latent ability. For any given number of items, the height of the test information curve at any given level of theta reflects the strength of the items (the slopes) that make up the test or the scale, in where the dimension of theta, the test information curve peaks is defined in large part by the difficulty parameters of the items that makeup the test (Willoughby, Wirth, & Blair, 2011). Each item for executive function tasks have different number of items, therfore Test information curvers of each task is represented separately.

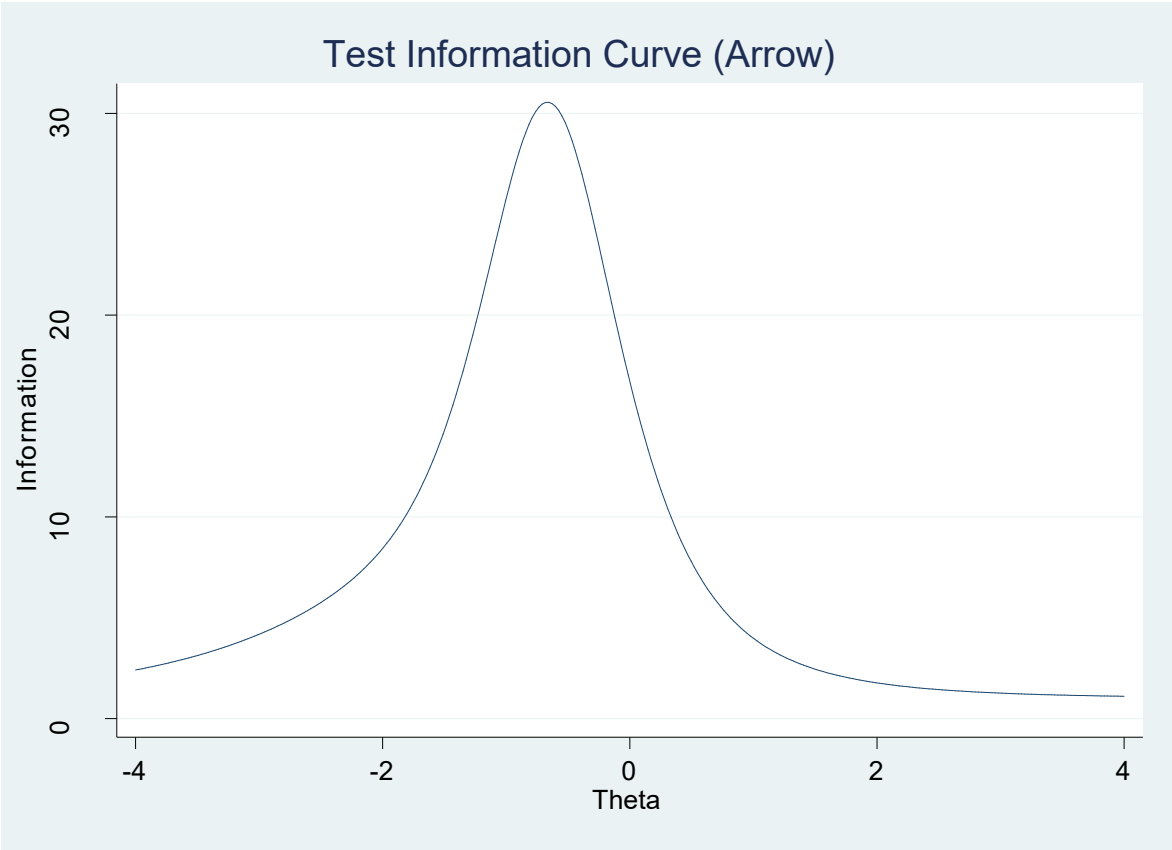

Figure 12. Test Information curves arrow task ± 4 SD around the mean level of executive function ability

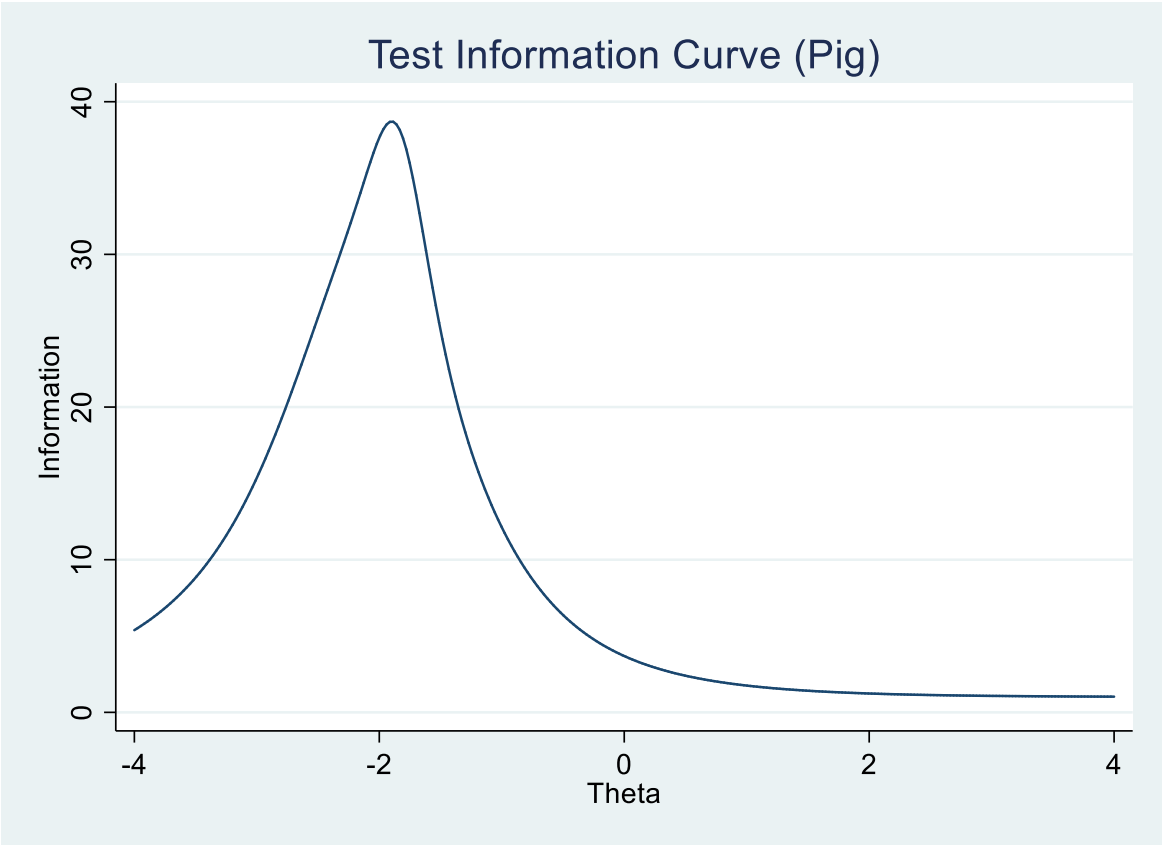

Figure 13. Test information curves pig task ± 4 *SD* around the mean level of executive function ability

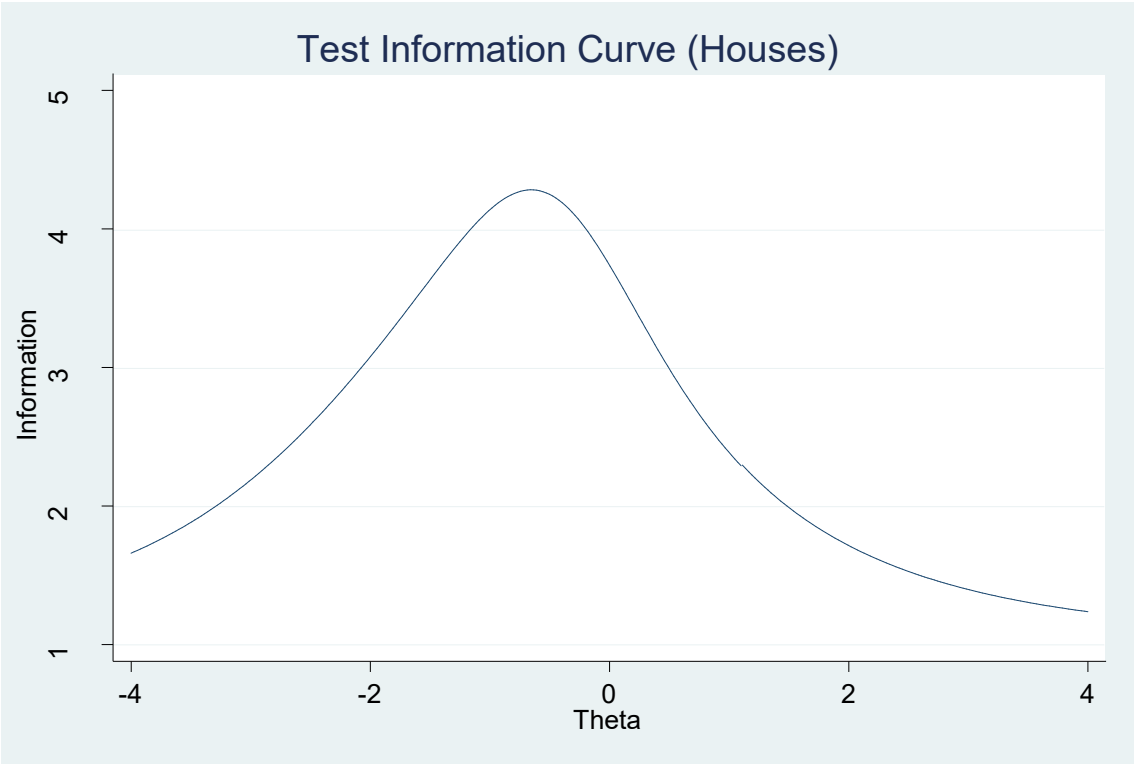

Figure 14. Test information curves houses task ± 4 SD around the mean level of executive function ability

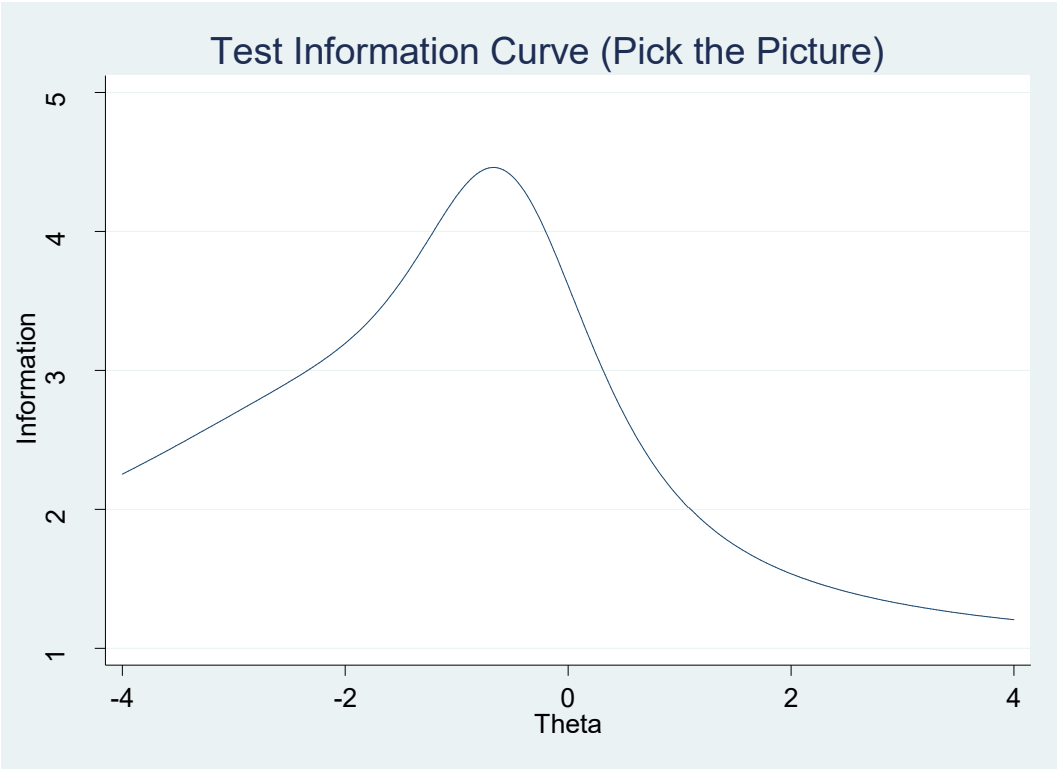

Figure 15. Test information curves pick the picture task ± 4 SD around the mean level of executive function ability

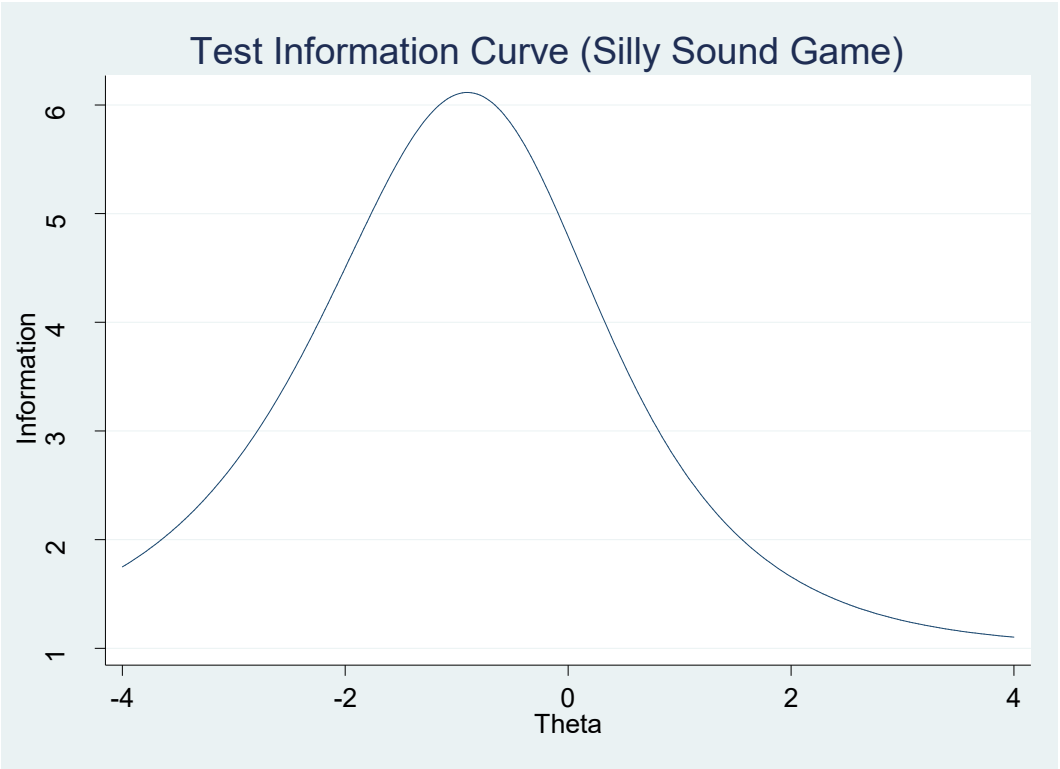

Figure 16. Test information curves silly sound game task ± 4 SD around the mean level of executive function ability

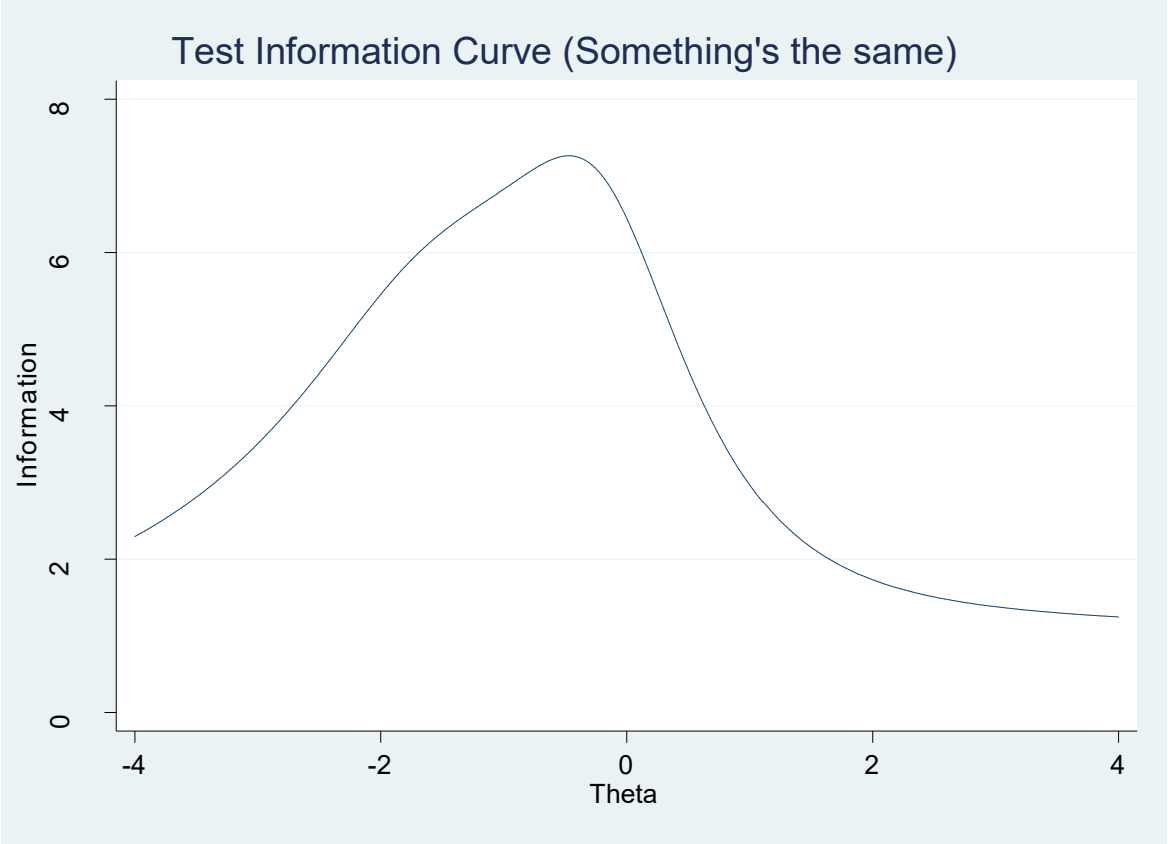

*Figure 17.*Test information curves somethings's the same ± 4 SD around the mean level of executive function ability

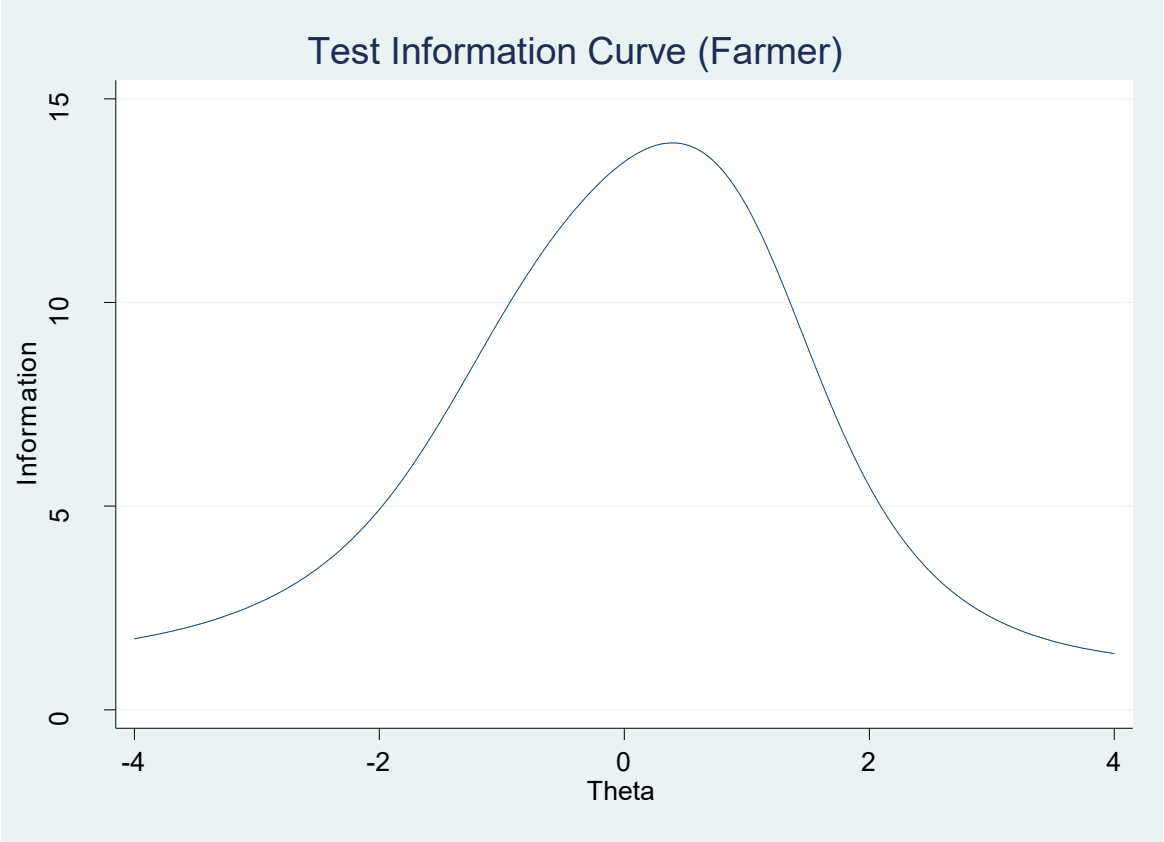

Figure 18. Test information curves farmer task ± 4 SD around the mean level of executive function ability

Above figures 12 to 18 represents the test information Curves from the seven executive function tasks. TIF plots the test information function for the currenlty fitted IRT model. As it can be seen different tasks are higher or lower at different points along the theta i.e., the executive function ability. The figures represents different information about preschoolers' executive function according to their true level of ability peak between 2 standard deviation below and high the sample mean of executive function ability. Though the Arrow and the Pig task provides more infomration with high curves as compare to rest of the tasks. But for the Pig task the peak is below the mean around at 2 standard deviation on executive function ability.

On the hand, pick the picture, houses, silly sound games, something's the same reflects the scores around the mean of EF ability. The figures above suggesting that each task provide reliable scores for preschoolers, and their true ability ranges from relatively moderate to avarage.

Differential Item Functioning

Differential item functioning (DIF) was assessed for each task for children who were residing in low (n = 66) and middle (n = 54) income household. The low income status was defined by Pakistan business recorder in terms of composite index and it fall within 50 thousands rupees range in low income and more than falls in middle income group. DIF was assessed to see that whether items of each task that are intended to investigate the latent ability of executive function were favoring the one income household groups over the other using Logistic regression DIF. The logistic regression used both the uniform and nonuniform DIF. According to Penfield and Lam (2000) uniform group effect is when there is advantage of one group over another on a the scale item is uniform or unidirectional and consistently favoring one group across all items of the ability scale. On the other hand, the non-uniform group effects is when group over the other group alter its direction on ability scale and is not uniform on the ability scale, and there exist interaction between the ability level of the individual and the group membership (Mellenbergh, 1982). The DIF for each task of executive function touch battery are given below. Because it is unnecessary to display all items, it is suggested to show only items whose p-value falls below a certain significance level (StataCorp, 2019).

Arrow task.

Table 16

Differential Item Functioning for the Arrow Task Across Low and High Household Income

	Non-uniform		Uniform	
Item No.	χ^2	*p*	χ^2	*p*
6	3.72	.05	.	.
10	3.78	.05	.	.
32	4.39	.03	.	.
35	4.08	.04	.	.

Note. χ^2= Chi² ; **p*<.05

Table 16 shows the DIF for the items of the arrow tasks. The total numbers of items for Arrow task were 36. For the Arrow task only four items were found to exhibit possible DIF and that for non-uniform DIF. suggesting no significant DIF was found on most of the items of arrow task for the two groups of household income.

Pig task.

Table 17

Differential Item Functioning for the Pig Task Across Low and High Household Income

	Non-uniform		Uniform	
Item No.	χ^2	*p*	χ^2	*p*
7	.	.	5.43	.01
11	8.67	.00	.	.
14	4.92	.02	.	.
18	.	.	6.59	.01
21	4.97	.02	.	.
28	4.90	.02	.	.
30	.	.	6.65	.00
34	3.58	.05	.	.
36	3.58	.05	.	.
40	4.30	.03	.	.

