



# Mother's Happiness with Cognitive - Executive Functions and Facial Emotional Recognition in School Children with Down Syndrome

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(Received 15 Oct 2014; accepted 17 Jan 2015)

## Abstract

**Background:** According to the mother's key roles in bringing up emotional and cognitive abilities of mentally retarded children and respect to positive psychology in recent decades, this research is administered to assess the relation between mother's happiness level with cognitive- executive functions (i.e. attention, working memory, inhibition and planning) and facial emotional recognition ability as two factors in learning and adjustment skills in mentally retarded children with Down syndrome.

**Methods:** This study was an applied research and data were analyzed by Pearson correlation procedure. Population is included all school children with Down syndrome (9-12 yr) that come from Tehran, Iran. Overall, 30 children were selected as an in access sample. After selection and agreement of parents, the Wechsler Intelligence Scale for Children-Revised (WISC-R) was performed to determine the student's IQ, and then mothers were invited to fill out the Oxford Happiness Inventory (OHI). Cognitive-executive functions were evaluated by tests as followed: Continues Performance Test (CPT), N-Back, Stroop test (day and night version) and Tower of London. Ekman emotion facial expression test was also accomplished for assessing facial emotional recognition in children with Down syndrome, individually.

**Results:** Mother's happiness level had a positive relation with cognitive-executive functions (attention, working memory, inhibition and planning) and facial emotional recognition in her children with Down syndrome, significantly.

**Conclusion:** Parents' happiness (especially mothers) is a powerful predictor for cognitive and emotional abilities of their children.

**Keywords:** Happiness, Cognitive-Executive function, Facial emotional recognition, Down syndrome

## Introduction

Happiness as a concept was attended by most of scientists and philosophers during the time. Most of philosophers and historians believe that, at the first, happiness was focused on good chance, but now, happiness defined as an emotion that is under control of human and persuaded as a goal.

Centuries before Christ, the word eudemonia was used for well-being and it is translated in English as happiness. Historians stated that, firstly, this word was used in poems of Hesiod. However, there was a deterministic perspective about happiness in ancient Greece. Socrates believed that

happiness is a content that is briefly in hands of people (1). He defined happiness as being and behaving well and living in its shadow.

Many terms are used as a synonym of happiness up to now: life satisfaction, quality of life, well-being, positive emotions, interesting and so on (2). Today, the word subjective well-being is the common term for happiness (3).

From the mid of twenty century, scientific researchers have been performed about the role of happiness in social sciences (4-6). Most of studies were related to happiness and its predictors. Happiness is correlated with factors like cognitive abilities, personality, behaviors, biology and emotions (7-11). Happiness has a positive and reciprocal relationship with cognitive abilities (12-14).

Human being bringing in a complex system up and several aspects of environment influence on him/her. An effective factor is the family. Family and each member of family have a reciprocal interaction. Therefore, it can be said that parents have influence on children and vice versa. So, several studies accomplished in this area (15, 16). In recent decades, studies are directed to exceptional children family. By using these researches, our knowledge about the family of children with disabilities is promoted (17). Although primary studies were focused on negative effects of parents' limitations, recent studies include positive effects of parents' behaviors (18).

Recent research models are investigating both strengths and distresses in the family of children with mental retardation. This studies respect to effects of parents on children and effects of child on parents (18, 19). It is clear that family structure has an important impact on forming child's skills (20, 21). Applying educational programs for parents leads to improvement in children abilities (22). An important factor that should be investigated in child-parent interaction is the effect of parents' emotions on cognitive and affective abilities of their children. Parents' emotions like happiness can play an important role in child's development, because parents' emotions affect both child's performance and their relation with family members (23). Therefore, such effects should be studied in children with mental retardation.

Among mentally retarded children, Down syndrome has a special place: First, the prevalence of this syndrome is high. Second, requirements of this group are not respected. Third, with existing facilities and learning methods, the ability of children with Down syndrome can be improved. Down syndrome is a chromosomal disorder that influence on emotional, cognitive and physical abilities. The important factor for training to this group is the realization of factors that affected emotional and cognitive abilities (24).

For example among cognitive abilities, cognitive-executive functions play an important role in learning process. Cognitive-executive functions are under control of prefrontal of brain and it is responsible for planning, control and managing behavior (25). Important indicators of cognitive-executive functions are as follow: attention, working memory, inhibition planning (26). Children with Down syndrome have problem in attention, working memory, inhibition and planning. Improvement in this area should be respected (27-30).

In addition, among emotional abilities, interpreting the facial emotions is a necessary skill that capable people to direct their social environment (31). Emotions recognition from the face is the first sign for understanding feelings and making empathy relations. Facial expressions recognition is common in all people in the world and it is not related to special culture. Normal children (after 4 yr) are able to recognize emotions like happy, fear, anger, and sadness (32). People with mental retardation like Down syndrome have deficits in facial emotional recognition (31, 33).

In one hand, the family is an effective system in the life of human and in another hand; happiness influences emotional and cognitive abilities of individuals. In the scope of exceptional children, the relation between parent's happiness and emotional-cognitive abilities of children with mental retardation is on top. Among emotional abilities, cognitive-executive functions are the most effective factors that affect learning and social adaptation of mentally retarded children. Down syndrome is attended as an important and wide group among all groups with mental retardation.

In this study, we discuss the relation between maternal happiness level with cognitive-executive function and facial emotional recognition in children with Down syndrome.

## Materials and Methods

This study is an applicable research and data are analyzed by correlation procedure. Population is included all school children with Down syndrome (9-12 yrs) that come from Tehran. According to their IQ (50-70), they are placed in experimental group. Among all, 30 students with mean age 10.5 yrs selected as an in access sample from Resalat, Touhid and Pirouzi schools. After selection and agreement of parents, the WISC-R is performed to determine the student's IQ. The mean IQ score of the sample was 65. The sample includes 9 female and 21 male students. The mean age of mothers was 45 yrs.

It should be noted that children with epilepsy were missed from experiment because using computerized tests can trigger the onset in epileptic children.

- **Wechsler Intelligence Scale for Children-Revised (WISC-R)**

The Wechsler Intelligence Scale for children-revised (WISC-R), is a general test of intelligence. The WISC-R consist of 12 subtests that it is divided into two parts, verbal and non-verbal. Validity and reliability of the test are assessed in several studies. Reliability of the test (in Iran) through test- retest is 0.79 to 0.96.

- **Oxford Happiness Inventory (OHI) (34)**

The OHI comprises 29 items, each involving the selection of one of four points (Likert scale) that are different for each item. The highest score in this scale is 87, which shows the highest point of happiness. Normal and mean range score in this scale is 40 to 42. Reliability of the OHI is 0.91 and internal correlation of items is about 0.04 to 0.67. In addition, reliability of the test in Iran by test-retest is 0.79.

- **Continues Performance Test (CPT) (35)**

CPT is a neuropsychological test. This test is computerized and it will be used to evaluate attention disorder. In this research, the Persian form of CPT is used. This test has two forms: numbers and pictures. The picture form of the test for mentally retarded children is used. The test included 150 stimulus, 30 stimulus are goal that the subject has to answer to it with pressing the button. Reliability of the test in Iran is 0.59. In current study, for assessing the validity of test, experts' rate is used. In addition, reliability of the test assessed in a group (N=15) with Down syndrome (0.68).

- **N-Backtest(