Note. χ^2= Chi² ; **p*<.05

Table 17 shows the DIF for the items of the Pig tasks. For the Pig task out of 40 items only 10 items were found to exhibit possible DIF. Suggesting no significant DIF was found on most of the items of Pig task for the two groups of household income and that items worked equally good for most of the items of the task.

Houses task. For the Houses task only one item was found to exhibit possible DIF. The item 14, $\chi^2 = 4.05$, $p < .04$. No significant DIF was found for rest of the task that it works differently for preschoolers residing in different household income.

Pick the picture task.

Table 18

Differential Item Functioning for the Pick the Picture Task Across Low and High Household Income

	Non-uniform		Uniform	
Item No.	χ^2	*p*	χ^2	*p*
8	8.03	.00	.	.
15	3.75	.00		
19	.	.	9.56	0.00

Note. χ^2= Chi² ; **p*<.05

Table 18 shows the DIF for the items of the Pick the Picture tasks. For the Pick the Picture task out of 32 items only 3 items were found to exhibit possible DIF. Suggesting no significant DIF was found on most of the items of Pick the Picture task for the two groups of household income and that items worked equally good for most of the items of the task.

Silly sound game task.

Table 19

Differential item functioning for the Silly Sound Game task across low and high household income

	Non-uniform		Uniform	
Item No.	χ^2	*p*	χ^2	*p*
4	3.60	.05	.	.
11	4.67	.03	.	.

Note. χ^2= Chi² ; **p*<.05

Table 19 shows the DIF for the items of the Silly Sound Game tasks. For the Silly Sound Game out of 17 items only 2 items were found to exhibit possible DIF.

Suggesting no significant DIF was found on most of the items of Silly Sound Game for the two groups of household income and that items worked equally good for most of the items of the task.

Something's the Same task.

Table 20

Differential Item Functioning for the Something's the Same Task Across Low and High Household Income

	Non-uniform		Uniform	
Item No.	χ^2	*p*	χ^2	*p*
7	.	.	3.81	.05
16	.	.	8.59	.00
17			4.23	.03

Note. χ^2= Chi² ; **p*<.05

Table 20 shows the DIF for the items of the Something's the Same task. For the Silly Sound Game out of 17 items only 3 items were found to exhibit possible DIF. Suggesting no significant DIF was found on most of the items of Something's the Same for the two groups of household income and that items worked equally good for most of the items of the task.

Farmer task.

Table 21

Differential Item Functioning for the Farmer Task Across Low and High Household Income

	Non-uniform		Uniform	
Item No.	χ^2	*p*	χ^2	*p*
1	8.80	.00	.	.
2	5.56	.01	.	.
19	.	.	9.32	.00
32	4.18	.04	.	.
33	.	.	5.67	.01

Note. χ^2= Chi² ; *p<.05

Table 21 shows the DIF for the items of the Farmer task. For the Farmer out of 36 items only 5 items were found to exhibit possible DIF. Suggesting no significant DIF was found on most of the items of Farmer for the two groups of household income and that items worked equally good for most of the items of the task.

Inter scale correlation. Inter scale correlation was computed to see the direction of relationship between EF, maternal, maternal and teacher MST, quality of parenting and other important demographic variables. The table 22 shows statistically significant relationship of age and gender of the preschoolers with their executive functioning as well as maternal, paternal and teacher mental state talk and quality of parenting. Also mother education was found to be correlated with their mental state talk, quality of parenting and executive functioning of the preschoolers. On the other hand father education was found to have statistically positive relationship between quality of parenting and executive functioning of the preschooler. Moreover, there was statistically significant relationship between teacher's mental state talk and executive function of the preschoolers.

Table 22

Inter Scale Correlations for Study Variables (N=120*)*

No	Variables	1	2	3	4	5	6	7	8	9	10	11	12
1	C_age	-	.04	.03	.14	.13	.00	.05	.21*	.22*	.30*	.39*	.46**
2	Gender		-	.13	.04	.03	.07	.15	.33*	.38*	.21*	.30*	.42*
3	M_edu			-	.06	.09	.01	.14	.24**	.13	.11	.38*	.48*
4	F_edu				-	.50*	.01	.03	.12	.22*	.04	.70**	.80**
5	Fam_IC					-	.04	.15	.01	.03	.09	-.08	.43*
6	T_Edu						-	.13	.01	.03	.29*	.03	.19*
7	T_Exp							-	.04	-.08	.23*	.15	.27**
8	M_MST								-	-.05	.07	.42*	.84**
9	F_MST									-	.13	.34*	.47*
10	T_MST										-	-.09	.43**
11	QoP											-	.86**
12	EF_T												-

*Note. *p*<.05, ***p*<.01, ****p*<.001, C_age= Child Age, M_edu= Mother Education, F_edu= Father Education, Fam_IC= Family income household income, T_edu= Teacher Education, QoP= Quality of parenting, EF_T= Executive Function total

Reliability analysis for coding of Mental State Talk. The Cohen kappa value was calculated for assessment of content of the father, mother and teacher mental state talk on mutually exclusive categories of: desire, emotions and cognitions by two independent trained raters for the 40% of the data (*N*=48). The Cohen kappa value for three categories (desire, emotion and cognition) was .82, .81 and .83 for father, .81, .81 and .84 for mothers and .84, .83 and .82 for teachers' talk respectively, which is more than substantial.

Mental State Talk employed by father, mothers and teachers.

Table 23

Descriptive Statistics for Mental State Talk Measures for Mother, Father and Teacher with the Preschoolers (*N*=120+120+67*)*

	Type of talk	*M*	*SD*	Range
Father	Desire	8.47	3.57	1-20
	Emotion	17.8	5.14	5-30
	Cognition	31.93	11.04	14-68
	Total MST	57.0	14.63	23-89
	MST (Proportion)	.20	.10	.05 - .51
Mother	Desire	6.16	2.92	0-16
	Emotion	40.63	11.14	5-69
	Cognition	19.99	8.26	8-44
	Total MST	66.66	15.9	30-117
	MST (Proportion)	.20	.16	.05 - 1.38
Teacher	Desire	3.67	2.2	0-12
	Emotion	11.12	3.65	3-24
	Cognition	56.13	10.94	28-86
	Total MST	70.80	11.7	39-97
	MST (Proportion)	.13	.03	.06-.25

Note. M = Mean, SD = Standard deviation, MST= Mental state talk

Table 23 shows the mental state talk employed by the father, mother and teachers of the preschoolers. The table reveals that father, mother and teachers differ in their use of mental state talk while reading wordless picture story books to the

preschoolers. The table shows that teachers and father use more cognitive talk (*M*=56.13, *SD*= 10.94; *M*=31.93, *SD*=11.04) as compare to mothers with *M*=19.99, *SD*= 8.26 as well as than the desire and emotional talk. On the other hand, mother use more emotional talk (*M*= 40.63, *SD*=11.14) as compare fathers and teachers with (*M* = 17.8, *SD* = 5.14) and (*M* = 11.12, *SD* = 3.65) respectively, as well then desire (*M* =6.16, *SD*= 2.92) and cognitive talk (*M*=19.99, *SD*= 8.26).

Table 24

Hierarchical Regression Analysis Predicting EF Composite (*N*= 120*)*

Predicted Variables	**B**	**95% CI for B**		**SE B**	***β***	**R2**	**ΔR2**
		LL	UL				
Step 1						.21	.21
Preschooler age	.35**	.23	.48	.06	.46		
Step 2						.28	.07
Preschooler age	.26**	.13	.40	.06	.34		
Mother Education	.40**	.16	.63	.12	.28		
Step 3						.69	.40
Preschooler age	.14**	.06	.23	.04	.19		
Mother Education	.06	-.10	.22	.08	.04		
Mother mental state talk	.63**	.53	.73	.05	.72		
Step 4						.70	.01
Preschooler age	.15**	.06	.23	.04	.19		
Mother Education	.01	-.15	.18	.08	.01		
Mother mental state talk	.59**	.48	.70	.05	.67		
Father mental state talk	.12**	.00	.23	.05	.12		
Step 5						.84	.14
Preschooler age	.07**	.00	.13	.03	.09		
Mother Education	.06	-.05	.19	.06	.04		
Mother mental state talk	.28**	.18	.38	.04	.32		
Father mental state talk	.08**	.00	.16	.04	.08		
Quality of Parenting	.18**	.14	.21	.01	.55		

**$p < .01$

Table 24 revealed that preschoolers' age, mother education, and mental state talk accounted for the highest contribution in the whole model with 40% variance in

relation to the overall sample of the preschoolers. On the other hand, the whole model tends to explain 84% variance in EF across the collective sample of preschoolers where preschoolers' age, mother education, maternal parental mental state talk, and quality of parenting as predictors contributed differential variance in the outcome (i.e., EF).

According to table 22, the correlation matrix showed that among the covariates; teacher years of experience were positively related to the EF composite as well as MST of the teacher. But table 24 showed that in the presence of parental MST, the teachers' years of experience was excluded from the regression model and it showed no contribution in EF composite of the preschoolers. Therefore an independent regression analysis was carried out with the teacher covariates and the predicting variable teacher MST.

Table 25

Hierarchical Regression Analysis for Teachers' Variables Predicting EF Composite (*N*= 120*)*

Predicted Variables	B	**SE B**	***β***	**95% CI for B**	
				LL	UL
Teacher Education	.17	.86	.01	-1.54	1.89
Teacher Experience	.09**	.04	.10	.00	.17
Teacher Mental State Talk	.27**	.01	.84	.24	.30
R2 = .76					
ΔR2 = .76					

**$p < .01$

Table 25 presents the un-standardized coefficient and confidence interval for multiple linear regression analysis. Results indicated that predictors Teacher mental

state talk and teacher years of experience are significant predictors of executive functioning of the preschoolers. The value of R2 showed that 76% of the variance in the scores of the executive function of the preschoolers can be accounted to teacher mental state talk as well as teacher experience.

Role of quality of parenting as moderator. For the present study the quality of parenting is taken as moderators that could possibly moderate the relationship between Mother/father's mental state talk and executive functioning of preschoolers. Moderation was computed by using PROCESS MACRO by Hayes in SPSS 21. Moderation analysis explores the unique conditions under which two variables are related. The quality of parenting did not moderate in the relationship between father's mental state talk and preschoolers' executive function. Following are the results of moderating effect of Quality of Parenting in relation between Mother's mental state talk and executive function of the preschoolers.

Table 26

Moderating Effect of Quality of Parenting on Mother's Mental State Talk and Executive Functioning (*N*=120*)*

		Executive Functioning	
		95% CI	
Variables	B	LL	UL
(Constant)	-.79	-2.80	1.22
Mothers Mental State Talk	.04*	.01	.07
Quality of Parenting	.55**	.35	.75
Mother MST x QOP	.004*	-.01	-.001
R^2	.77		
F	133.31		
ΔR^2	.0132		
ΔF	6.79		

**$p < .01$, *$p < .05$

Table 26 indicates the result of moderation analysis on the effect of quality of parenting on Mother's Mental State Talk and Executive Functioning. The interaction shows that Quality of Parenting is significantly moderating in the relationship between Mother's Mental State Talk and Executive Functioning of the preschoolers. Further, the detail of the moderation analysis is represented in the mod graph.

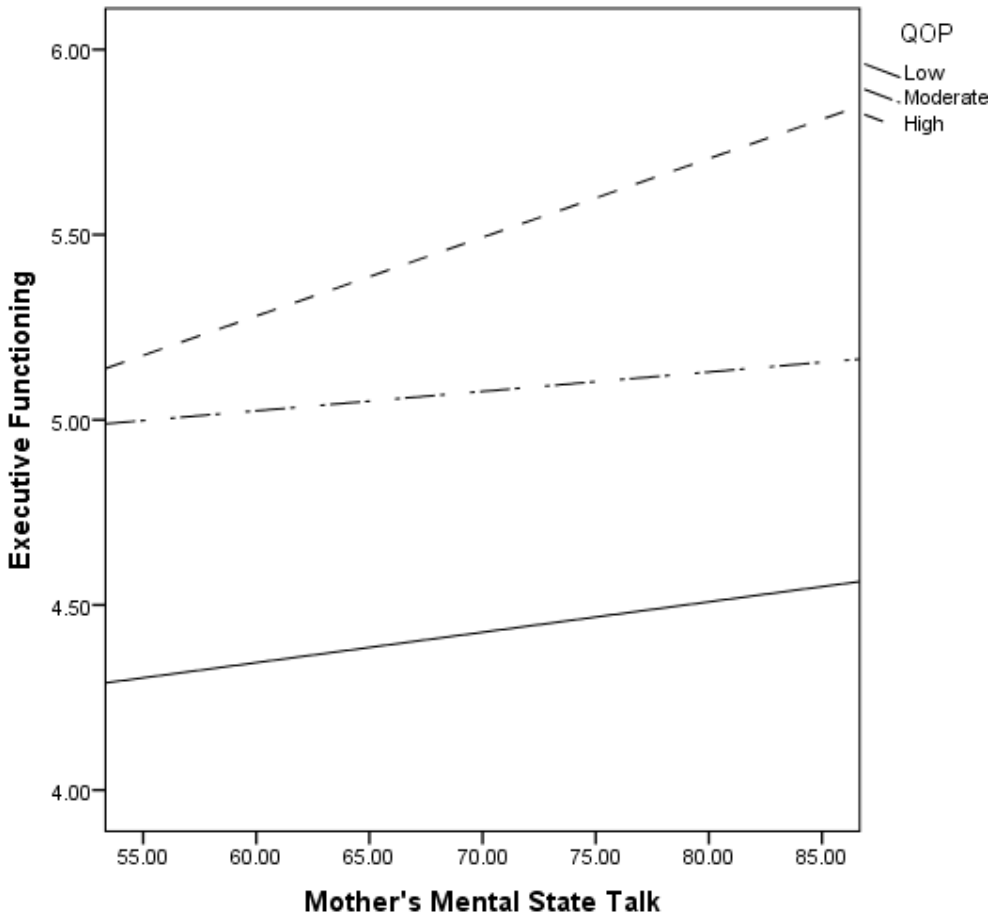

Figure 19. Mod graph of quality of parenting between the effect of mother's mental state talk on executive functioning

Figure 19 represents moderation by Quality of Parenting between the effect of Mother's Mental State Talk on Executive Functioning of the preschoolers. The mod graph depicts that relationship between Mother's Mental State Talk and Executive functioning of Child is moderated significantly when quality of parenting is high. This moderation is in positive direction, which means the moderator is contributing significantly in the relationship between Mother's Mental State Talk and Executive Functioning.

Differences on demographic variables.

Table 27

Mean Differences on Younger and Older Preschoolers on Executive Function Touch Battery (N=120)

Variables	3-3.99 years (*n*=63)		4 -5.99 years (*n*=57)		*t*	*p*	95% *CI*		Cohen's *d*
	M	*SD*	*M*	*SD*			*LL*	*UL*	
Arrows	.65	.20	.79	.18	-3.82	.00	-.20	-.06	-0.73
Silly Sounds Game	.68	.20	.76	.19	-2.23	.02	-.15	-.00	-0.41
Houses	.16	.13	.68	.16	-2.51	.01	-.12	-.01	-3.59
Something 's the same	.71	.13	.78	.10	-3.05	.00	-.11	-.02	-0.60
Pig	.90	.11	.94	.08	-1.84	.67	-.07	.00	N/A
Pick the Picture	.70	.11	.77	.08	-3.84	.00	-.10	-.03	-0.72
Farmer	.49	.19	.61	.18	-3.54	.00	-.19	-.05	-0.65
EF Total	4.7	.66	5.36	.60	-5.10	.00	-.82	-.36	-1.04

Note. M = Mean, SD = Standard deviation, EF= Executive function

Table 27 shows the age differences on executive function of the preschoolers. The values in table reveal that overall the older preschoolers have higher executive function as compared to younger preschoolers (p =.00). Further, it shows that older preschoolers perform better on all the task of executive function covering three domains, working memory, inhibitory control and attention shifting except for one the inhibitory control task ‘Pig’. For the task pig the values in the table shows no significant differences for younger and older preschoolers.

Table 28

Mean Differences of Preschoolers Raised in Home with Lower and Higher Monthly Income on Executive Function Touch Battery (*N*=120)

Variables	Rs. 20,000 – 40,000 (*n*= 45)		Rs. 41,000-70,000 (*n*=36)		Rs 71,000 and above (*n*=39)		*F*	*p*	Groups	*MD* (*I-J*)	η^2
	M	*SD*	*M*	*SD*	*M*	*SD*					
Arrows	.62	.20	.79	.16	.77	.19	9.60	.00	20-40k< 71k and above 20-40k < 41k-70k	-.17* -.14*	.14
Silly Sounds Game	.60	.22	.79	.16	.78	.15	13.47	.00	20-40k< 71k and above 20-40k < 41k-70k	-.18* -.17*	.18
Houses	.60	.14	.65	.15	.68	.16	2.79	.06	N/A		.04
Something 's the same	.69	.13	.78	.11	.76	.11	6.18	.00	20-40k< 71k and above 20-40k < 41k-70k	-.08* -.07*	.09
Pig	.90	.13	.94	.07	.93	.09	1.22	.29	N/A		.02
Pick the Picture	.69	.11	.74	.10	.77	.08	6.58	.00	20-40k< 71k and above	-.08*	.10
Farmer	.48	.19	.56	.19	.61	.18	5.27	.00	20-40k< 71k and above	-.08*	.08
EF Total	4.61	.63	5.29	.65	5.33	.56	18.08	.00	20-40k< 71k and above 20-40k < 41k-70k	-.68 -.71	.23

Note. M = Mean, SD = Standard deviation, EF= Executive function, MD= mean differences

Table 28 shows results of mean differences across different categories of household income on Executive function touch battery. Mean values indicate that significant group differences occurred on overall executive function (F (2,117) = 18.08, p< .001) between preschoolers from different income household. A post-hoc analysis was further computed to examine group differences and the findings revealed that those preschoolers who are raised in families with better monthly income perform better on tasks and have higher executive function as compared to middle and low income household groups. Further, the values reflect that on working memory tasks, 'Farmer and pick the picture' preschoolers who are raised in higher income households had significantly higher score (F (2,117) = 5.27, p< .001; F (2,117) = 6.58, p< .001) as compared to lower higher income households. However, for the third working memory task 'Houses' no group significant differences emerged on the three levels of income households. The results further reveal that on inhibition control tasks ' arrow and silly sound games', preschoolers from higher income households had significantly higher score (F (2,117) = 9.60, p< .001) (F (2,117) = 13.47, p< .001) as compared the from lower income households. However, for the third inhibition control task 'Pig' no group significant differences appeared at any level. Further, the results on attention shifting task 'Something's the same', preschoolers from higher income households had significantly higher score (F (2,117) = 6.18, p< .001) as compared to preschoolers from lower income households.

Table 29

Mean Differences Among Girls and Boys (*preschoolers) on Executive Function Touch Battery* (*N*=120)

Variables	Boys (*n*=63)		Girls (*n*=57)				95% *CI*		Cohen's *d*
	M	*SD*	*M*	*SD*	*t*	*p*	*LL*	*UL*	
Arrows	.65	.20	.79	.18	-3.82	.00	-.20	-.06	-0.73
Silly Sounds Game	.68	.20	.76	.19	-2.23	.02	-.15	-.00	-0.41
Houses	.61	.13	.68	.16	-2.51	.01	-.12	-.01	-0.48
Something 's the same	.71	.13	.78	.10	-3.05	.00	-.11	-.02	-0.60
Pig	.90	.11	.94	.08	-1.84	.06	-.07	.00	N/A
Pick the Picture	.70	.11	.77	.08	-3.84	.00	-.10	-.03	-0.72
Farmer	.49	.19	.61	.18	-3.54	.00	-.19	-.05	-0.65
EF Total	4.76	.66	5.36	.60	-5.10	.00	-.82	-.36	-0.95

Note. EF= Executive function; M= Mean; SD= standard deviation

Table 29 shows the gender differences on the executive function task. The values in the table reflect that girls perform better on all individual tasks as compared to boys. Moreover, mean of overall executive functioning is also higher in girls as compared to boys (p <.001). The results also depict that there are significant mean difference in all the tasks and domain of executive function except for the inhibitory control task ‘Pig.

Table 30

Mean Differences of Mothers' years of Education on Preschoolers Executive Function (*N*=120)

Variables	Up to 5 years (*n*=28)		10- 12 years (*n*=58)		14 years and above (*n*=34)		*F*	*p*	Groups	*MD* (*I-J*)	η^2
	M	*SD*	*M*	*SD*	*M*	*SD*					
Arrows	.60	.16	.72	.21	.81	.18	9.61	.00	up to5 years <14 years and above up to5 years < 10-12 years	-.12* -.21*	.14
Silly Sounds Game	.63	.24	.71	.18	.80	.18	6.12	.00	up to5 years <14 years and above	-.17*	.09
Houses	.60	.14	.64	.16	.68	.15	2.27	.10	N/A		.03
Something 's the same	.65	.13	.75	.10	.80	.11	13.04	.00	up to5 years <14 years and above up to5 years < 10-12 years	-.09* -.15*	.18
Pig	.92	.09	.91	.10	.94	.10	.62	.53	N/A		.01
Pick the Picture	.66	.09	.74	.10	.78	.09	11.21	.00	up to5 years <14 years and above up to5 years < 10-12 years	-.07* -.11*	.16
Farmer	.44	.21	.55	.17	.61	.19	6.41	.00	up to5 years <14 years and above up to5 years < 10-12 years	-.10* -.17*	.09
EF Total	4.51	.57	5.06	.63	5.47	.62	18.26	.00	up to5 years <14 years and above up to5 years < 10-12 years	-.54* -.95*	.23

Note. M = Mean, SD = Standard deviation, EF= Executive function, MD= mean differences

Table 30 shows results of mean differences across different categories of mother's qualification (years of education) on executive function of the preschoolers. Mean values indicate that significant group differences occurred on overall executive function of preschoolers (F (2,117) = 18.26, p< .001) across different groups of mothers' years of education.

A post-hoc analysis was further computed to find out within group differences and the findings revealed that mean scores of mothers with 14 and above years of education (p <.001) was higher on all tasks of executive function as compared to mothers with less than 14 years of education. The values reflect that on working memory tasks, 'Farmer and pick the picture' preschoolers of more educated mothers had significantly higher score (F (2,117) = 6.41, p< .001; F (2,117) = 11.21, p< .001) as compared to the mothers with less than 14 years of education. However, for the third working memory task 'Houses' no group significant differences emerged. The results further reveal that on inhibition control tasks ' arrow', preschoolers of more educated mothers had significantly higher score (F (2,117) = 9.61, p< .001) as compared to the mothers with less than 14 years of education. Moreover for inhibition control tasks ' Silly sound games', preschoolers of more educated mothers had significantly higher score (F (2,117) = 6.12, p< .001) as compared to the mothers with less than 14 years of education. However, for the third inhibition control task 'Pig' no group significant differences appeared. Further, the results on attention shifting task 'Something's the same', preschoolers of more educated mothers had significantly higher score (F (2,117) = 13.04, p< .001) as compared to the mothers with less than 14 years of education.

Table 31

Mean Differences of Fathers' Years of Education on Preschooler Executive Function (*N*=120)

Variables	Up to 5 years (*n*=28)		10- 12 years (*n*=39)		14 years and above (*n*=53)		*F*	*p*	Groups	*MD* (*I-J*)	η^2
	M	*SD*	*M*	*SD*	*M*	*SD*					
Arrows	.52	.16	.69	.19	.84	.14	36.45	.00	14 years and above >up to5 years 14 years and above >10-12 years	.32* .15*	.383
Silly Sounds Game	.51	.21	.72	.15	.83	.14	33.57	.00	14 years and above >up to5 years 14 years and above >10-12 years	.31* .10*	.364
Houses	.55	.14	.61	.12	.71	.15	12.50	.00	14 years and above >up to5 years 14 years and above >10-12 years	.15* .10*	.176
Something 's the same	.65	.13	.73	.11	.80	.10	16.46	.00	14 years and above >up to5 years 14 years and above >10-12 years	.15* .07*	.219
Pig	.85	.16	.93	.07	.95	.04	11.03	.00	up to5 years<14 years and above up to5 years< 10-12 years	-.07* -.10*	.158
Pick the Picture	.66	.11	.71	.08	.79	.07	20.09	.00	14 years and above >up to5 years 14 years and above >10-12 years	.13* .07*	.255
Farmer	.40	.20	.52	.15	.64	.17	16.71	.00	14 years and above >up to5 years 14 years and above >10-12 years	.23* .11*	.222
EF Total	4.16	.44	4.94	.42	5.60	.39	110.82	.00	14 years and above >up to5 years 14 years and above >10-12 years	1.43* .65*	.654

Note. M = Mean, SD = Standard deviation, EF= Executive function, MD= mean differences

Table 31 shows results of mean differences across different categories of father's qualification (years of education) on executive function of the preschoolers. Mean values indicate that significant group differences occurred on overall executive function of preschoolers (F (2,117) = 110.82, p< .001) across different groups of fathers' years of education.

A post-hoc analysis was further computed to find out within group differences and the findings revealed that the mean scores of fathers with 14 and above years of education (p <.001) was higher on all tasks of executive function as compared to fathers with less than 14 years of education. Moreover, the table reflects that fathers with 14 and above years of education has higher mean score on all three domain of working memory, inhibition control, and attention shifting of the executive function of the preschoolers.

Table 32

Mean Differences of Father, Mother and Teacher's Mental State Talk Among Younger and Older Preschoolers (*N*=120*)*

	Type of Talk	3-3.99 years (*n*=63)		4 -5.99 years (*n*=57)		*t*	*p*	95% *CI*		Cohen's *d*
		M	*SD*	*M*	*SD*			*LL*	*UL*	
Father										
	Desire	8.10	3.51	8.88	3.63	-1.1	.23	-2.07	.510	N/A
	Cognition	28.70	8.93	35.49	12.09	-3.5	.00	-10.61	-2.97	-0.64
	Emotion	16.65	4.72	19.07	5.32	-2.6	.00	-4.23	-.603	-0.48
	Total MST	51.76	13.02	62.80	14.22	-4.44	.00	-15.97	-6.11	-0.81
Mother										
	Desire	5.54	2.63	6.86	3.09	-2.52	.01	-2.35	-.28	-0.46
	Cognition	19.37	7.46	20.68	9.09	-.87	.38	-4.31	1.67	N/A
	Emotion	39.21	10.13	42.21	12.05	1.48	.14	-7.01	1.00	-0.27
	Total MST	63.28	16.19	70.40	14.82	-2.50	.01	-12.75	-1.48	-0.46
Teacher										
	Desire	3.33	2.29	4.04	2.05	-1.75	.08	-1.49	.08	-0.33
	Cognition	54.89	13.29	57.49	7.44	-1.30	.19	-6.55	1.34	N/A
	Emotion	10.87	3.85	11.39	3.44	7.66	.00	-1.83	-.81	-0.14
	Total MST	65.69	12.74	76.43	7.03	-5.63	.00	-14.51	-6.96	-1.03

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk

Table 32 shows mean differences of father, mother and teachers' mental state talk on different age groups of preschoolers. Values in the table indicate that mean of father; mother and teacher mental state talk was significantly greater for older preschoolers as compared to younger preschoolers, indicating that father, mother and teachers use more mental state talk with older preschoolers as compared to younger preschoolers (p <.00). Further, mean of teachers' overall mental state talk use is significantly higher with the older preschoolers as compared to younger preschoolers. Results further reveal that the fathers' mental state talk use differs significantly on emotional and cognitive terms for

both groups. However, for desire there are no significant differences between the two groups. Moreover, father use more cognitive and emotional terms with older preschoolers than younger preschoolers. For mother mental state talk, the results reflects that mothers use more mental state talk with older preschoolers and differ significantly on desire and emotional terms while talking to their preschoolers, indicating mothers use more emotional and desire terms with older preschoolers. However for mothers' cognitive talk, no significant differences emerged between the two groups. Results for teacher mental state talk, show significant differences for older and younger preschoolers. The results further reveal that the for teachers' cognitive talk no differences appeared for the two groups. However, significant differences exist for desire and emotional terms for both the groups.

Table 33

Mean Differences of Preschoolers Raised in Home with Lower and Higher Monthly Income on Mothers and Fathers' Mental State Talk (*N*=120*)*

Type of Talk	Rs. 20,000 – 40,000 (*n*=45)		Rs. 41,000-70,000 (*n*=36)		Rs. 71,000 and above (*n*=39)						
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*	Groups	*MD* (*I-J*)	η^2
Father											
Desire	7.73	3.44	9.42	3.92	8.44	3.25	2.26	.10	N/A		.03
Cognition	27.36	8.35	34.64	11.74	34.69	11.6	6.76	.00	71k and above>20-40k	7.33*	.103
Emotion	16.91	4.18	18.42	5.97	18.26	5.31	1.09	0.34	N/A		.01
Total MST	50.8	13.17	55.97	13.66	65.12	13.55	12.01	.00	71k and above>20-40k 71k and above>41k-70k	14.32* 9.15*	.17
Mother											
Desire	6.02	2.52	6.89	3.01	5.67	3.21	1.73	.18	N/A		.02
Cognition	18.78	8.93	21.67	7.88	19.85	7.74	1.24	.29	N/A		.02
Emotion	36.98	9.48	41.75	11.14	43.82	11.96	4.4	.01	71k and above>20-40k	6.84	.070
Total MST	62.33	14.82	60.03	11.09	77.79	15.27	18.60	.00	71k and above>20-40k 71k and above>41k-70k	15.46* 17.76*	.241

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk, MD= mean differences

Table 33 shows results of mean differences of father and mother mental state talk across lower, middle and higher household income of the preschoolers. Mean values indicate that significant group differences occurred on father's mental stat talk (F (2,117) = 12.01, p< .001) across high, middle and low income household groups of preschoolers. A post-hoc analysis was further computed to find out within group differences and the findings revealed that mean of father's cognitive talk was significantly higher (p<.001) for preschooler in higher income household as compared to lower income household, whereas no significant differences emerged for preschooler in middle and lower income household. The table further shows that no significant differences emerged for fathers' emotional and desire talk for the all three income household groups. For mother mental state talk, mean values indicate that overall significant group differences occurred on mother mental state talk (F (2,117) = 18.60, p <.001) across high, middle and low income household groups of preschoolers. A post-hoc analysis was further computed to find out within group differences and the findings revealed that the mother emotional talk was significantly higher (p<.001) for preschooler in higher income household as compared to lower income household. The table further shows that no significant differences emerged for mothers' cognitive and desire talk for the three groups.

Table 34

Mean Differences of Father Mental State Talk Across Father's Years of Education (*N*=120)

Type of talk	Up to 5 years (*n*= 28)		10- 12 years (*n*=39)		14 years and above (*n*=53)		*F*	*p*	Groups	*MD* (*I-J*)	η^2
Variables	*M*	*SD*	*M*	*SD*	*M*	*SD*					
Desire	6.71	3.39	7.90	3.36	9.81	3.35	8.56	.00	14 years and above >up to5 years 14 years and above >10-12 years	3.09* 1.91*	.127
Cognitive	26.89	8.09	26.62	9.13	38.49	10.27	22.96	.00	14 years and above >up to5 years 14 years and above >10-12 years	11.59* 11.87*	.281
Emotions	16.04	4.38	15.92	4.70	20.11	4.96	11.26	.00	14 years and above >up to5 years 14 years and above >10-12 years	4.07* 4.19*	.161
Total MST	52.75	12.76	53.00	13.13	62.20	15.17	6.54	.00	14 years and above >up to5 years 14 years and above >10-12 years	9.45* 9.20*	.100

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk, MD= mean differences

Table 34 shows mean differences of fathers' mental state talk across low, middle and high level of fathers' years of education. Mean values indicate that significant group differences occurred on father mental stat talk (F (2,117) = 6.54, $p<$ .001) across different groups of fathers' years of education. A post-hoc analysis was further computed to find out within group differences and the findings revealed that the cognitive, emotional and desire talk was significantly higher ($p<.001$) for those fathers who have 14 and above years of education as compared to fathers with less than 14 years of education. Further the results show that fathers who have 14 and above years of education use more overall mental state talk as well as more cognitive, desire and emotional talk as compared to fathers with less than 14 years of education.

Table 35

Mean Differences of Mother Mental State Talk Across Mother's Years of Education (*N*=120)

Type of talk	Up to 5 years (*n*= 28)		10- 12 years (*n*=58)		14 years and above (*n*=34)		*F*	*p*	Groups	*MD* (*I-J*)	η^2
Variables	*M*	*SD*	*M*	*SD*	*M*	*SD*					
Desire	4.75	1.95	6.12	2.62	7.41	3.55	6.99	.00	14 years and above >up to5 years	2.66*	.106
Cognitive	17.43	8.14	19.48	7.08	22.97	9.50	3.83	.02	14 years and above >up to5 years	5.54*	.061
Emotions	36.71	9.64	39.47	10.17	45.85	12.23	6.29	.00	14 years and above >up to5 years 14 years and above >10-12 years	9.13* 6.38*	.097
Total MST	57.46	11.79	66.58	12.98	74.38	19.33	10.00	.00	14 years and above >up to5 years 14 years and above >10-12 years	16.91* 7.79	.146

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk, MD= mean differences

Table 35 shows mean differences of mothers' mental state talk of the preschoolers across different categories of mothers' years of education. Mean values indicate that significant group differences occurred on mother mental stat talk (F (2,117) = 10.00, $p<$ .001) across all three groups of mothers years of education. Further the results show that mothers with education of 14 and more years use more overall mental state talk as well as more cognitive, desire and emotional talk as compared to mothers with up to 5 years of education and 10 to 12 years of education . A post-hoc analysis was further computed to find out within group differences and the findings revealed that the for mothers who have 14 years of education emotional talk was significantly higher ($p<.001$) as compared to mother with 10 to 12 and up to 5 years of education. Moreover, for desire and cognitive talk, the results show significant differences for mother with 14 and above years of education and mother with up to 5 years of education whereas show no significant differences for 10 to 12 years and up to 5 years of education.

Table 36

Mean Differences of Father, Mother, Mental State Talk Among Girls and Boys (*N*=120*)*

	Type of talk	Boys (*n*=63)		Girls (*n*=57)		*t*	*p*	95% *CI*		Cohen's *d*
		M	*SD*	*M*	*SD*			*LL*	*UL*	
Father										
	Desire	8.10	3.51	8.88	3.63	-1.19	.23	-2.07	.51	N/A
	Cognition	28.70	8.93	35.49	12.09	-3.52	.00	-10.61	-2.97	-0.64
	Emotion	16.65	4.72	19.07	5.32	-2.63	.00	-4.23	-.603	-0.48
	Total MST	51.76	13.02	62.80	14.22	-4.44	.00	-15.97	-6.11	-0.81
Mother										
	Desire	5.54	2.63	6.86	3.09	-2.52	.01	-2.35	-.28	-0.46
	Cognition	19.37	7.46	20.68	9.09	-.87	.38	-4.31	1.67	N/A
	Emotion	39.21	10.13	42.21	12.05	-1.48	.14	-7.01	1.00	-0.27
	Total MST	63.28	16.19	70.40	14.82	-2.50	.01	-12.75	-1.48	-0.46
Teacher										
	Desire	3.33	2.29	4.04	2.05	-1.75	.08	-1.49	.08	N/A
	Cognition	54.89	13.29	57.49	7.44	-1.33	.19	-6.55	1.34	N/A
	Emotion	10.87	3.85	11.39	3.44	-.76	.44	-1.83	.814	N/A
	Total MST	65.69	12.74	76.43	7.03	-5.63	.00	-14.51	-6.96	-1.03

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk

Table 36 shows gender differences of the preschoolers on mental state talk of fathers, mothers and teachers. The values in the table show the use of overall mental state talk of fathers, mothers and teachers was significantly higher for girls as compared to boys (p <.001). Further, the results showed that fathers' use of cognitive and emotional talk is significantly higher for the girls as compared to boys. For desire talk, the result reflects no significant differences for both the gender. Moreover, mothers emotional and desire mental state talk is also significantly higher for girls as compared to boys. However, for mother cognitive talk, no significant differences emerged for both the gender. For teacher mental state talk, no significant differences appeared for all three

types of mental state talk for both the groups. However results reflect overall significant differences on teacher mental state talk for both the gender.

Table 37

Mean Differences of Teachers' Mental State Talk across Educational Qualification (*N*=120*)*

Type of talk	14 Years Education (*n*=35)		16 Years and above Education (*n*=85)				95% *CI*		Cohen's *d*
	M	*SD*	*M*	*SD*	*t*	*p*	*LL*	*UL*	
Desire	3.89	2.16	3.58	2.22	.69	.48	-.56	1.18	N/A
Cognition	54.26	13.09	56.89	9.91	-1.20	.23	-6.98	1.70	N/A
Emotion	10.89	4.34	11.21	3.36	-.44	.65	-1.78	1.13	N/A
Total MST	58.62	8.78	75.81	8.69	-9.81	.00	-20.65	-13.71	-1.97

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk

Table 37 shows mean differences of teachers' educational qualification on mental state talk of teachers of the preschoolers. The values in the table show the mean of overall mental state talk of teachers was significantly higher for teachers with post-graduation qualification (p =.001). However for, emotional, desire, and cognitive talk of teachers, no significant differences emerged between the two groups.

Table 38

Mean Differences on Mental State Talk across Teacher's Years of Experience (*N*=120)

Type of talk	0 – 2 years (*n*= 43)		2.1 – 4 years (*n*=42)		4 and above years (*n*=35)		*F*	*p*	Groups	*MD* (*I-J)*	η^2
	M	*SD*	*M*	*SD*	*M*	*SD*					
Desire	3.47	2.62	3.86	1.70	3.69	2.20	.33	.71	N/A		.00
Cognitive	54.40	13.70	57.26	7.41	56.89	10.73	.84	.43	N/A		.01
Emotions	10.16	4.28	11.50	2.99	11.83	3.39	2.41	.09	N/A		.03
Total MST	65.41	10.05	65.59	8.78	83.65	4.58	58.81	.00	4 years and above >up to 2.1 to 4 years 4 years and above >0-2 years	18.23* 18.06*	.501

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk, MD= mean differences

Table 38 shows results of mean differences of mental state talk of teachers of the preschoolers across different groups of years of teaching experience. The mean value of overall mental state talk of teachers indicate that significant group differences occurred on teacher mental state talk (F (2, 117) = 58.81, p<.001) across all three categories of years of teaching experience. A post-hoc analysis was further computed to find out within group differences and the findings revealed that teachers mean of overall mental state talk was significantly higher (p<.001) for teachers with 4 and more years of teaching experience as compared to teachers with up to 2 years of teaching experience. However for emotional, desire and cognitive talk, no significant differences emerged for all three groups of teaching experience.

Supplementary Analysis

One of the objectives was to explore the differences on Mental State talk among father and mothers who spend more time talking with their preschoolers every day or over the weekend. Furthermore, to see the differences on Mental State talk among father and mothers, who tells story to their preschoolers with or without books in their daily routine.

Table 39 shows results of one way ANOVA to find out the mean differences of preschoolers' father and mother mental state talk across four different categories of talking hours per day. The mean values of overall and on each type of mental state talk of mother and father indicate that no significant group differences emerged at any level of talking hours of father (F (2,117) = .06, p >.001) and mother (F (2,117) = 1.32, p >.001).

Table 39

Mean Differences on Mental State Talk Across Talking Hours per day Among Father and Mothers of Preschoolers (*N*=120*)*

Type of Talk	1-2 hours (*n*=25)		2-4 hours (*n*=23)		4-6 hours (*n*=38)		6 and above (*n*=34)				
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*	η^2
Mother											
Desire	6.00	2.61	5.74	2.50	6.18	2.10	6.56	4.06	.52	.66	.00
Cognition	19.16	9.01	19.26	8.42	21.37	9.01	19.56	6.74	.38	.76	.01
Emotion	39.00	11.14	39.96	11.88	41.63	12.46	41.18	9.24	.33	.80	.00
Total MST	65.52	17.80	66.50	15.04	67.28	13.55	66.50	15.04	.06	.97	.00
Father	(*n*=43)		(*n*=35)		(*n*=21)		(*n*=21)				
Desire	8.86	3.66	7.29	2.97	8.76	2.25	9.33	4.90	1.95	.12	.04
Cognition	31.88	10.05	32.46	11.97	28.29	8.87	34.76	12.98	1.25	.29	.03
Emotion	17.95	5.43	17.17	4.76	18.29	4.08	18.05	6.24	.26	.85	.00
Total MST	54.53	13.97	59.00	16.93	54.76	14.57	61.00	11.09	1.32	.27	.03

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk

Table 40

Mean Differences on Mental State Talk Across Talking Hours over the Weekend Among Father and Mothers of Preschoolers (*N*=120*)*

Type of Talk	1-2 hours (*n*=21)		2-4 hours (*n*=22)		4-6 hours (*n*=28)		6 and above (*n*=49)				
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*	η^2
Mother											
Desire	7.38	3.64	5.18	2.51	6.18	1.99	6.20	3.04	2.34	.07	.02
Cognition	22.71	11.34	19.18	7.13	20.50	8.60	19.06	7.07	1.08	.35	.05
Emotion	38.95	12.24	42.79	9.55	38.32	11.80	41.16	11.24	.85	.46	.02
Total MST	67.95	17.32	64.03	11.83	72.63	17.80	64.93	16.13	1.54	.20	.03
Father	(*n*= 30)		(*n*=34)		(*n*=35)		(*n*=21)				
Desire	7.87	4.02	8.94	3.79	8.89	3.79	7.86	3.21	.84	.47	.02
Cognition	29.80	11.33	31.15	9.73	31.06	9.92	37.67	13.12	2.47	.06	.06
Emotion	16.87	5.89	18.38	4.65	18.54	4.31	16.95	6.00	.90	.44	.02
Total MST	54.86	12.65	58.35	14.67	55.17	14.80	60.95	16.81	1.00	.39	.02

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk, MD= mean differences

Table 41

Mean Differences on Mental State Talk across Story Telling Routine Among Father and Mothers of Preschoolers (*N*=120*)*

Type of Talk	With books (*n*= 37)		Without books (*n*=47)		Not at all (*n*=36)						
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*	Groups	*MD* (*I-J*)	η^2
Father											
Desire	9.73	3.95	7.89	2.98	7.92	3.63	3.17	.03	With book> without books	1.83*	.05
Cognition	36.92	12.05	30.02	9.62	29.28	10.26	5.97	.00	With book> without books With book> not at all	6.89* 7.64*	.09
Emotion	19.49	5.27	17.38	4.85	16.61	5.06	3.22	.04	With book> not at all	2.87*	.05
Total MST	61.59	13.63	56.38	14.98	53.11	14.28	3.25	.04	With book> not at all	8.48*	.05
Mother	(*n*= 35)		(*n*=64)		(*n*=21)						
Desire	7.17	3.63	5.86	2.32	5.43	2.99	3.19	.04	N/A		.05
Cognition	19.20	7.29	20.20	7.58	20.67	11.52	.24	.781	N/A		.00
Emotion	41.66	9.69	43.11	9.93	31.38	12.53	10.38	.00	With book> without books Without books> not at all	11.72* 10.27*	.15
Total MST	73.20	13.44	64.29	15.44	63.00	18.41	4.46	.01	With book> without books With book> not at all	8.90* 10.20*	.07

Note. M = Mean, SD = Standard deviation, MST= Mental State Talk, MD= mean differences

Table 40 show the shows results of one way ANOVA analysis to find out the mean differences on father, mother mental state talk of the preschoolers between four different levels of talking hours over the weekend. The mean values of overall and on each type of mental state talk of mother and father indicate that no significant group differences emerged at any level of talking hours of father (F (2,117) = 1.54, p >.001) and mother (F (2,117) =1.00, p >.001).

Table 41 shows results of one way ANOVA to find out the mean differences on fathers and mothers mental state talk across different routines of storytelling. The mean value of overall mental state talk of mother and father indicate that significant group differences occurred on different routines of storytelling. For fathers overall mental state talk, there are significant mean differences (F (2, 117) = 3.25, p<.001) across the three routines of storytelling. A post-hoc analysis was further computed to find out within group differences and the findings revealed that father overall mental state talk was significantly higher (p<.001) for fathers who tell story to their preschoolers using books as compared to father who do not tell story to their preschoolers at all. Further the results show that cognitive talk of fathers differ significantly for fathers who tell story to their preschoolers using story books as compared to those who do not tell story at all and who tell story without story books. However for emotional and desire talk, the results show significant differences for fathers who tell story with books and father who do not tell story at all. For mother, the post-hoc analysis revealed that mothers overall mental state talk as well as emotional talk are significantly higher (p< .001) for mothers who tells story to their preschoolers using book as compared to mothers who do not tell story to their preschoolers at all. However, for desire and cognitive talk no significant differences emerged for all three routines of storytelling.

DISCUSSION

Chapter-V

Discussion

The aim of the main study was to investigate the role of paternal, maternal and teachers' mental state talk and quality of parenting to predict the Executive function (EF) of the preschoolers. The broader objective of the present study was not only to assess the EF of the preschoolers but also to examine the feasibility of the EF touch battery for Pakistani preschoolers. In addition, it utilized the modern measurement theory to evaluate each task of the EF touch battery. Furthermore, the present study was intended to examine the hypothesized role of maternal, paternal, teachers and the preschoolers' demographic characteristics on main study variables. To meet the objective of the study data was collected in two steps. The EF of the preschoolers and teacher MST were assessed in their respective schools, afterwards the maternal and paternal MST and quality of parenting was investigated at the preschoolers' home.

Feasibility Report of Executive Function Touch Battery

One of the primary objectives of the present study was to evaluate the performance of EF touch battery through feasibility report for preschoolers. Following previous studies (Kuhn, Willoughby, Blair, & McKinnon, 2017; Willoughby, Piper, Oyanga, et al., 2019) the feasibility was measured in three-fold, first the completion rate of each task, where the proportion of completion was calculated as preschooler who passed the training items. Secondly, the time related to the completion of each task i.e., the length of administration and lastly, the subjective impression of the assessor regarding the quality of each task of the battery. The results for training items for each task showed that the task was comprehended by the

preschoolers. The feasibility matric demonstrated that most of the task of the battery was completed by most of the preschoolers, with minimum for the *Farmer* task which measure the working memory; only 79.2% of the preschoolers passed the training items. These findings are unlike previous study (Willoughby, Piper, Kwayumba, et al., 2019) conducted in Low middle income country using the same battery, for their study they found the *Arrow* task as most difficult one. These results may suggest that the instructions from understanding task or the criteria of passing the training item need revision for the Pakistani sample. Further the difficulty level of the task was high for younger preschoolers. It needs to be tested on a larger sample for clearer picture. Moreover, the performance of preschoolers on each EF task vary and ranged from 52.27% - 91.8% for the present sample. The Pakistani preschoolers demonstrated low performances scores on working memory tasks *Farmer* and *Houses*. One of the possible explanations for low performance as suggested by Noble, McCandliss, and Farah (2007) might be the environmental condition in low middle income countries. Results further showed the researcher's quality of rating that was evaluated after completion of each task of EF touch battery.

The quality rating supported the feasibility and performance matrices of the direct assessment of the preschoolers, which was collected at the end of each task of the battery, by the researcher who was collecting data. The quality of rating showed that for most of the tasks the researcher showed confidence and was satisfied with the quality of data. It also demonstrated that most of the preschoolers understood the task well and were fully engaged during the task.

This brief approach of assessing the quality rating was structured method which helped the researcher to share her subjective opinion regarding the quality of response from the preschoolers. The method was convenient over the subjective open ended questionnaire format which may require rigorous method of analysis and interpretation without biases.

The systematic procedure of the EF touch battery ensured ease to the researcher in the assessment procedures. All the task of the battery started with the training items, followed by the test item for those preschooler who passed the training items. The researcher was not required to concern whether the test items were passed or failed. The standardized automatic procedure was programmed to determine whether the training items were passed, which followed the test items. This facilitated the researcher to understand that the preschoolers comprehended the objective of each task. Also, unlike other performance based battery, the researcher was not tasked to concern about the number of training items that were needed before the preschoolers were allowed to move to test items.

Structural Validation of Instruments

The second objective of the study was to evaluate the dimensionality of the EF touch battery. Research on cognitive development in children and older adults shed light not only on the developmental differences in the structure of cognitive abilities but on their functional organization too (Flavell, 1982). Existing evidence from the literature suggest that the structure and organization of cognitive function may differentiate during the course of development. According to Miyake et al. (2000) the use of factor and confirmatory factor analysis techniques may be utilized to identify

the latent dimension of EF. Several factor analytical studies assessing EF with preschoolers have suggested a unidimensional construct of EF (Fuhs & Day, 2011; Wiebe et al., 2011). On the other hand, other supported the multidimensional structure of EF even during the preschool years (Skogan et al., 2016). Comparing the findings of the studies that were conducted on preschoolers with the studies that were conducted on the adult sample, it is important to note that it represent unresolved questions about the dimensionality of EF skills.

To verify the dimensionality of EF touch battery for the present sample. CFA analysis was carried. The results demonstrated the unidimensionality of the EF battery for the present sample. The findings of the present research is in line with recent studies that were conducted on early childhood (e.g. Fuhs & Day, 2011; Hughes, Ensor, Wilson, & Graham, 2009; Wiebe et al., 2011; Willoughby et al., 2010) which suggest that EF of the preschoolers as unidimensional. Jurado and Rosselli (2007) found that EF skills may develop from a unitary factor at early years in life and progressively differentiated in structure i.e., multidimensional; during middle childhood and adolescence when many separable control processes evolve. According to Willoughby, Blair, Wirth, and Greenberg (2012) there may be various biological factors like brain development or experiential factors like improved complexity of adult requests may occur from early to middle childhood which contribute to the shift from the unidimensional factor structure to multidimensional stricture of executive function skills.

Item Response Theory: Item Parameters Estimation, Test Information Function and Differential Item Functioning

The use of modern testing method i.e., Item Response Theory (IRT), over the Classic Test Theory (CTT) provides comprehensive framework which help for assessing the tasks of executive function battery as well as it also gives a better picture than assumptions followed by CTT (e.g.Willoughby et al., 2011) argued that the idea that the precision and accuracy of measurement remain constant for the range of ability levels which may not be applicable for several measure of EF. According to IRT, with respect to performance on each EF task, all children have underlying latent ability; the latent ability is not directly observable and is measured on the basis of performance on each task of EF battery. Assumption related to CTT claims that it is dependent on the items which measures the latent ability, however, according to IRT, it is independent of the items, the children performance on the task of EF ability is represented by theta, which is the function of children's ability and the characteristics of test items. Each item in the test is characterized by item difficulty and discriminating power.

The present study demonstrated the framework for evaluating each task of the EF touch battery. The standardized procedure of IRT provided the evaluation of item characteristics for each item of all the seven tasks. For present sample, for all the tasks, item characteristics curved were computed, it identified the items that worked poorly, it revealed the discrimination value; the larger discriminating parameter represented that it can better distinguish between the low and high level of EF skills. Furthermore, for all the tasks, it revealed the difficulty level for each items. Following

the suggestion by the (StataCorp, 2019) two exemplary items were shown with most and least discriminating items, which reflected their difficulty level too. The author/developer of the EF touch battery recommended using the battery without modifying any item therefore; no changes were made or recommended for modification to most or least difficult items.

With few exceptions (Nieto, Ros, Medina, Ricarte, & Latorre, 2016; Willoughby, Blair, Wirth, et al., 2012) numbers of measures that have been developed to assess the EF in preschooler years have not utilized the strict psychometric evaluations. The IRT approach provides the perspective which helps to understand how reliability varies as a function of level of ability of the preschoolers; the CTT lacks to provide this perspective. Hence, in addition to item characteristics, the current study also computed the test information curves (TICs), which graphically demonstrated the efficiency and precision of the EF touch battery over the range of preschoolers' latent EF ability. Each task of the battery varies with respect to the task information. The relative height for each TICs across all the task of the EF touch battery are not comparable as each task varies in their total number of item that contributed to the scores, however, the spread of each TICs is interpretable. The TICs suggested that each task of the EF battery provided reliable score for the present sample of preschoolers and their true ability ranges peak between 2 standard deviation below and above the sample mean of their EF ability. According to Willoughby, Blair, Wirth, et al. (2012) the TIC's for any battery or measure that access EF in early childhood would provide an in depth knowledge that would help to select specific tasks that reflects the characteristics of the preschoolers. For example, for the

preschoolers that represent under privileged or marginalized living or any disability, the task that provides more information about the ability among low performing children will be selected, on the other hand for older or more intelligent preschoolers that the task that showed information of ability among higher performing children will be selected. For the present sample the TICs the Arrow and the Pig task provided more information with high curves, but the pig task showed more information about the ability among low performing children. The results of each task of the battery provided reliable scores and their true ability ranges from relatively moderate to average level. These findings showed that EF touch battery works well for varied range of preschoolers.

In addition to test information, IRT also consider another feature of item evaluation, the Differential item functioning (DIF), which describe whether each individual item for each task of the battery function equivalently for participants from distinct subgroups. Ruling out the DIF for each item for all the task help to ensure that any group differences for distinct subgroups on the ability were not associated with any biases in the construction of test items and that it works equally for both sub groups. The results of DIF for present sample demonstrated that for few of the tasks of the EF touch battery showed non uniform group effect which reflects that there is no advantage of one group over the other group and the it's the product of interaction between the ability level of the preschoolers and their membership to the middle or low income household (Penfield & Lam, 2000). Consistent with other relevant studies (e.g. Willoughby, Blair, Wirth, et al., 2012; Willoughby et al., 2011) overall the tasks of EF touch battery showed no measurement invariance and reflected that the battery

works equivalent for preschoolers living in low and middle income household income, ensuring the group difference were not the product of varied measurement operation. These previous studies revealed that the each task of the battery had to be understandable not only in terms of language but also in the structure in order to work efficiently even with young children from low income household.

Relationship between Study Variables

One of the major objectives of the study was to see direction of relationship between all the study variables. Table 22 showed the findings of the inter scale correlation between the study variables, the results indicated that EF of the preschoolers showed positive relationship with preschooler main characteristics i.e., the preschooler age and gender, the results revealed with the increase in age the preschooler perform better on EF skills for both girls and boys, the direction of the relationship is in congruence with the previous literature (e.g. Ardila et al., 2005; Rosselli, Ardila, Bateman, & Guzman, 2001; Zelazo et al., 2016), with regard to gender differences of the preschooler on EF, the literature suggested that girls outperform boys on the EF skills (Anderson, 2001; Gestsdottir et al., 2014; Wiebe, Sheffield, & Espy, 2012; Willoughby et al., 2016).

The results further showed that the EF of the preschooler are also related to the family monthly household income, the literature support the direction of the results. According to Haft and Hoeft (2017) children living in poverty are exposed to variety of biological, psychological, environmental stressors which may effect the development of EF and that the children EF skills and low income or poverty

conditions are related (e.g. Hackman et al., 2015; Haft & Hoeft, 2017; Malecki & Demaray, 2006)

Moreover, in line with the previous research (King & La Paro, 2015) teacher MST and experience are found to be positively related with the EF of the preschoolers (Cameron Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009). Likewise, the roles of maternal and paternal MST were found to be positively related to the EF of the preschoolers. Previous literature mostly suggested the maternal not paternal MST to contribute to EF of the preschoolers (Baptista et al., 2017; Bernier et al., 2012). Furthermore, the results showed positive relationship between the quality of parenting and EF of the preschoolers which is in congruence with previous studies Clark et al. (2013). According to Carlson (2009), parents that respond to their children need; provide an emotionally supportive, cognitively stimulating environment and who foster the child with warmth are consider to promote self-regulating skills that are a key component of executive function skills.

Reliability Analysis for Coding of Mental State Talk

The inter-rater reliability represents that data collected in the research are correct representation of the variable we intend to measure. Interrater reliability for father, mother and teacher mental state talk (MST) was calculated and was found to be good. According to (Cohen, 1960) there is a possibility of agreement among the rater when they do not know the correct answer and simply guessing the correct response ; he suggested that few number of guesses would be congruent and that reliability procedure should be the way for the agreement between the raters. The procedure of calculating the Cohen Kappa was in consistent with the previous studies

(e.g. Nawaz, 2015; Pinto, Primi, Tarchi, & Bigozzi, 2017; Ruffman et al., 2002) and found that the mental state terms were true representation of the type of talk.

Mental State Talk Employed By Father Mothers and Teachers

To see the difference in the mental state talk employed by father, mother and teacher, descriptive analysis was carried out. Following the previous study (i.e. Baptista et al., 2017) to control the differences in the verbosity of father, mother and teacher mental state talk, proportion of the total number of words from each category (desire, cognition and emotion) were calculated and used to see the differences on MST employed by parents and the teachers of the preschoolers. Previous studies have mainly focused on comparing either parental differences on MST or compared the teacher and maternal MST while interacting to the preschoolers. The current study extends the past findings by comparing the three significant contributors of mental state terms with the preschoolers. The results revealed that consistent with other relevant studies (Andrews et al., 2020; Baptista et al., 2017; Jenkins et al., 2003; Ziv et al., 2014) when accounting for the total mental state term, teachers employ more MST when interacting to the preschoolers as compared to mothers. Moreover, Pakistani mother converse more mental state terms in comparison to the father of the preschoolers. However, when computing for the proportion of MST, the results of present study revealed there were no parental differences in the use of MST employed by fathers and mothers. Additionally, in contrast to studies, teachers were found to use less proportion of MST as compared to mother and father of the preschoolers during the interaction with the preschoolers (table 23). One of the possible explanation is the context of picture book task; the story narration session are contextualized, the father,

mother and teacher may show different pattern of MST in everyday life or activities where they get involved in with the preschooler. It is assumed that face to face interaction in naturalistic setting where mother are more exposed to use not only words but also mental state words, or the task which demand more attention of the parents and teachers may lead to differences in MST of parents . These findings were consistent with (LaBounty et al., 2008) which showed no differences in the total rate of mental talk employed by father and mothers of the preschoolers.

Furthermore, in align with hypothetical assumptions father, mother and teachers differ in the kind of MST they employed with preschoolers during the book narrative session. The results showed that teachers utilized more cognitive talk as compared to emotion or desire talk. These results are in accord with the previous research (Misailidi et al., 2013) which used the wordless story book narration, and other studies with methodological difference of naturalistic observation (King & La Paro, 2015) and (Pelletier, 1996). These studies showed that teachers varied in the amount of MST with cognitive or perception talk as most frequent of them; suggesting that teachers have the tendency to utilize cognitive terms when interacting with the preschoolers. Though Pelletier (1996) study few percent (40%) did not employed MST at all. Thus, the current study and the (Misailidi et al., 2013), may direct that teachers are prone to employ MST during story book narrations session. Picture story narration is a social-cognitive context that encourage mental state terms (Symons et al., 2005).

Similarly, in accordance with literature on maternal and paternal MST, mother in the present study employed emotional terms more frequent with the preschoolers as

compared to fathers of the preschoolers. Previous studies (e.g. Kornhaber & Marcos, 2000; LaBounty et al., 2008; Reynolds, Vernon-Feagans, Bratsch-Hines, Baker, & Investigators, 2019) which showed similar findings in both laboratory and naturalistic setting that mother of the preschoolers made emotional talk more frequently in response to attention of the preschoolers, as compared to fathers.

Using established procedure of wordless story narration task, teacher child, mother –child and father child dyads were a compared, focusing on their MST. As expected certain differences emerged between father, mother and teacher mental state discourse with their children. Teachers expressed the cognitive term most frequently as compared to the mother and father of the preschooler. On the other hand father employed more cognitive term in comparison to mother of the preschoolers. Though to date, up to our knowledge no previous research compared the three important contributors of MST for the child. But these results are in line with the research that conducted so far which compared the dyads mother-child and father-child, or teacher/ educator child and mother-child (e.g. Andrews et al., 2020; Baptista et al., 2017; LaBounty et al., 2008; Ziv et al., 2014). Mothers utilize MST according to child need, according to (S. R. Burgess, Hecht, & Lonigan, 2002), intuitively mothers mold their conversation, to meet the need of their child according to the their knowledge, demand of the situation, on the other hand teachers are trained to read and to deal with group of students (Gianvecchio & French, 2002). Teachers used more cognitive terms more often than father and mothers to manage preschoolers' behavior or activities. Similarly, father tend to use cognitive talk which describes more action oriented strategies (John, Halliburton, & Humphrey, 2013) which helps to promote children outcome like problem solving skills e.g., EF. Furthermore, for present research

mother used more emotional term as compared to father and teacher of the preschoolers. Research suggest that during the preschooler period children started to understand and label emotions (Denham & Couchoud, 1990) ; mothers frequent use of emotional talk suggest that mothers understand the need of the preschoolers and connect to them on emotional level which in return may help them with their outcomes e.g., emotional underrating more often than father and teacher. Differences on parental and teacher MST in interaction with the child during story book narrative directs varied implication not only on the EF of the child but also on various child outcome e.g., Children own MST, emotional understanding and theory of mind development. For instance, LaBounty et al. (2008) suggest that parental use of emotional talk helps in children MST, Father may contribute to theory of mind development.

Predictive role of Father Mother and Teachers' mental state talk and quality of parenting on executive function of the preschoolers

Preschool years are the most important years of life, child cognitive and social process evolve during these years. The quality of social input specifically the quality of parenting practices influence the cognitive processes is a distinctive social proximity aspect (Cruz Alaniz, 2015). The major objective of the present study was to see the prospective link of these parental inputs on the executive function of the preschoolers. To meet the objective and test the predictive role of father, mother and teachers' use of mental state talk, quality of parenting on the executive function of the preschoolers, multiple hierarchical regression analysis was computed (table 24).

The results of the present are noteworthy, in contrast to previous literature (Baptista et al., 2017; Bernier et al., 2012) the findings of the present study exhibited that along with covariate of preschooler character e.g., age; not only maternal but paternal mental state talk also contributes to the development of EF of the preschooler.

Although, it is well documented that father-child and mother-child relationship differently contribute in various aspect of the development of the child (Boldt, Kochanska, Yoon, & Koenig Nordling, 2014; Hertz, Bernier, Cimon-Paquet, & Regueiro, 2019; Owen et al., 2013); however, studies have largely reported the role of mothers (e.g. Bernier et al., 2010; Cheng, Lu, Archer, & Wang, 2018; Kraybill & Bell, 2013). The results of the present study compliments the previous studies that have focused on the role of father in development of child EF skills (e.g. Hertz et al., 2019; Kochanska, Aksan, Prisco, & Adams, 2008; Meuwissen & Carlson, 2015) Father and mother both provide the context where they facilitate the development of EF skills of their children. As mentioned earlier according to sociocultural theory, (Luria, 1961; Vygotsky, 1980), stated that the development of EF skills takes place in the context of social interaction, where usually the parents and other significant others provides their children with cultural tools e.g., symbols and language, that facilitate the skills related to memory and attention to goal directed behavior which, the child cannot do alone. Fathers and mother both provides language input but the function and domain of their language input varies. Mothers may employ mental state words that are comforting or emotional in nature especially when a child is in pain or distress, they may switch from one mental state reference to another, which in return facilitate the child to learn and manipulate their own emotions and regulate their

behavior according to the demand of the situation. Keeping in mind the indigenous culture in Pakistan, mothers usually provide words that are comforting and emotional in nature. Likewise, fathers employ mental state terms that encourage the child to take challenge during interaction with other children, or in a novel situation. According to StGeorge, Fletcher, Freeman, Paquette, and Dumont (2015), the father helps their child destabilize by introducing them to novel situations. These father and mother contribution for their children to deal with challenges, demand of the situation help them regulate their behavior which is central to executive function skills. The literature (Kornhaber & Marcos, 2000; LaBounty et al., 2008; Reynolds et al., 2019) emphasize that mother employ terms that are need based and are emotional in nature than other terms as compared to fathers. On the other hand, the fathers employ more cognitive talk which explain more action oriented strategies (John et al., 2013) which helps to promote children outcome like problem solving skills e.g., EF.

Moreover, the present results pertaining to the contribution of the quality of parenting, add to the growing body of literature that suggests that the quality of child and parent interaction is related to early EF skills. Highlighting the importance of the father's contribution Towe-Goodman et al. (2014) suggested that paternal sensitivity during play is associated with the development of goal-directed actions and regulatory skills. Likewise Hammond et al. (2012) found that maternal supportive scaffolding and sensitivity during puzzle time with three years preschoolers was associated with an increase in executive function. According to (Bernier et al., 2012; Bernier et al., 2010) maternal support for autonomy and sensitivity provides the platform where the child may learn and develop executive function skills. Additionally, higher quality of parenting is associated with a higher score on executive function performance such as

the quality of fathers' and mothers' interactive behavior during free play, direct observation between 12 to 18 months, and predicted preschooler's executive function later at age of 3. Carlson (2009) argued that parents that respond to their children need; provide an emotionally supportive, cognitively stimulating environment and who foster the child with warmth are consider to promote self-regulating skills that are a key component of executive function skills. According to Clark et al. (2013), parental use of stimulation in the home environment facilitates improvement in children's working memory, inhibitory control, and attention shifting. Similarly, Blair et al. (2014) have examined changes and parenting dimensions like stimulation, sensitivity, and responsiveness in, 3 to 5 years of preschoolers, and found that positive parenting dimension over the period predicted an increase in preschoolers executive function.

In addition to the quality of parenting and maternal mental state talk, age of the preschooler and maternal education also predicted the executive function of the preschooler. The results indicated that maternal educational level, not the variable that works in isolation, may work with many associated living conditions and other variables to contribute to the executive function of the preschooler. The age-related finding is in accordance with earlier studies showing that the development of executive function proceeds sequentially, Klenberg, Korkman, and Lahti-Nuuttila (2001) argued that the development of inhibitory control precedes the development of a complex component of selective attention and the development of executive function conative to develop throughout adolescence. Further, a meta-analytic study showed that age predicts switching performance and its magnitude in preschoolers (Doebel & Zelazo, 2015).

Overall, the results showed that the contribution of parental input specifically, their distinct kind of talk that reflects the mental state vocabulary and interactive behavior were found to be associated with preschooler executive function skills that develop during early years and progress with time.

Previous research demonstrating the significance of parent-child interaction for the development of EF skills during early childhood suggest that during early childhood the interaction with significant others such as teachers, may also contribute to the early EF skills (Choi et al., 2016). However, the present research when assessed the contribution of teacher MST along with the other teacher characteristic such as teacher years of experience and their qualification which according to literature assumed to contribute to child development, the results revealed (Table 25) that the teacher's variables in the presence of maternal and paternal variable (such as their mental state talk, quality of parenting and maternal education) does not contributed to the preschooler EF. These findings were unexpected and noteworthy. These results can be explained through evidence from previous investigation (Vernon-Feagans, Bratsch-Hines, & Investigators, 2013) made an attempt to understand if children from marginalized background who do not receive language input from the parents at home, the child care or the teacher at child care setting may buffer these children from risk. The research concluded that positive child- caregiver positive verbal interaction facilitated and appeared as buffer the children poor language input. Moreover, the bioecological model, posited that the early development of the child is not just influence by the person's attributes and the environment they are in like the home or the school. However, the interaction between the person and environmental features also shape it (Bronfenbrenner & Morris, 2007). Concluding that the input from the

significant others of the child may not benefit each child equally. The attributes of each child, their risk factors, family characteristics e.g., maternal paternal verbal input, maternal education (Vernon-Feagans et al., 2013) may intervene to influence the child. Therefore the teacher contribution to the developing EF of the preschooler was independently assessed for the present study.

Findings of the present study partially supported the hypothesis regarding the role teachers' experience and education in EF of the preschoolers. The results suggested that teacher mental state talk, and their teaching experience contributes to the EF of the preschoolers. Though there is scarcity of research evidence on contribution of teachers' metal state talk on the development of EF of the preschoolers during early years of life. However, the literature deliver evidence that teachers who employ high quality instruction to their children provides opportunity and exposure to more complex language input, which consequently facilitate the children in the development of higher order thinking skills and helps them to develop the understanding to achieve their goals (Pianta, La Paro, & Hamre, 2008). These high level instructions by the teacher may provide language and literacy environment which help to enhance the EF skills of the children. Blair et al. (2014) stated that language support is significant factor which contribute to EF skills in children. Rich language exposure to the children in the classroom enable the children to gain analytical thinking pattern and skills that may help them planning to achieve the goal, hence provide prospect to exercise EF skills. In line with these findings (Choi et al., 2016; Weiland & Yoshikawa, 2013) have found that rich quality of instruction were associated with the increase in inhibitory control during the preschool years for children at high risk.

Similarly, (Cameron Ponitz et al., 2009) argued that the preschool teacher can promote preschooler behavioral and cognitive self-control abilities by redirecting children's instructional time, managing misbehavior and routines. Preschool teacher in Pakistan act as a buffer to lack of language input that is important for the development of cognitive skills, It was a common observation that young teachers in Pakistan were assumed to be more receptive of children need and to provide the facility to the young students with opportunity, as they are thought to be more energetic and motivated but the results of present study revealed that the teachers with more teaching experience contribute to EF of the child. One of the possible reasons, is that with the passage of time, the teacher use more mental state terms, specifically the cognitive term (King & La Paro, 2015), these rich language exposure may facilitate the EF of the child.

Role of Quality of Parenting as Moderator

When considering the development of executive function of the child, the role of quality of parenting is important to consider, that how it can shape the executive function skill. Research in the past has assessed the relationship between development of early executive function of preschoolers and parenting practices and found significant predictive role of parenting dimension on developing executive function (e.g. Blair & Raver, 2012; Blair et al., 2014; Towe-Goodman et al., 2014). Similarly (LaBounty et al., 2008) suggested the influence of maternal and paternal mental state talk on the child sociocognitive abilities. These findings take to another objective of the study to see the moderating role of quality of parenting in the relationship between maternal and paternal mental state talk and executive function of the preschoolers. To

meet the objective moderation analyses were carried out but there found no moderating role of quality of parenting in the relationship between father's mental state talk and executive function of the preschooler. The Table 26 shows the positive moderating role of quality of parenting for the relationship between the mother's mental state talk and executive function of the preschoolers. The results indicated that mothers' mental state language contributes to the executive function of the child, which is positively enhanced by the presence of quality of parenting. In accordance to previous studies (Jenkins et al., 2003) as well as findings of the current study suggest that Pakistani mother employ mental state more frequently than fathers, as well as they spent more time with their children and are considered as the primary caregivers. Previous literature (Arnott & Meins, 2007; Reynolds et al., 2020) suggested and supported the association between the quality of parenting behavior and mental state talk. They suggest that mothers who are sensitive and responsive and engage in positive behavior utilized more mental state talk (Mcquaid et al., 2008; Meins et al., 2001). Bernier et al. (2010) also suggest the contribution of mother use of mental state talk, accompanied by mother parenting contributes positively to the development of executive function of the child. These finding suggest direct relationship between quality of parenting and mothers not fathers use of mental state talk and the way mother 's responsiveness and cognitive stimulation may effect the use of mental state language, also parents who use more responsive and warm relationship utilize more mental state talk and consequently contributes to child executive function. These findings are of great importance and highlight the major objective of the study that is the contribution of parental mental state talk and quality of parenting on the development of early executive function of the child.

Differences on Demographic Variables

For age related changes in the EF, the results (table 27) supported the hypothetical assumption; the present study found that older preschoolers performed better on the EF task measuring the inhibitory control, working memory and the attention shifting than the younger preschoolers. The existing literature shed some light on the age related differences on the EF skills, according to which the development of EF is related to development of human brain (Anderson & Reidy, 2012) . During the preschool period (age 3 to 6 years) the EF develop rapidly with the development of prefrontal cortex, which is thought to underlie the executive function (Kagan & Herschkowitz, 2006; Zelazo et al., 2016). The preschool period is characterized by the dramatic growth of the executive function skills (Hughes, 2011; Zelazo & Jacques, 1997). Studies elaborated that, performance on EF test improves with the age, for both girls and boys (e.g., Andreson, 2001 ; Ardila, 2005; Rosselli et al., 2001) .

Anderson (2002) suggested that the progression of EF skills in not linear but it usually occur in spurt. Moreover, the component of EF may follow different developmental trajectories; the components of EF show progress with the neurophysiological development in the prefrontal cortex (Anderson, 2001) . As well, development of different dimensions of EF may interdependent on each other (Ackerman & Friedman-Krauss, 2017). For example at the age from 3 to 4 years, the working memory and inhibition control manifest (Röthlisberger, Neuenschwander, Cimeli, & Roebers, 2013). At the same time, the attention system of the preschooler starts to develop which helps them to control their behavior and thoughts (Garon et al., 2008). The older preschoolers demonstrated improved EF performance on EF

task that are designed to assess EF for wide age range (Buss & Spencer, 2014; Clark et al., 2013; Diamond, Carlson, & Beck, 2005; Wiebe, Sheffield, & Espy, 2012).

Furthermore, the research suggested that during the preschool, children improve on their ability to hold two things simultaneously and the ability to inhibit control over their behavior. The period of the preschooler before the attainment of these abilities was labeled as preoperational stage by Piaget (Piaget & Inhelder, 1969). Literature suggested those early preschoolers who are from 3 to 4 years faced difficulty to hold information simultaneously. On the other hand, by the age 5 to 6, they become capable of holding the information as well exhibit control over their behavior.

Similarly, in delay gratification task, children when given a choice of immediate smaller reward or larger reward later, the younger preschooler unable to inhibit the smaller immediate reward, though they desire for larger one, on the other hand older preschooler preferred to wait for the bigger reward (Mischel & Mischel as cited in Diamond & Taylor, 1996).

Within the supportive context, though it is suggested that the age related changes are the product of maturational changes, which result from the biological changes in the brain, similarly there is rich research evidence which suggested that age related change may as well as the result of contextual changes in the social experience which governs the development of the child (Carlson, 2005).

Though the effect of genetics is remarkable in the development of EF, the role of environment on the child EF cannot be neglected. According to Talwar et al. (2011) children who are raised in punitive environment showed poor results on EF as compared to children in less punitive environment. The environmental factors during

the early years of development can significantly influence the development of EF of the child (Huttenlocher, 2009). These family environmental has been shown to be of great importance during the preschool period (Hughes, 2011). These conditions may include poverty or poor living conditions or low SES. According to Haft and Hoeft (2017) children living in poverty are exposed to variety of biological, psychological, environmental stressors which may effect the development of EF.

As discussed earlier, there is some debate, on how to operationalize the construct of SES. This issue was discussed by (Ursache & Noble, 2016) stating that whether different indicators such as income, father and mother education and their occupation should combined to create a composite or should address as separate entities. According to Duncan, Magnuson, and Votruba-Drzal (2017) combining different indicators may not be informative because these variables are theoretically distinct and each effect the development of children in unique way. For present study, the income household was taken as the indicator of SES, it has been shown as valuable indicator of the construct of SES in several studies (Duncan, Daly, McDonough, & Williams, 2002).

Literature from western and non-western, developed and developing countries showed significant association between the children EF skills and low income or poverty conditions (Hackman et al., 2015; Haft & Hoeft, 2017; Malecki & Demaray, 2006). These studies show that children from low income household have poor inhibitory control, working memory and attention skills (Farah et al., 2006; Kishiyama, Boyce, Jimenez, Perry, & Knight, 2009). The results of the present study also compliment the previous literature (table 28); suggesting that there is differences on EF skills of preschoolers who are raised in three different groups of low and

middle income homes from Pakistan. The results further showed that the three groups of preschoolers showed different results, the preschoolers from lowest income group performed poor on the EF tasks, measuring the inhibitory control, attention shifting and working memory. Although literature (e.g. Vandenbroucke et al., 2016) suggested that children from family with unstructured or chaotic environment may perform better between response sets i.e., on attention shifting task, but for the present sample the results does not show similar findings.

The association between the low income and poor EF skills among the preschoolers has been well documented, based upon the researchers demonstrating that low income groups are exposed to chronic stress that are often related to poverty can alter the brain structure and function, specifically part of brain that is associated with prefrontal cortex (Arnsten, 1999, 2009; Blair & Raver, 2012). According to the well-known principle of psychology, the performance on cognitive complex task are effected under stressful situation that may be caused by poverty (Yerkes & Dodson, 1908).

Through global risk factors that are associated with poverty and low income, parents play very important role in development of EF during poverty; they may provide various the risk or protective factors. There is a possibility that low income families may have less exposure for joint cognitive interaction, due to over burden from working more hours, or they may spent less time with their children (Choi et al., 2016). Higher income families may have more prospect to facilitate their children EF skills (Noble et al., 2007). These findings endorsed research (e.g. Fay-Stammbach et al., 2014; Kurkul & Corriveau, 2018) that parents from higher income families may create opportunities to provide scaffolding than parents from low income families

that effect the EF of their children. Along with scaffolding parental responsiveness that provides rich environment for the development of EF skills. According to Sarsour et al. (2011b) the responsiveness and enrichment varies according to factors that are related to SES.

Concluding that, the effects of poverty or low income on the development of EF are influenced by the cultural factors and practices of the country. Furthermore, the evidence from *Differential item functioning* analysis suggested that the EF touch battery worked equivalently well for each sub group of population i.e., preschoolers from families from lower to middle income group. Consistent with other relevant studies (e.g. Willoughby, Blair, Wirth, et al., 2012; Willoughby et al., 2011) overall the tasks of EF touch battery showed no measurement invariance and reflected that the battery works equivalent for preschoolers living in low and middle income household income, ensuring the group difference were not the product of varied measurement operation.

One of the important individual factors that effect the development of EF is gender. Previous literature to measure EF, do not provide any consistent data on gender differences. No gender differences were reported in western as well as non-western countries (Carlson & Wang, 2007; Holmes et al., 2016; Yamamoto & Imai-Matsumura, 2019) on EF and specifically on emotional regulation. On the other hand, For studies in western countries (e.g. Gestsdottir et al., 2014), where EF was measured on parents and teacher evaluation; found that girls exhibited more inhibitory control as compared to boys. Additionally, studies (e.g. Wanless et al., 2013) in non-western countries showed that girls exhibited high score on behavioral regulation than boys.

To assess the gender differences on EF touch battery t- test analysis was carried out, the results of the present research revealed that the girls outperformed the boys on EF skills for Pakistani sample (Table 29); for overall EF skills as well as three component of inhibitory control, working memory and attention shifting. Although these findings are in accordance with the previous study (e.g. Willoughby et al., 2016) which measured the cross group comparison for the EF touch battery to assess the measurement invariance and found similar results that girls performed better on EF skills then boys. This is consistent with (Berlin & Bohlin, 2002) which showed boys showed lower level of inhibitory control than girls. Carlson and Moses (2001) revealed comparable results showing that on inhibitory control 3-4 years girls outperformed boys.

One of the significant environmental influences on cognitive development of the child is the parents' level of education. According to Baydar, Brooks-Gunn, and Furstenberg (1993), the level of parents education is not an isolated variable, it exists with reference to living condition. For present study, like household income, the parental education, also provide as an indicator of the compound variable SES. The present research showed that higher paternal and maternal educational qualification effect positively to overall EF skills of the preschoolers and also for the three domains of EF. Hence for the Pakistani sample, not only the household income but also the parent education as a component of SES is particularly important for the child related outcomes. Recent study (Conway, Waldfogel, & Wang, 2018) provided evidence to these findings suggesting that parental education and income have distinct theoretical relationship with the resources they provide in the child related outcomes.

Keeping the Pakistani context in mind, why few additional years of maternal and paternal educational qualification significantly contribute to the EF of the preschoolers. It is important to consider that the higher educational qualification of parents just not represent the years of education, nonetheless it is related to chain of variables, for example it represent the financial, familial, social resources to attend the college or university, value and belief system, perceived importance of education, intellectual level etc. Ayala (2001) suggested that differences in education represent the not only the decisions to attend the college but it is related to array of variables associated with it.

Moreover, (Ardila, 2005) associated certain value system with parent with higher educational level, than parents with less years of education. According to this value system the parents provide more stimulating environment for their offspring that facilitated performance on the EF skills. Hoff (2003) also suggested that more educated parents provide more intellectual stimulating environment for their children for the development of EF skills.

Other researches (Bornstein, Hahn, & Haynes, 2011) also verified this argument; parents with higher educational qualification have better comprehension regarding the need of their children, and when their children have to acquire certain skill or behavior. Further, According to (Hoff-Ginsberg et al., 2002) highly educated parents have unique way of interaction, they employ rich language and read often to their children than parents with less educational qualification, and is related to cognitive development of the child. Similarly (Ganzach, 2000) found out that parental

education is associated with their children school attendance and their cognitive development.

Lareau (2000) claimed that parent education is similar to human capital that deliberates benefits, to their children before even formal schooling, above and beyond the income level. Therefore, for Pakistani children the parents' educational level act as a non-economic resource, can facilitate the EF skills of the preschoolers

To assess the preschoolers' age related differences on their mother and teachers' use of MST, t- test was computed. The results revealed that in line with the sociocultural developmental theory, the father, mother and teachers utilize greater number of MST while narrating the wordless story book to preschoolers; suggesting that age of the preschoolers is significant factor in preschoolers' exposure to talk about mental state references by their parents and teachers (Table 32). Previous research (Andrews et al., 2020) support the findings of the present research that not only parents but teachers are sensitive to linguistic constraint of the young children, they are aware that older preschoolers are more likely to understand the range of mental state vocabulary than the younger preschoolers. As the preschooler progress through age, not only there is enhancement in their conversational and linguistic capabilities but also their understanding of the language and talk by their parents, teachers and other significant others.

According to (Jakubowska et al., 2018), with the increase in preschoolers' age the frequency of parental mental state talk increases additionally, it is expected that the complexity also increases. While telling a story parents may just associate desire, cognition or emotion to the story protagonists, alongside, they may utilize casual, explanatory or contrastive talk about these mental states. The increase in frequency of

parental MST is associated with the changes in the type of MST. The results of the study indicated that parents and teacher use more cognitive talk, than emotional or desire talk with older preschoolers. These results are supported by past research (e.g. Brown & Dunn, 1991; Moore, Furrow, Chiasson, & Patriquin, 1994) taking these parental research, it is assumed that teacher and parents adjust their speech according to the age of their children.

For the past few decades the research has focused on understanding the concept how family income can relate to maternal or paternal language input to their children, and subsequently children's developmental milestones. Present research assessed the variation in maternal and paternal MST according to varied household income. The current study extends the past findings which measure the interconnection that emerged between the maternal and paternal mental state talk and socioeconomic status (SES). For present research monthly household income was taken as the indicator of SES. The former researches has shown that children exposure to language input differs with the variation in family income, besides these variation differ in quality but also the frequency (Ebert et al., 2017; Vasilyeva & Waterfall, 2011). In the view of these researches, it is suggested that limited economic conditions may increase the parental psychological stress which reduce the quality and quantity of parental language input (Garrett-Peters et al., 2008).

Similarly, a recent research (Thompson & Foster, 2014) suggested association between the SES and parents' meta cognitive mental language, including the mental state words, during the joint play task with the preschoolers, the research revealed differences in frequencies with which parents use meta cognitive questions and further showed differences on specific type of talk. The present research also

complements this literature by suggesting that for present Pakistani sample the differences on monthly household income along with overall paternal and maternal MST also showed that father with more monthly household income employ more cognitive terms than with lesser monthly household income groups, similarly, mother from higher monthly income employ more emotional terms as compared to lower household monthly income. Adrián et al. (2007); Ruffman, Slade, Devitt, and Crowe (2006) also suggest the effect of SES on specific kind of mental state term e.g., cognitive talk but not on emotional or other terms. In the same line, Garrett-Peters et al. (2008); Garrett-Peters et al. (2011), also concluded that while talking to young children, parents from lower income are less likely to use emotional references as compared with higher income parents. Furthermore, comparing with higher income parents, parents from lower income are least reported in conversational exchange (Rowe et al., 2004).

Concluding, the present research added to previous findings that parents who have limited financial resources may face psychological or emotional stress that challenge the parents' ability to provide rich language exposure that contributes the development of their children. It might include lack of time for interaction with their children owing responsibilities due to economic burden. Hence, these findings are restricted to the Pakistani parents who are facing severe economic stress, or deprivation.

Analysis of variance were carried out to study mothers' and father's educational wise group differences on mental state talk. The results suggested that father and mother with higher educational qualification employed more mental state talk; as the mental state talk was greater in middle and high educational qualification

than low educational qualification. Furthermore, father and mother with higher educational qualification state more emotional, cognitive and desire talk with their preschoolers than with middle and low educational qualification. Jenkins et al. (2003) documented that maternal education contributes to increase in MST, specifically more educated mothers employ more cognitive terms than mothers with less education. Moreover, they reported that father and mother education is not just associated with theory of mind but also to broader cognitive outcomes. Likewise (Hughes & Dunn, 1998) reported that maternal education is related understanding of theory of mind.

It is observed that father and mothers' educational attainment provides father and mother with a positive learning opportunities, moreover it provide knowledge, thinking strategies and exposure to mental state language that they in return employ with their children. In Pakistan parents who do not get the opportunity to get education may unable to create language environment needed for development of basic children outcome. Parents with higher education may facilities prospect for learning related activities e.g., reading a book (Davis-Kean, 2005); which may provide exposure to mental state words for their children. According to Taylor, Clayton, and Rowley (2004) parents who are educated may have educational expectation and provide opportunities and create environment for learning activities that are linked to cognitive development of the child.

It was hypothesized that gender of the preschoolers directs the mental state talk of the father, mother and the teachers. The results demonstrated that overall father, mother and teacher of the preschoolers employ more mental state talk to female child as compare to the male child (table 36). These findings are in accordance with the previous studies (Dunn et al., 1987; Fivush, Brotman, Buckner, & Goodman,

2000; Leaper, Anderson, & Sanders, 1998). According to research on gender socialization of language, mother speak frequently to daughters than their son, therefore may facilitate greater exposure to language to them (Lovas, 2011); this idea is supported by growing research evidence for father too (Buerkel-Rothfuss, Fink, & Buerkel, 1995). Moreover, in accordance with hypothetical assumptions the results showed that Pakistani parents use more talk with female child and direct more emotional talk with their daughters as compared to their son. These differences were indicated by recent research (e.g. Lovas, 2011; McHale et al., 2003), indicating that parents used more emotion terms and desire talk to their daughters than to their sons. Female child in general and specifically in Pakistan are socialized to employ emotional talk, according to (Garner, Jones, Gaddy, & Rennie, 1997) mother use more emotional talk besides this, they talk about the consequences of these emotional and feeling states with their daughters as compared to their son. On the other hand, parents employ words that are associated with labeling or naming with their sons, which are either directive in nature or words that are used to draw attention of the son (Clearfield & Nelson, 2006). Although the results indicated significant mean differences in teachers overall mental state talk for male and female child but no significant differences were found on the emotional, cognitive or desire term. This may indicate that although similar to parents, the teachers talk more frequently with female child but they do not discriminate the type of talk.

To assess the differences across teacher educational qualification on mental state talk of the teachers, t- test analysis was carried out. Finding revealed results consistent with the hypothetical assumption, that teachers with higher educational qualification or formal degree employ more mental state words than teachers with

lesser years of educational qualification (table 37). These findings are supported by recent researches (e.g. Andrews et al., 2020; Manning, Garvis, Fleming, & Wong, 2017) suggested that educators and teachers who have higher education or formal training in children education, utilize words and language that are complex and rich while engaging the children during the conversation. Teachers with less years of educational qualification may have more years of teaching experience but degree or formal education qualification, facilitate the children in using the words, language and engage the child deeply that helps extending children thinking (Piasta et al., 2012). Also, state that formal education of the teacher facilitates thinking as well as metacognitive abilities too. According to Burchinal, Cryer, Clifford, and Howes (2002); McElwain et al. (2011) the sensitivity and formal eductaion of the caregivers or educators are related to mental state language they use in conversation with the child. Moreover, it is suggested that besides for MST qualification of teacher the quality with which the teacher of the preschooler interact matters alot.

The study also examined the differences across years of teaching experience on mental state talk the teacher employ. The results showed that Pakistani teachers who have more teaching experience employ more mental state talk with the preschoolers during the story book narration. Teachers experience was found to be associated with the overall use of MST as well for cognitive mental state talk. Previous studies do not provide consistent data (Misailidi et al., 2013) showed no relationship between years of teaching experience and number of mental state talk the teacher used. On contrary King and La Paro (2015) revealed that association between the perception term and teaching experience, however, these findings showed that with increase in teaching experience, the teacher employ less perception terms. It is

further suggested that there is a possibility that teachers with more teaching experience may utilize terms other than usual use of directive terms e.g., look and see to get attention of the preschoolers. Many of the studies do not discriminate between the perception and the cognitive talk (Jakubowska et al., 2018) for present study the perception terms are no different than cognitive terms hence showed greater cognitive MST with more teaching experience. Teachers' years of experience with the preschoolers is of great importance; it is related to several significant outcomes e.g., language development of a child (Kontos & Fiene, 1987); preschoolers learning (Barnett, 2003) and provide high quality of classroom learning environment (Zhang, 2014).

One of the objectives of the study to explore the maternal and paternal differences on mental state talk on the basis of how much time they spent talking to their child during the day and on the weekend. The results revealed the no parental differences on their mental state terms whether they spend more or less time talking and interacting to their child (Table 39 & 40). Although the results are partially congruence with previous studies (Jenkins et al., 2003) that mother spend more time with their children than fathers, which led to expect that mother will employ more mental state talk to their children than fathers. This may suggest that the interaction may not guarantee the exposure of mental state talk, previous research (Pelletier, 1996) observed similar findings that few of the preschool teacher did not use mental state terms at all; hence increase in interaction may not always lead to increase in MST. Nevertheless, these analyses were carried out to verify the common observation that prevail in Pakistani context that suggest that parents who are more

talkative in general and specifically father talk less frequently than mothers, hence they employ less MST. The present research therefore addressed this issue by calculating the proportion of total number of words, from the three categories of MST, employed by parents and also for the teachers of the preschoolers during the story narration session.

Furthermore, to address the issue concerning the apprehension regarding the Story telling routine among Pakistani parents, the researcher analyzed the paternal and maternal differences on MST across their story telling routine (Table 41). The results showed that 70% of the fathers and more than 82% mothers follow the routine of storytelling with or without books. The findings do not support the apprehension suggested by indigenous research (Nawaz, 2015) that in developing countries like Pakistan, parents from middle and low income household may not practice the story book reading or storytelling routine. Furthermore, the present research revealed that father and mothers who practice story telling with books employed more mental state talk than parents who practice story telling routine without books. This may suggest that the parents, who practice the story telling and story book reading habit with their children on daily basis, expose their children with rich language which are beneficial for their child related outcome.

Story narration method captured the maternal paternal MST well; this method was preferred over assessment procedures due to its practicality and it provides prospect to discuss mental states (Slaughter, Peterson, & Mackintosh, 2007; Tompkins, 2015). Parents who frequently ask their preschoolers regarding the story character's feelings, emotions, thoughts or desires during the story narration session, they may indirectly contribute in developing the habit of engaging in conversation

about the mind (Symons et al., 2005). Baptista et al. (2017) also recommended that book narration task captures the contribution of MST well.

Conclusion

In Pakistan, the present study is first of its kind in the context that it has tried to measure the executive function of the preschooler using performance based software, and assessed the maternal and paternal and teachers' mental state talk using indigenous wordless picture story book. The research is in line with the recent growing research trends which suggest these assessment procedures.

Present study availed the opportunity for the translation and validation of the executive function touch battery in Urdu language, to evaluate the executive function of the preschoolers. Further, the research modified the story books to be utilized as an indigenous tool for the measurement of mental state talk of the father, mother and teacher of the preschooler.

The results study showed that paternal, maternal; teacher mental state talk and quality of parenting contribute to executive function of the preschoolers. As hypothesized, mother talk more frequently to their children than father and teachers of the preschoolers but contrary to assumption the father and mother showed no differences on their use of mental state talk. The teachers' years of experience, mother education and age of the preschooler contribute positively to the executive function of the preschooler. On the other hand the poor monthly household income may act as a risk factor for executive function skills of the preschooler.

Limitation and future direction

Although the present study advances knowledge of potential role of maternal paternal and teacher in development of EF of the preschooler in low middle income country like Pakistan; however, the present study holds few weakness as well.

First, the present study utilized the cross-sectional design, as EF progress through age especially in early childhood; future studies are suggested to follow longitudinal design which would help to better understand the developmental trajectories of EF skills in early childhood.

The present study consisted of small sample size which included 120 preschoolers along with their father, mothers and teacher. The EF touch battery takes 50 to 60 minute with each preschooler. The three audio recordings with the child were included 120 dyads (mother-preschooler, father-preschooler and teacher-preschooler), practically it was not possible to collect and handle large data set.

For present research, the mental state talk content (emotion, desire, cognition) of the father, mother and teacher was examined during the story narration task, the quality of the MST were not assessed, the further research should also account for the quality of MST, in book narration task as well as in different context. Moreover, during the book narration task children response were not recorded; future research should account the parent child language interaction within the picture book narration task as well across various context. The bi-directional language input can provide better picture and rich content.

The present study assessed the quality of parenting which has an influence on the preschooler's cognitive development, it was very important that the parents should

perceive the importance of their contribution therefore it is recommended that future research should include the perceive knowledge of effective parenting that has an influence on their children's cognitive development.

The present research investigated the role of teacher language input to the child EF in their school settings, but the present study did not examined the any variables related to the classroom characteristics, or teacher characteristics e.g., Marital status, income, children etc. these variables should be considered in future research.

Implication

The present study has theoretical as well practical implication. The present research contributed to dearth of research in low middle income countries and specifically in Pakistan on executive function of preschoolers. The present research not only contributed to indigenous literature by translating the performance based EF touch battery but also analyzed its feasibility/ performance metrics, validated it using Item Response Theory, which may benefit future researcher, teacher and other stakeholders in the assessment of early EF skills.

One of the key strength of the study is the validation of the EF Touch battery, besides assessing the test parameter estimation for difficulty and discriminating power of the test item, it also assessed the efficiency of each task over the range of its latent variable it was designed to measure. Further, the best feature was the Differential Item Functioning which ensured that for the EF touch battery worked equally well for preschooler living in low and middle income household and that the group differences were not the result of measurement invariance.

Furthermore, the study modified the picture story books to measure MST of father, mother and teacher, which filled the gap in the methodological literature; up to researcher knowledge no indigenous measure was available to assess the MST during the story narrative task. Nevertheless, previous research in Pakistan assessed MST in naturalistic setting (Nawaz, 2015).

It further, highlighted the significance of social factors like the maternal paternal and teacher input for EF development. This contribution provided knowledge to parents to educate them to improve their language and parenting skill, likewise one of the major contribution is the justification for intervention as preventive measure, which may assist to enhance the early social environment in return facilitate the EF skills. Neville et al. (2013) suggtested that intrevention plans that include both children and their parents would offer prospects for imporvemnt in social support that would promote children EF skills.

Morover, the study investigated the role of teacher MST, that would be benefical for educators and early childhood programs in Pakistan. In pakistan, there is no uniform policy for hiring and training educators and teachers in preschools specially in priavte sector. The policy makers can take directions from present research considering proper qualification, and expereince to interat with preschoolers and to plan intrevention, to teach them the siginifcane and use of words and mental terms during the interaction with preschooler and the contribution their words in child related outcomes.

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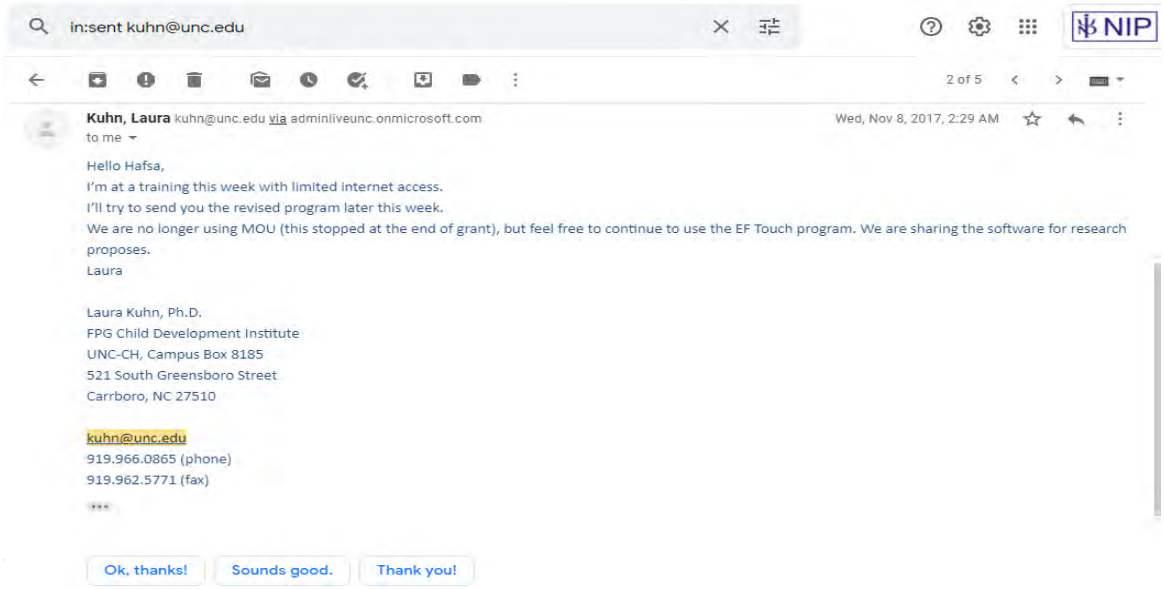
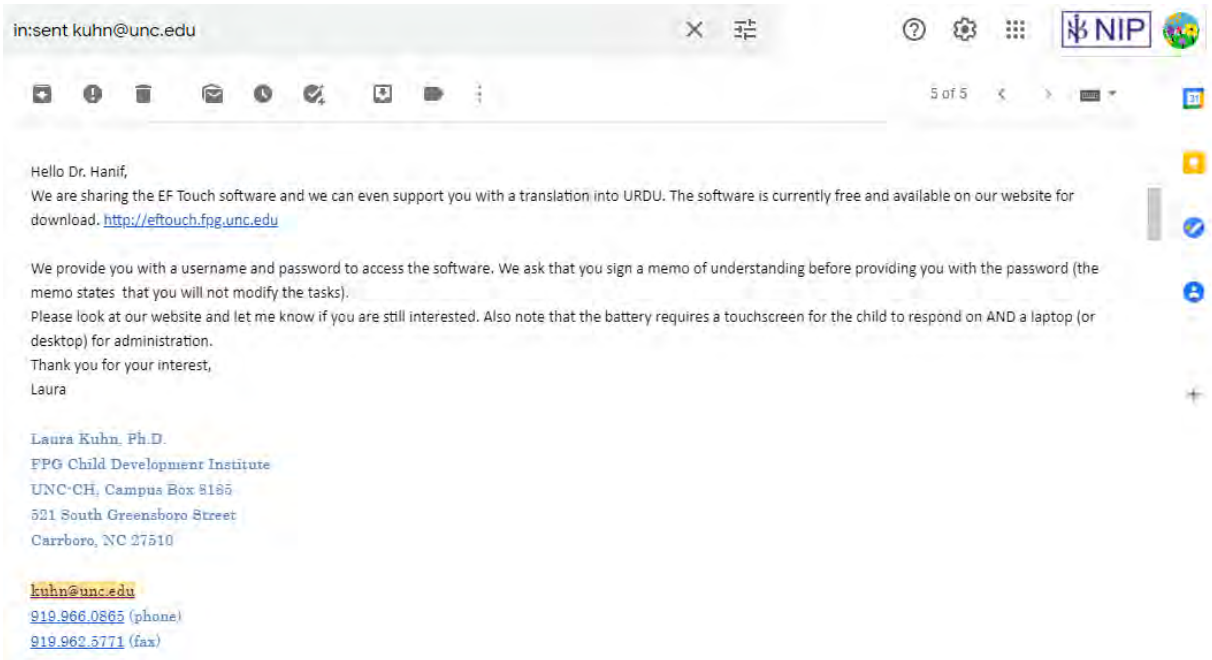
APPENDICES

Appendix A

Permission for Executive Function Touch Battery





Appendix B

Sample: English verbal instruction of Executive Function Touch Battery

"We're going to play some fun games. In those games you're going to be touching this screen."

Admin:"[Point to the touch screen]"

"Let me show you how this works."

"Touch the red dot."

"Right, good job."

Admin:"[Provide correction]"

"Touch the yellow dot."

"Touch the blue dot."

"Touch the bird."

"Touch the cat."

"You've done a great job! Now we're going to play other games where you will touch this screen."

"We are going to play a game where I need your help. This screen has two buttons, one on each side "

Admin:"[point to buttons]."

"We have two hands "

Admin:"[show each hand]."

"I am going to show you pictures with arrows that point in different directions."

"Your job is to touch the button that the arrow is pointing to using this hand "

Admin:"[point to the child's left hand] "

"when the arrow is pointing to this button "

Admin:"[point to left button] " "and this hand "

Admin:"[point to the child's right hand] "

"when the arrow is pointing to this button "

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"Now you touch the fields in the SAME order that the Cat walked in them."

"Now the Dog is going to walk in some fields."

"Now you touch the fields in the SAME order that the Dog walked in them."

"Now the Cow is going to walk in some fields."

"Now you touch the fields in the SAME order that the Cow walked in them."

"Now the Pig is going to walk in some fields."

"In this game, you are going to see some blue buttons in different places on the screen. Every time you see a button, touch it as fast as you can."

"Ready?"

"Remember to touch each button as fast as you can."

"OK, let's try this one more time."

Appendix C

Sample: Urdu verbal instruction of Executive Function Touch Battery

"ہم کچھ مزے کے کھیل کھیلنے جا رہے ہیں ان کھیلوں میں آپ کو اس سکرین کو چھونے جا رہے ہیں"

Admin:"[ٹچ سکرین کی طرف اشارہ کریں]"

"آیئے میں اپ کو دیکھتا ھوں یہ کیسے کام کرتا ہے"

"سرخ نقطے کو ہاتھ لگائیں۔"

"صیح. بہت اچھے"

Admin:"[تصیح فراھم کریں]"

"پیلے نقطے کو چھوئیں"

"نیلے نقطے کو چھوئیں."

"پرندے کو چھوئیں."

"بلی کو چھوئیں۔ "

"آپ نے بہت اعلیٰ کام کیا! اب ہم کچھ دوسرے کھیل کھیلیں گے جس میں آپ سکرین کو چھوئیں گے۔"

"ہم ایک کھیل کھیلنے جا رہے ہیں جہاں مجھے آپ کی مدد چاہیے. اس سکرین پہ دو بٹن ہیں, دونوں جانب ایک ایک بٹن۔"

Admin:"[بٹنوں کی طرف اشارہ کرے]"

"ہمارے دو ہاتھ ہیں"

Admin:"[دونوں ہاتھ دکھائیں]"

"میں آپ کو اب تصویریں دکھاؤں گا جس کے اوپر تیر کے نشان ہیں جو مختلف اطراف اشارہ کر رھیں ہیں."

"آپ کا کام یہ ہے کہ اس ہاتھ کے استعمال اُس بٹن کو چھوئیں جس کی طرف تیر اشارہ کر رہا ہے۔"

Admin:"[بچے کے بائیں ہاتھ کی طرف اشارہ کرے]" "

" جب تیر اس بٹن کی طرف اشارہ کر رہا ہو"

" [بائیں بٹن کی طرف اشارہ کریں]"Admin:

" اور یہ ہاتھ"

" [بچے کے دائیں ہاتھ کی طرف اشارہ کریں]"Admin:

" جب تیر اس بٹن کی طرف اشارہ کرے۔"

"[دائیں ہاتھ کی طرف اشارہ کریں.]"Admin:

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.

"اس کھیل میں آپ نیلے بٹن سکرین کی مختلف جگہوں پر دیکھنے جا رہے ہیں۔ ہر بار جب آپ کو بٹن دکھائی دیں آپ جتنی تیزی سے ہو سکے ان کو چھوئیں۔"

"تیار رہیں؟"

". یاد رہے! ہر ایک بٹن کو جتنی تیزی سے ہو سکے اپ اتنی تیزی سے چھوئیں۔"

"ٹھیک ہے! ۔ چلیں اس کو ایک دفعہ پھر کوشش کرتے ہیں۔"

Appendix D

Sample of English Verbal Instruction in Programming for the EF Touch Software

child:Times New Roman

Admin:Arial

=mUmSxCgDrNNSE8rYs6MRynh+BZpFzDr4ar5cfgtmtHI=

"We're going to play some fun games. In those games you're going to be touching this screen."

=855C2k9rf+Wy3nHUXkAo8gSdTDGSMw13qHOD0cjg+mo=

Admin:"[Point to the touch screen]"

=FbHR7Eq0ckmU9/fOKQhBL2BrDiP0LExNpbOTcrs82s0=

"Let me show you how this works."

=rvWxFDb4uK9eLxOwcZoYLqHzZ/J4Q6dyRsI+qfyjo/8=

"Touch the red dot."

=K5HdYPhok6j4/MUNFBi3q9/EPhi7ueC6LynLpUgdpOM=

"Right, good job."

=Iqj4hbf1Ww3mkgqqSaexj6eqo7V/dvZtqsg2dWtWZz0=

Admin:"[Provide correction]"

=c/upSs9oZuYa5XiDKhtTi88mC+r4O8BfX4yiYIaGR0w=

"Touch the yellow dot."

=6eIeLr85YRLGPhRZww0wJ6NlGrEmKqUMIsyYGOC2pkQ=

"Touch the blue dot."

=a32RuYcRpNrjVcTCHYTxq4k0XI/1Ig2dGbUcZNxW0JQ=

"Touch the bird."

=O/meX1wWzkG0R6v407Q5EzYUyH9d/qQXMXnaJ+iqV3g=

"Touch the cat."

=CPdUB7kaQlHyVoCdqh89TiLEcscrYgj4RlpNMIAxelY=

"You've done a great job! Now we're going to play other games where you will touch this screen."

=baPWf06J16ASrwGeT/EzqoDJwTjAae+ubtE21ezQcGU=

"We are going to play a game where I need your help. This screen has two buttons, one on each side "

Admin:"[point to buttons]."

=eUrpFErwnp6pvNKrbhXvsveah70z2m77sCZH5STGq6M=

"We have two hands "

.

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.

.

"In this game, you are going to see some blue buttons in different places on the screen. Every time you see a button, touch it as fast as you can."

=x1vvxkdlwT7GL525aju+cOOfYtI5FbaJbUNjqQsqVD8=

"Ready?"

=jWurDnMsM1M/Ws8zB3B9t2aze/E6YbvHoOngWnMQX/g=

"Remember to touch each button as fast as you can."

=WhCmtYRxRxR99jOD82wddjbLlxL22GO8UuiRk8dJdCg=

"OK, let's try this one more time."

Appendix E

Sample of Urdu Verbal Instruction in Programming for the EF Touch Software

Child:Times New Roman

Admin:Arial

=mUmSxCgDrNNSE8rYs6MRynh+BZpFzDr4ar5cfgtmtHI=

"ہم کچھ مزے کے کھیل کھیلنے جا رہے ہیں ان کھیلوں میں آپ کو اس سکرین کو چھونے جا رہے ہیں"

=855C2k9rf+Wy3nHUXkAo8gSdTDGSMw13qHOD0cjg+mo=

Admin:"[ٹچ سکرین کی طرف اشارہ کریں]"

=FbHR7Eq0ckmU9/fOKQhBL2BrDiP0LExNpbOTcrs82s0=

"آیئے میں اپ کو دیکھتا ھوں یہ کیسے کام کرتا ہے"

=rvWxFDb4uK9eLxOwcZoYLqHzZ/J4Q6dyRsI+qfyjo/8=

"سرخ نقطے کو ہاتھ لگائیں۔"

=K5HdYPhok6j4/MUNFBi3q9/EPhi7ueC6LynLpUgdpOM=

"صیح. بہت اچھے"

=Iqj4hbf1Ww3mkgqqSaexj6eqo7V/dvZtqsg2dWtWZz0=

Admin:"[تصیح فراھم کریں]"

=c/upSs9oZuYa5XiDKhtTi88mC+r4O8BfX4yiYIaGR0w=

"پیلے نقطے کو چھوئیں"

=6eIeLr85YRLGPhRZww0wJ6NlGrEmKqUMIsyYGOC2pkQ=

"نیلے نقطے کو چھوئیں."

=a32RuYcRpNrjVcTCHYTxq4k0XI/1Ig2dGbUcZNxW0JQ=

"پرندے کو چھوئیں."

=O/meX1wWzkG0R6v407Q5EzYUyH9d/qQXMXnaJ+iqV3g=

"بلی کو چھوئیں۔ "

=CPdUB7kaQlHyVoCdqh89TiLEcscrYgj4RlpNMIAxelY=

"آپ نے بہت اعلیٰ کام کیا! اب ہم کچھ دوسرے کھیل کھیلیں گے جس میں آپ سکرین کو چھوئیں گے۔"

.

.

.

.

.

.

. sS71ENfqGtz8COWsF4T2hYiWBIOzMhoU5rDVY2bP9Tw=

"اس کھیل میں آپ نیلے بٹن سکرین کی مختلف جگہوں پر دیکھنے جا رہے ہیں۔ ہر بار جب آپ کو بٹن دکھائی دیں آپ جتنی تیزی سے ہو سکے ان کو چھوئیں۔"

=x1vvxkdlwT7GL525aju+cOOfYtI5FbaJbUNjqQsqVD8=

"تیار ہیں؟"

=jWurDnMsM1M/Ws8zB3B9t2aze/E6YbvHoOngWnMQX/g=

"یاد رہے! ہر ایک بٹن کو جتنی تیزی سے ہو سکے اپ اتنی تیزی سے چھوئیں۔."

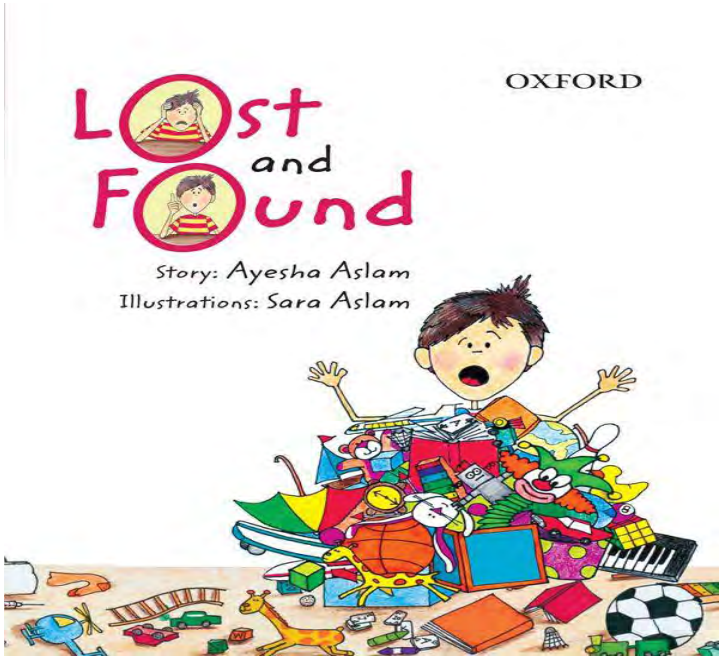
=WhCmtYRxRxR99jOD82wddjbLlxL22GO8UuiRk8dJdCg=

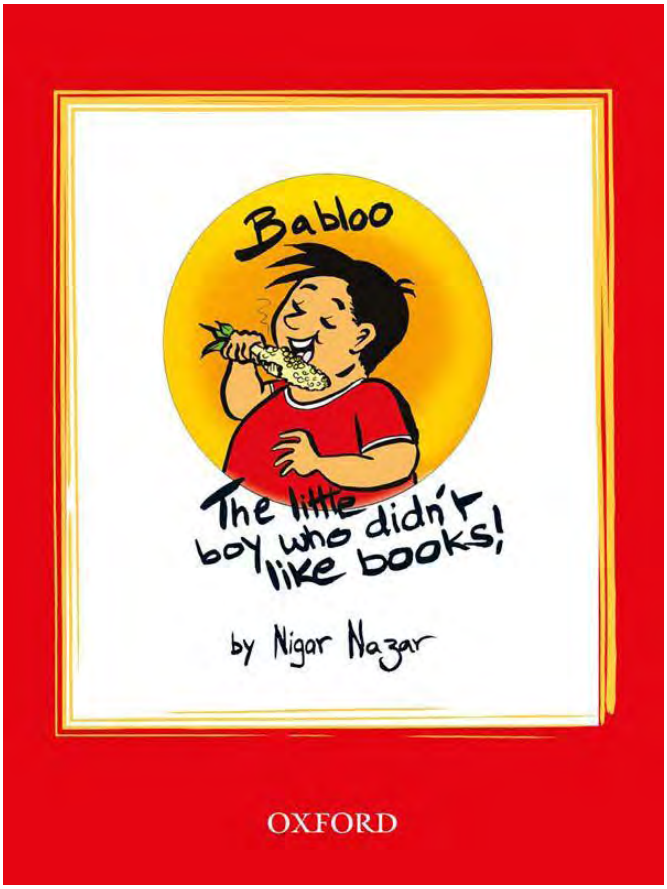
"ٹھیک ہے! ۔ چلیں اس کو ایک دفعہ پھر کوشش کرتے ہیں۔"

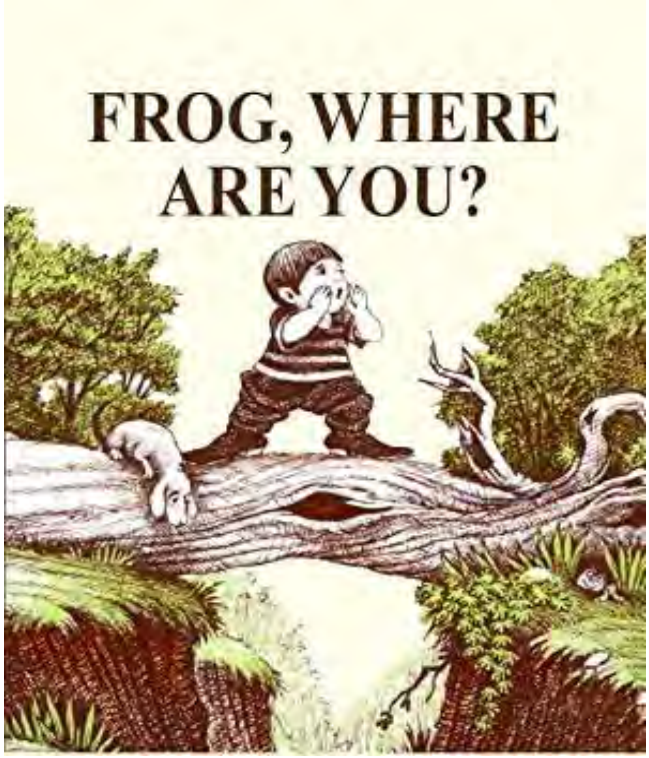
Appendix F

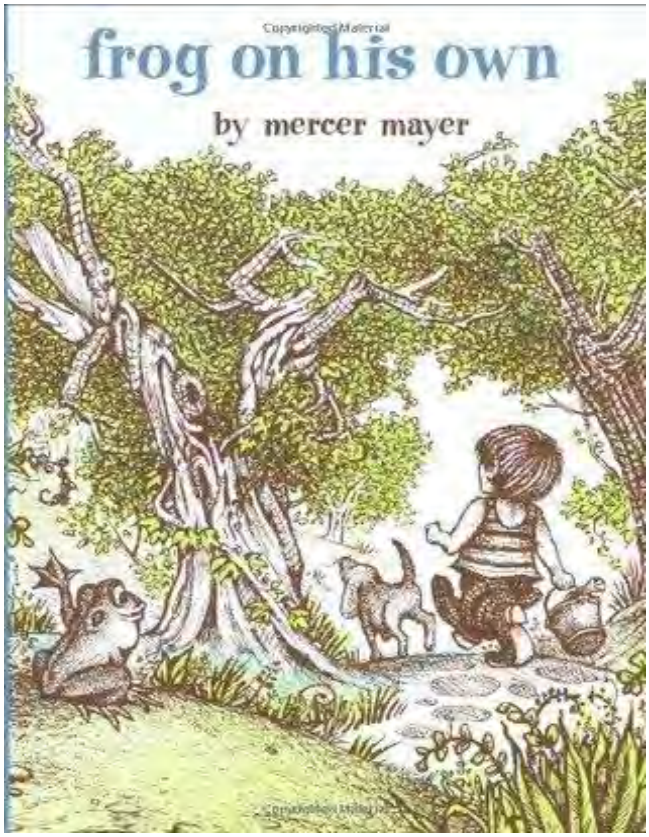
List and Pictures of Story Books Initially Identified As Prospect Tool for Measurement of Mental State Talk of Father, Mother and Teachers

S.No	Name of Story Book	Author Name
1.	Lost and found	Ayesha Aslam
2.	Babloo: The Little Boy Who Didn't Like Books!	Nigar Nazar
3.	Frog, where are you?	Mercer Mayer
4.	Frog on his own	Mercer Mayer
5.	Garbage monster	Nigar Nazar
6.	Raima and Rehan	Nandini Nayar
7.	Where Is Amma?	Nandini Nayar
8.	Listen to the Wind: The Story of Dr. Greg & Three Cups of Tea	Greg Mortenson
9.	Our Super Hero Edhi Baba	Maria Riaz
10.	Bano, Billoo, and Amai: The Paper Doll Book	Fauzia Aziz Minallah
11.	Amai and the Banyan Tree	Fauzia Aziz Minallah
12.	My Baba is amazing	Mahpara

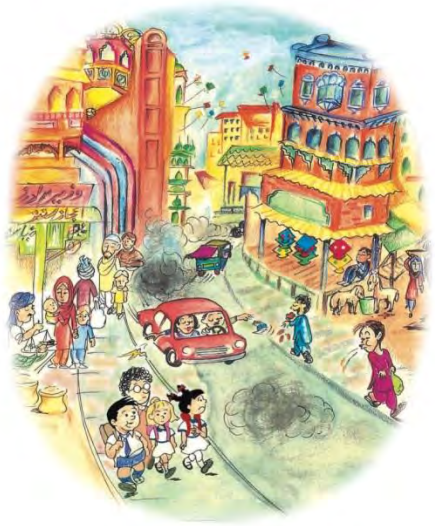

OXFORD
Lost and Found
Story: Ayesha Aslam
Illustrations: Sara Aslam


Babloo
The little boy who didn't like books!
by Nigar Nazar
OXFORD

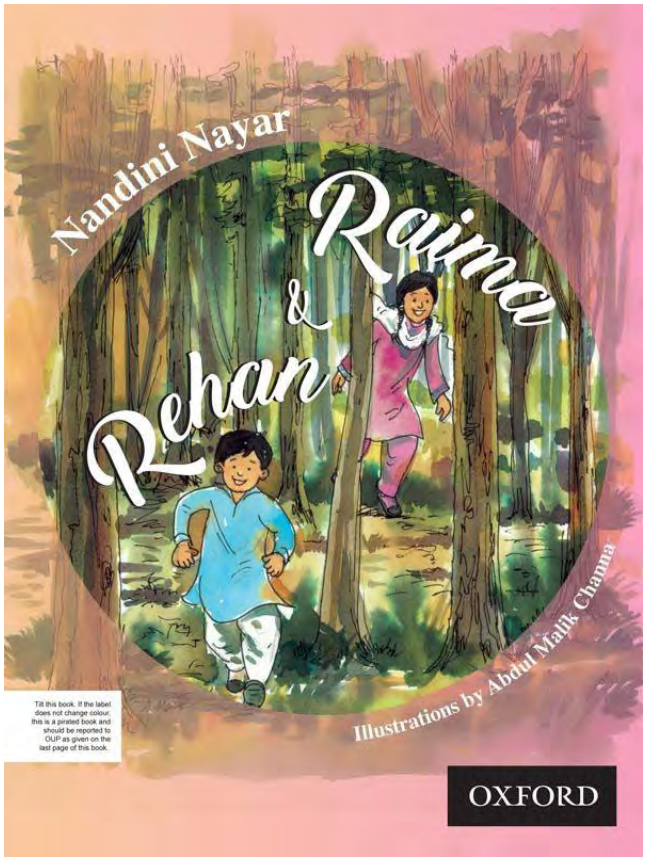

FROG, WHERE ARE YOU?

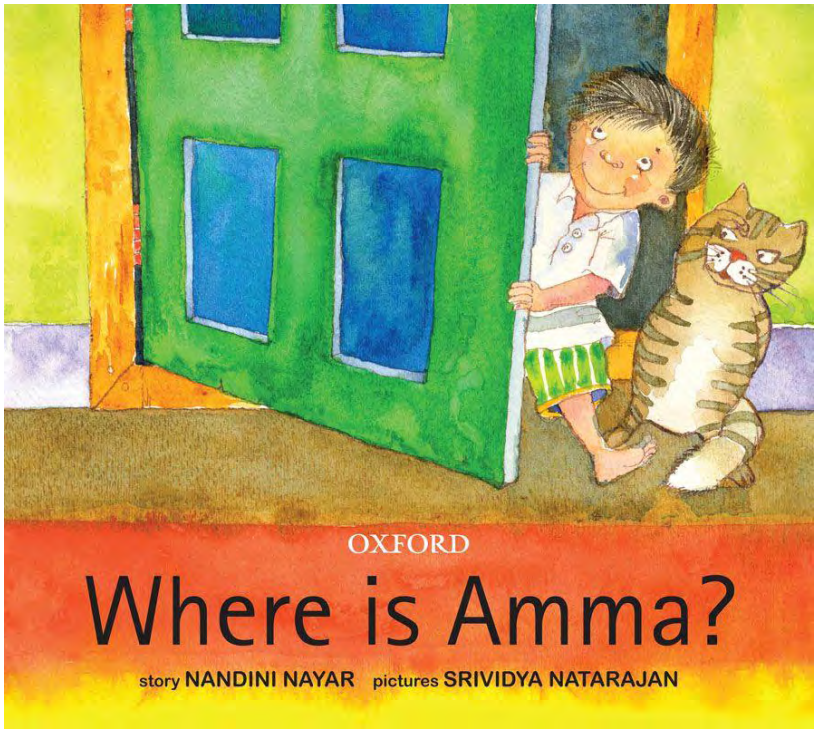

Copyrighted Material
frog on his own
by mercer mayer

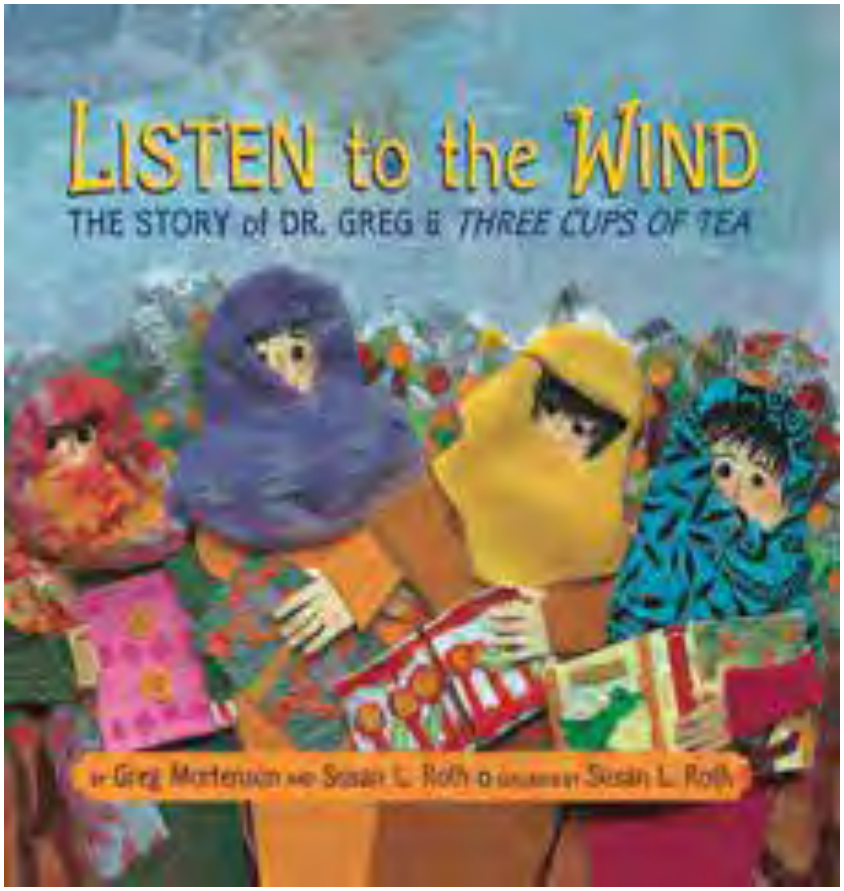
THE GARBAGE MONSTER

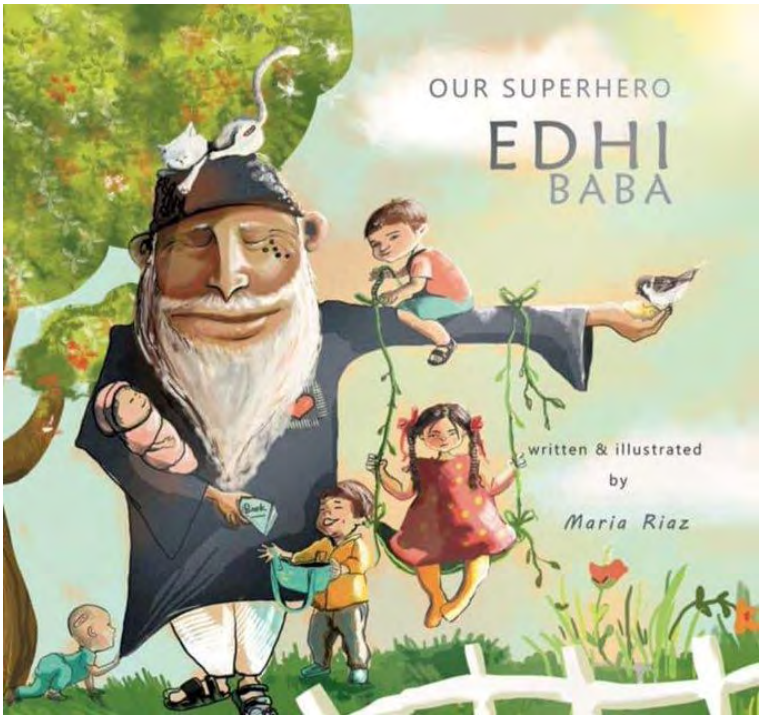


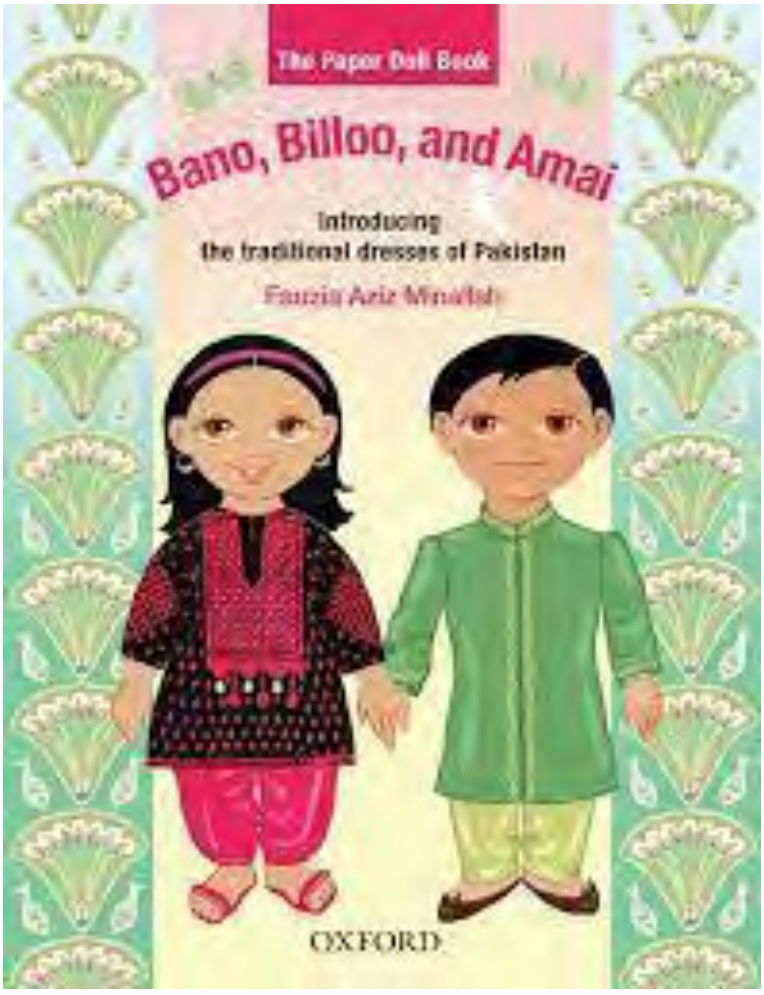
WRITTEN AND ILLUSTRATED
BY
NIGAR NAZAR

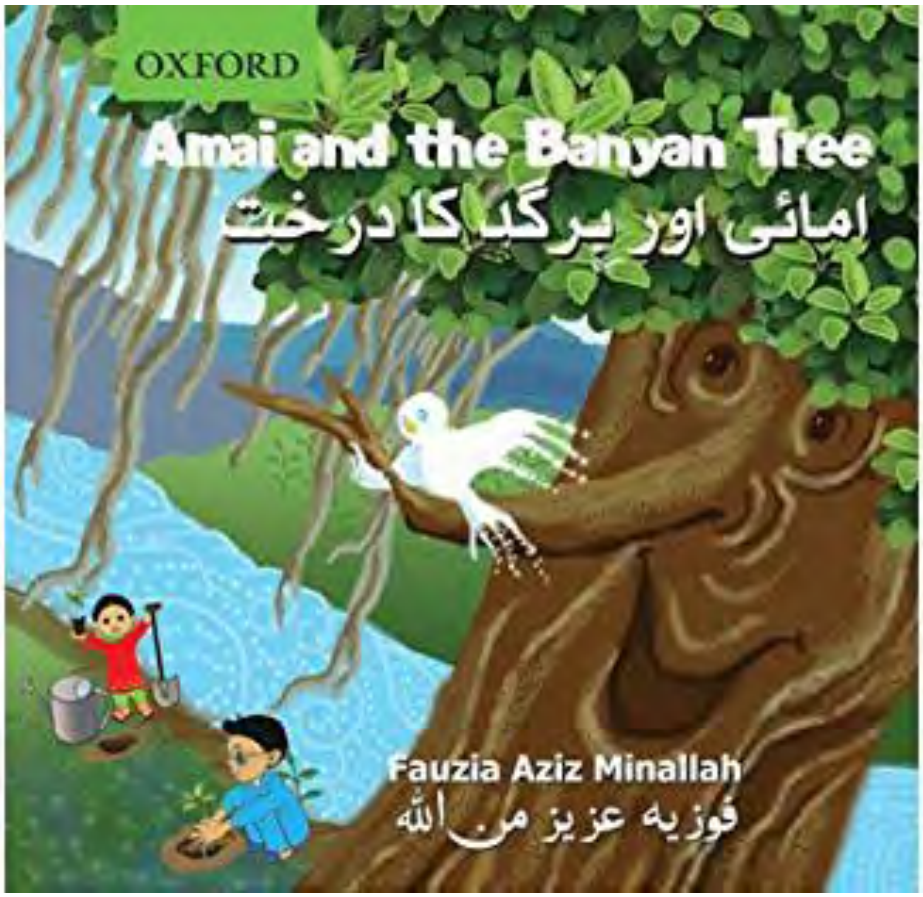



OXFORD
Where is Amma?
story NANDINI NAYAR pictures SRIVIDYA NATARAJAN


LISTEN to the WIND
THE STORY of DR. GREG & THREE CUPS OF TEA
by Greg Mortenson and Susan L. Roth illustrated by Susan L. Roth


OUR SUPERHERO
EDHI
BABA
written & illustrated
by
Maria Riaz

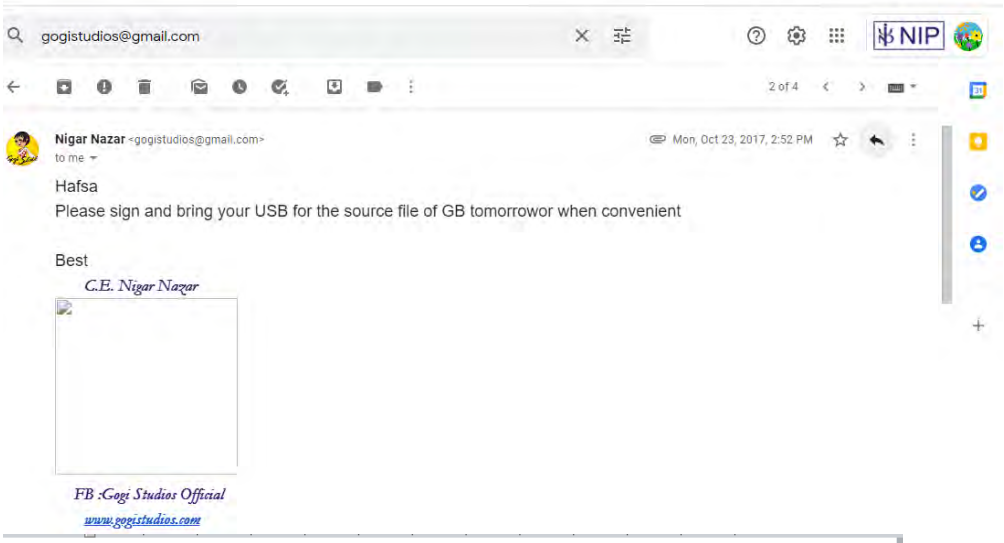

The Paper Doll Book
Bano, Billoo, and Amai
Introducing
the traditional dresses of Pakistan
OXFORD


OXFORD
Amai and the Banyan Tree
امائی اور برگد کا درخت
Fauzia Aziz Minallah
فوزیہ عزیز من اللہ

Appendix G

Permission for Story Books

Permission for Garbage monster



gogistudios@gmail.com

2 of 4

Nigar Nazar <gogistudios@gmail.com>
to me

Mon, Oct 23, 2017, 2:52 PM

Hafsa
Please sign and bring your USB for the source file of GB tomorrowor when convenient

Best
C.E. Nigar Nazar

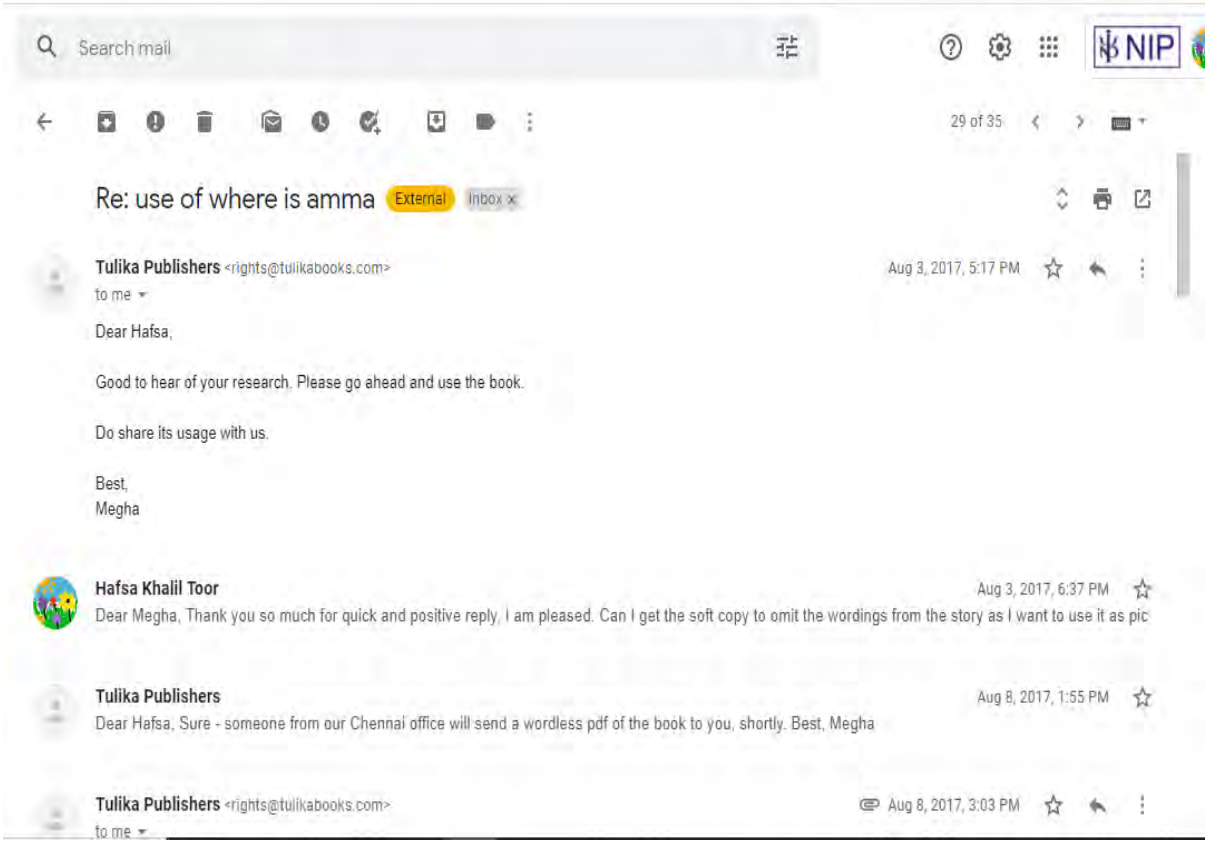
FB :Gogi Studios Official
www.gogistudios.com

Usage Of Garbage Monster Story And Illustrations

I am Ms. Hafsa Khalil Toor, doing PhD from National Institute of Psychology, Quaid e Azam University Islamabad, under the supervision of Dr. Rubina Hanif (Associate Professor). One of my research variables is to measure Mental state talk of parents and teacher of preschoolers, which we intend to measure through indigenous Picture story books, one of the books which fulfills are requirement is Story book by Ms. Nigar Nazar, named "The Garbage Monster", this story book not only represents our culture but also signifies very powerful message too. I under the supervision of my supervisor take this responsibility that we will not use this picture story book other than our research purpose, The Garbage Monster is bring given to me in good faith and trust that I will not reproduce it for sale purposes. That in whatever format the picture book is to be used, it will retain the name of the author ,website and facebook ID. This is a document that binds me to the usage of the Garbage Monster under the Intellectual Property Rights of the author and artist, Nigar Nazar.

Hafsa Khalil Toor,
October 23, 2017

Permission for Where is Amma?



Search mail

29 of 35

Re: use of where is amma External Inbox ×

Tulika Publishers <rights@tulikabooks.com> Aug 3, 2017, 5:17 PM

to me

Dear Hafsa,

Good to hear of your research. Please go ahead and use the book.

Do share its usage with us.

Best,
Megha

Hafsa Khalil Toor Aug 3, 2017, 6:37 PM

Dear Megha, Thank you so much for quick and positive reply, I am pleased. Can I get the soft copy to omit the wordings from the story as I want to use it as pic

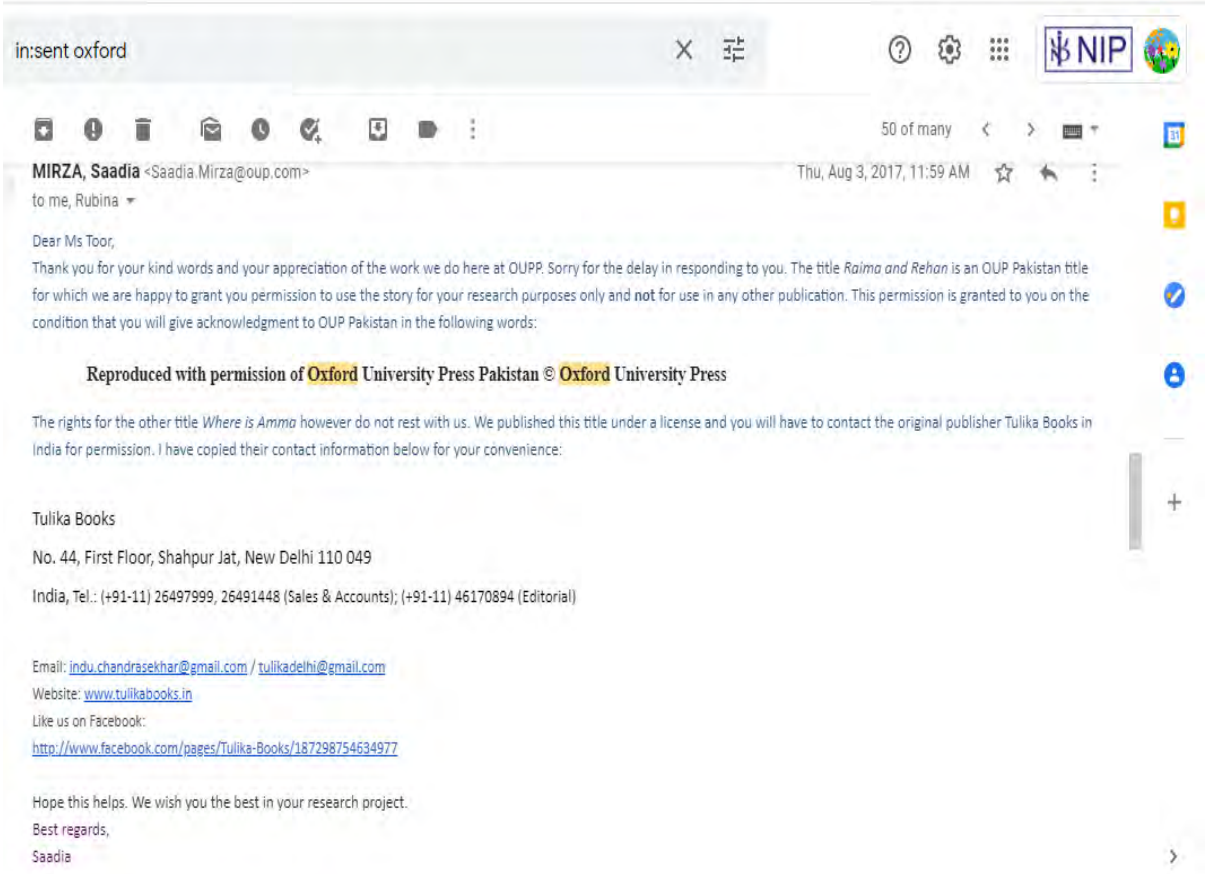
Tulika Publishers Aug 8, 2017, 1:55 PM

Dear Hafsa, Sure - someone from our Chennai office will send a wordless pdf of the book to you, shortly. Best, Megha

Tulika Publishers <rights@tulikabooks.com> Aug 8, 2017, 3:03 PM

to me

Permission for Raima and Rehan



in:sent oxford

50 of many

MIRZA, Saadia <Saadia.Mirza@oup.com> Thu, Aug 3, 2017, 11:59 AM

to me, Rubina

Dear Ms Toor,

Thank you for your kind words and your appreciation of the work we do here at OUPP. Sorry for the delay in responding to you. The title *Raima and Rehan* is an OUP Pakistan title for which we are happy to grant you permission to use the story for your research purposes only and **not** for use in any other publication. This permission is granted to you on the condition that you will give acknowledgment to OUP Pakistan in the following words:

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Hope this helps. We wish you the best in your research project.
Best regards,
Saadia

Appendix H

Demographic Sheet and Informed Consent for Study I

CONSENT

معزز والدین اور اساتذہ!

قومی ادارہ نفسیات، قائدِ اعظم یونیورسٹی، اسلام آباد ایک تحقیقاتی ادارہ ہے۔ جہاں مختلف موضوعات پر تحقیق کی جاتی ہے۔ میری تحقیق بچوں کی ذہنی نشوونما میں والدین اور اساتذہ کی بات چیت اور الفاظ کے چناؤ کے اثرات سے متعلق ہے۔ جس کے لیے والدین اور اساتذہ کہانی سنائیں گے۔ میری اس تحقیق میں والدین اور اساتذہ کے اس کہانی سنانے کے عمل کی آڈیو ریکارڈنگ درکار ہے۔ ھم اپ کو یقین دلاتے ہیں کہ آپ کی آڈیو ریکارڈنگ مکمل صیغہ راز میں رکھی جائے گی۔ اور صرف تحقیقاتی مقاصد کے لیے استعمال کی جائے گی۔ جس کے لیے آپ کی اجازت درکار ہے۔ اس کے علاوہ ہم کچھ معلومات والدین کے گھر کے ماحول کے متعلق کرنا چاہتے ہیں۔ جس کے لیے آپ کی اجازت درکار ہے۔ اس کے علاوہ آپ سے یہ معلومات کچھ مہینوں کے بعد دوبار حاصل کریں گے۔ آپ سے گزارش ہے کہ آپ ہماری تحیق مکمل ہونے تک ہمارے ساتھ تعاون کریں۔ آڈیو ریکارڈنگ کے دوران کبھی بھی آپ اچھا محسوس نہ کریں تو ہمیں رکنے کا کہہ سکتے ہیں۔ آپ کے اس تعاون پر ہم آپ کے تہہ دل سے شکر گزار ہیں۔

حفصہ خلیل طور

پی ایچ ڈی سٹوڈنٹ

Mother's Demographic Information

نام--------------------------------- تعلیم---------------------- عمر-------------------

پیشہ------------------------------- ماہانہ آمدنی--------------------------------------

کام کے اوقات-------------- بچوں کی تعداد-------------------------------

خاندانی نظام--------------------------------

بچے کا نام---------------------------------- بچے کی تاریخ پیدائش-----------------------

کیا آپ کے بچے کو کوئی جسمانی مرض ہے؟------------- اگر ہاں تو تفصیل بتائیں--

----

کیا آپ کے بچے کو کوئی ذہنی مرض ہے؟------------- اگر ہاں تو تفصیل بتائیں-----------------------------

Father's Demographic Information

نام---------------------------------- تعلیم---------------------- عمر------------------

پیشہ----------------------------------- ماہانہ آمدنی-----------------------------------

کام کے اوقات--------------- بچوں کی تعداد---------------------------

خاندانی نظام-------------------------------

بچے کا نام-------------------------------- بچے کی تاریخ پیدائش---------------------

کیا آپ کے بچے کو کوئی جسمانی مرض ہے؟------------- اگر ہاں تو تفصیل بتائیں--

کیا آپ کے بچے کو کوئی ذہنی مرض ہے؟------------- اگر ہاں تو تفصیل بتائیں----------------------------

Teacher's Demographic Information

نام-----------------------------------

شاگرد کانام---------------------تعلیم---------------------- عمر----------- -

ماہانہ آمدنی-----------------------------------

ازدواجی حیثیت----------------------

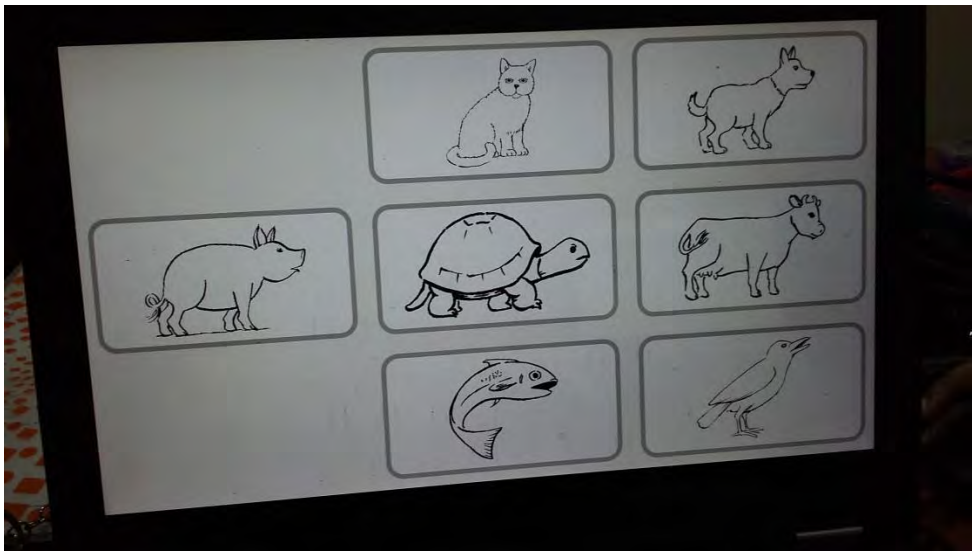
کیاآپ کی بچے ہیں ؟------------

کام کے اوقات---------------

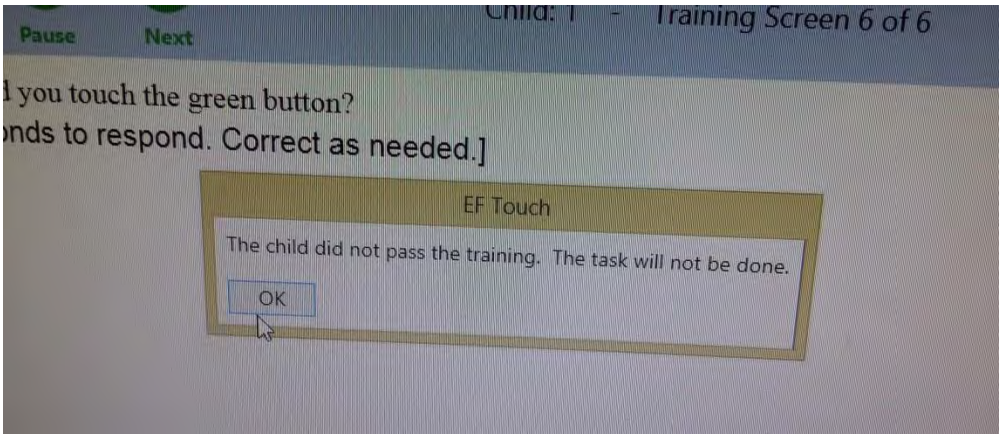
پڑھانے کا تجربہ------------

Appendix I

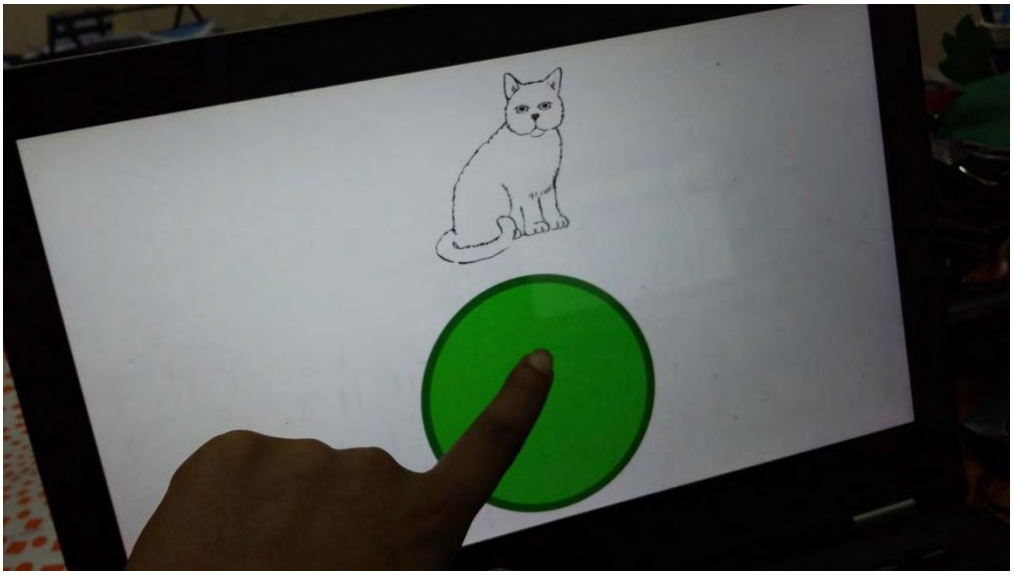
Glimpses of EF touch battery



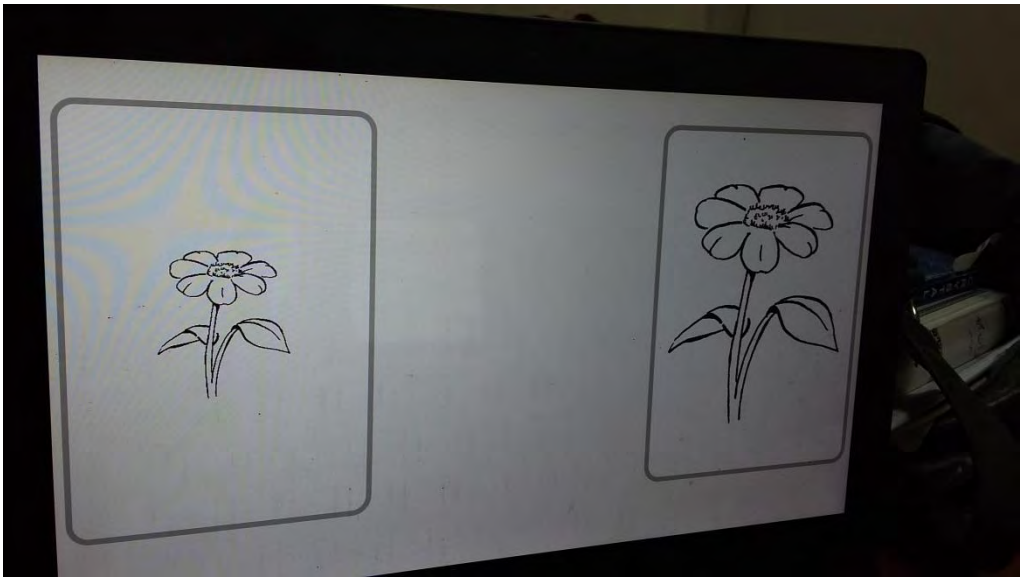
a) Introduction Screen



b) Training task



c) Pig task

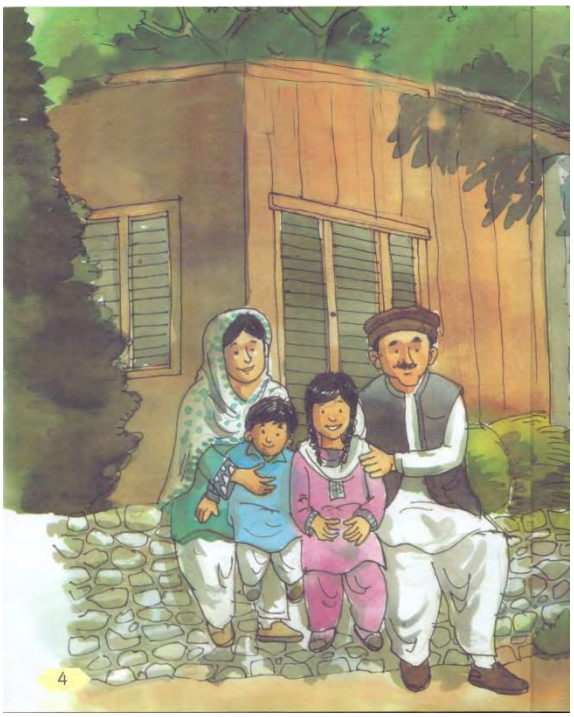


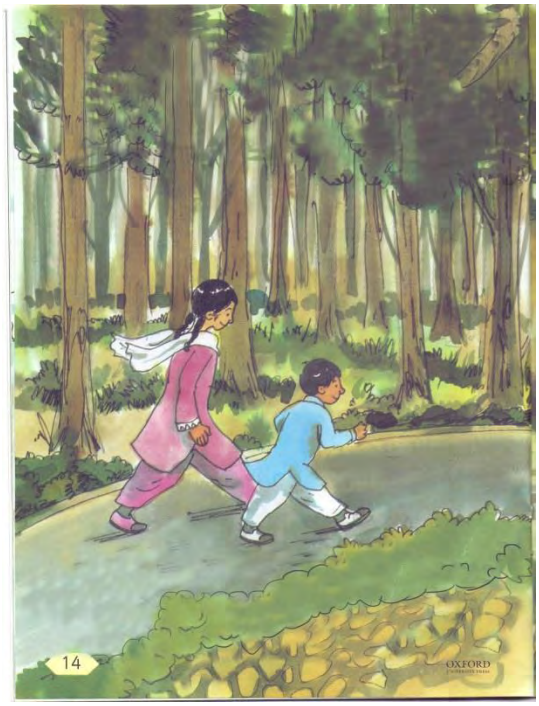
d) Something's same task

Appendix J

Sample Pictures of Adapted Story Books

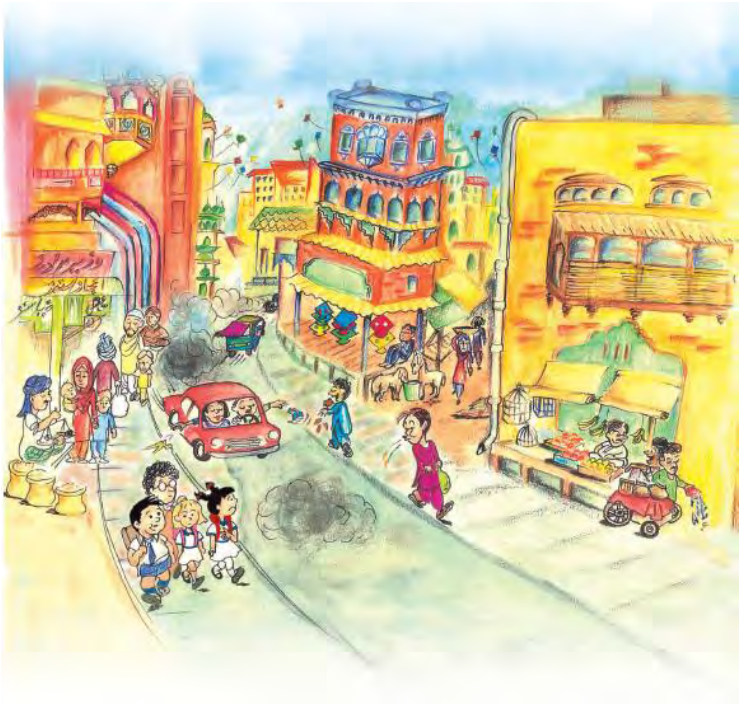
Raima and Rehan





Where Is Amma?

The Garbage Monster



Appendix K

The Early Childhood (EC) HOME Inventory

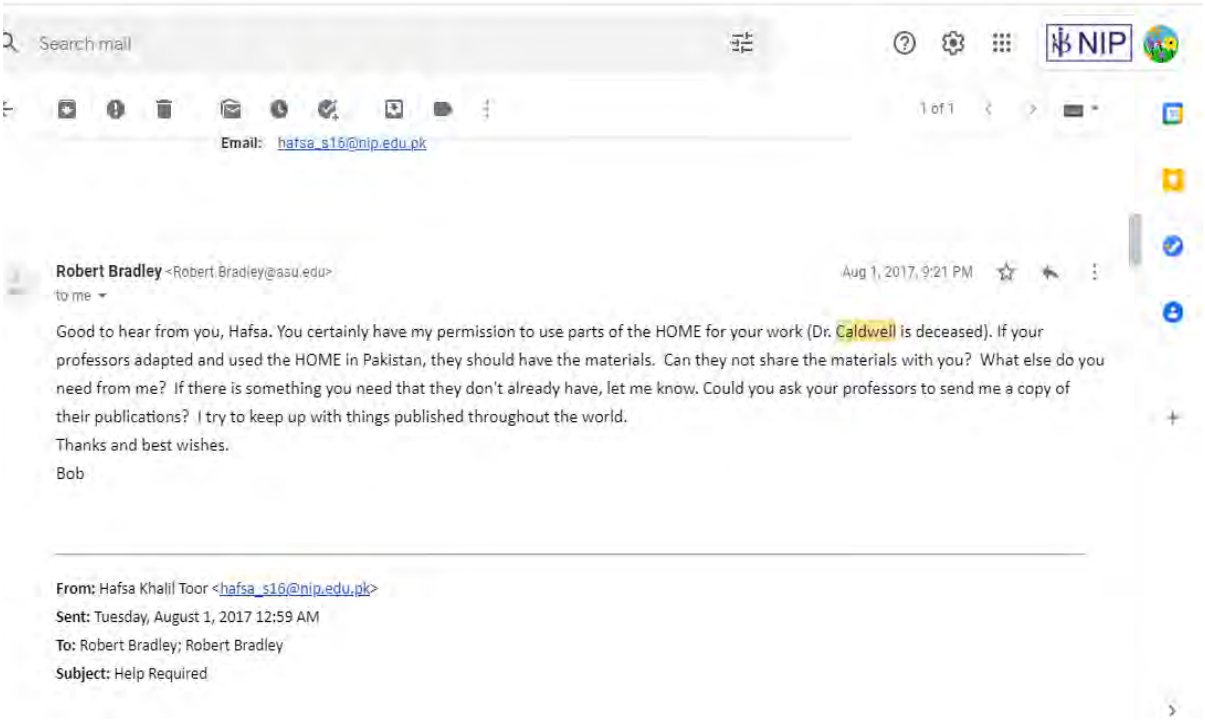
Early Childhood HOME Record Form

Place a plus (+) or minus (-) in the box alongside each item depending on whether the behavior is observed during the visit, or if the parent reports that the conditions or events are characteristic of the home environment. Enter the subtotals and the total on the Summary Sheet. **Observation (O), Either (E), or Interview (I) is indicated for each item.**

S. No	**I. LANGUAGE STIMULATION**	
1.	Child has toys that help teach names of animals. **E**	
2.	Child is encouraged to learn the alphabet. **I**	
3.	Parent teaches child simple verbal manners (please, thank you, I'm sorry). **I**	
4.	Parent encourages child to talk and takes time to listen. **I**	
5.	Child is permitted choice in breakfast or lunch menu. **I**	
6.	Parent uses correct grammar and pronunciation. **O**	
7.	Parent's voice conveys positive feelings about child. **O**	
S. No	**RESPONSIVITY**	
8.	Parent holds child close 10-15 minutes per day. **I**	
9.	Parent converses with child at least twice during visit. **O**	
10.	Parent answers child's questions or requests verbally. **O**	
11.	Parent usually responds verbally to child's speech. **O**	
12.	Parent praises child's qualities twice during visit. **O**	
13.	Parent caresses, kisses, or cuddles child during visit. **O**	
14.	Parent helps child demonstrate some achievement during visit. **O**	

Appendix L

Permission for HOME inventory



Appendix M

CONSENT

معزز والدین اور اساتذہ!

قومی ادارہ نفسیات، قائدِ اعظم یونیورسٹی، اسلام آباد ایک تحقیقاتی ادارہ ہے۔ جہاں مختلف موضوعات پر تحقیق کی جاتی ہے۔ میری تحقیق بچوں کی ذہنی نشوونما میں والدین اور اساتذہ کی بات چیت اور الفاظ کے چناؤ کے اثرات سے متعلق ہے۔ جس کے لیے والدین اور اساتذہ کہانی سنائیں گے۔ میری اس تحقیق میں والدین اور اساتذہ کے اس کہانی سنانے کے عمل کی آڈیو ریکارڈنگ درکار ہے۔ ھم اپ کو یقین دلاتے ہیں کہ آپ کی آڈیو ریکارڈنگ مکمل صیغہ راز میں رکھی جائے گی۔ اور صرف تحقیقاتی مقاصد کے لیے استعمال کی جائے گی۔ جس کے لیے آپ کی اجازت درکار ہے۔ اس کے علاوہ ہم کچھ معلومات والدین کے گھر کے ماحول کے متعلق کرنا چاہتے ہیں۔ جس کے لیے آپ کی اجازت درکار ہے۔ اس کے علاوہ آپ سے یہ معلومات کچھ مہینوں کے بعد دوبار حاصل کریں گے۔ آپ سے گزارش ہے کہ آپ ہماری تحیق مکمل ہونے تک ہمارے ساتھ تعاون کریں۔ آڈیو ریکارڈنگ کے دوران کبھی بھی آپ اچھا محسوس نہ کریں تو ہمیں رکنے کا کہہ سکتے ہیں۔ آپ کے اس تعاون پر ہم آپ کے تہہ دل سے شکر گزار ہیں۔

حفصہ خلیل طور

پی ایچ ڈی سٹوڈنٹ

Mother's Demographic Information

نام------------------------------------ تعلیم---------------------- عمر-------------------

پیشہ---------------------------------- ماہانہ آمدنی---------------------------------------

کام کے اوقات--------------- بچوں کی تعداد----------------------------

خاندانی نظام--------------------------------

آپ کے گھر میں کون سی زبان بولی جاتی ہے ؟

کیا آپ کے گھر میں ٹچ سکرین موبائل فون یا کوئی اور ٹچ سکرین کمپیوٹر/ گیم/ ٹیبلٹ ہے ؟ نہیں /ہاں

بچے کا نام-- بچے کی تاریخ پیدائش------------------------

کیا آپ کے بچے کو کوئی جسمانی مرض ہے ؟------------- اگر ہاں تو تفصیل بتائیں--

کیا آپ کے بچے کو کوئی ذہنی مرض ہے ؟------------- اگر ہاں تو تفصیل بتائیں----------------------------

کیا آپ اپنے بچے کو کہانی سناتے ہیں ؟ ہاں---------------------- نہیں-------------------

بچے کے ساتھ بات چیت میں دن کا کتنا وقت گزارتے ہیں ؟

2-1 گھنٹے------------ 4-2 گھنٹے------------

4-6 گھنٹے------------ 6 سے زائد گھنٹے------------

Weekend پر بچے کے ساتھ بات چیت میں دن کا کتنا وقت گزارتے ہیں ؟

2-1 گھنٹے------------ 4-2 گھنٹے------------

4-6 گھنٹے------------ 6 سے زائد گھنٹے------------

Father's Demographic Information

نام-------------------------------- تعلیم--------------------- عمر-------------------

پیشہ-------------------------------- ماہانہ آمدنی-----------------------------------

کام کے اوقات---------------- بچوں کی تعداد---------------------------

خاندانی نظام------------------------------

آپ کے گھر میں کون سی زبان بولی جاتی ہے ؟

کیاآپ کے گھر میں ٹچ سکرین موبائل فون یا کوئی اور ٹچ سکرین کمپیوٹر/گیم/ٹیبلٹ ہے ؟ نہیں/ہاں

بچے کانام------------------------------------ بچے کی تاریخ پیدائش----------------------

کیاآپ کے بچے کو کوئی جسمانی مرض ہے ؟------------ اگرہاں توتفصیل بتائیں---

کیاآپ کے بچے کو کوئی ذہنی مرض ہے ؟------------ اگرہاں توتفصیل بتائیں--------------------------

کیاآپ اپنے بچے کو کہانی سناتے ہیں ؟ ہاں---------------- نہیں-----------------

بچے کے ساتھ بات چیت میں دن کا کتناوقت گزارتے ہیں ؟

2-1 گھنٹے----------- 4-2 گھنٹے-----------

6-4 گھنٹے----------- 6 سے زائد گھنٹے-----------

Weekend پر بچے کے ساتھ بات چیت میں دن کا کتناوقت گزارتے ہیں ؟

2-1 گھنٹے----------- 4-2 گھنٹے-----------

6-4 گھنٹے----------- 6 سے زائد گھنٹے-----------

Teacher's Demographic Information

نام-----------------------------------

شاگرد کا نام--------------------- تعلیم--------------------- عمر----------- -

ماہانہ آمدنی----------------------------------

ازدواجی حیثیت---------------------

کیا آپ کی بچے ہیں ؟------------

کام کے اوقات--------------

پڑھانے کا تجربہ------------

Appendix N

CONSENT

Respected Parents and Teachers,

National Institute of Psychology, Quaid-i-Azam University Islamabad is a research center, where different issues and topics are researched. My research is based on the role of parents and teachers' language and their choice of words in the child's cognitive development. In the present research, parents and teachers of preschoolers will be required to narrate a story to their children. Their audio will be recorded as per my research objective. For this purpose, I need your consent to participate in this study. We ensure that your audio will be kept confidential and will be used only for research purposes. In addition to this, we also require information related to the home environment of the preschooler. You are requested to corporate till the completion of this study. Please note that participation in the study is voluntary and you can withdraw from the study or during recording at any time.

We are grateful and highly appreciate your cooperation.

Hafsa Khalil Toor

Ph.D. Scholar

Mother's Demographic Information

Name _____ Education _____Age_____

Occupation_____ Monthly income _____

Working hours _____ Number of children :_____

Family system: _____

Which language do you speak at home? _____

Child Name: _____ Child Date of birth: _____

Does your child have any physical disability? _____ If yes, share details_____

Does your child have any psychological problem? _____If yes, share details_____

Do you tell story to your child? Yes_____ No_____, If yes; Do you tell story with the help of storybook? _____ Or without story book?_____

On average how much time do you spend talking with your child per day?

1 to 2 hours _____ 2 to 4 hours_____

4 to 6 hours _____ 6 or more _____

On average how much time do you spend talking with your child on weekend?

1 to 2 hours _____ 2 to 4 hours_____

4 to 6 hours _____ 6 or more _____

Father's Demographic Information

Name _____ Education _____Age_____

Occupation_____ Monthly income_____

Working hours _____ Number of children :_____

Family system: _____

Which language do you speak at home? _____

Child Name: _____ Child Date of birth: _____

Does your child have any physical disability? _____ If yes, share details_____

Does your child have any psychological problem? _____If yes, share details_____

Do you tell story to your child? Yes_____ No_____, If yes; Do you tell story with the help of storybook? _____ Or without story book?_____

On average how much time do you spend talking with your child per day?

1 to 2 hours _____ 2 to 4 hours_____

4 to 6 hours _____ 6 or more _____

On average how much time do you spend talking with your child on weekend?

1 to 2 hours _____ 2 to 4 hours_____

4 to 6 hours _____ 6 or more _____

Teacher's Demographic Information

Name: _____

Name of student: _____

Education: _____ Age_____

Monthly income: _____

Marital status: _____

No of children: _____

Working hours: _____

Teaching experience: _____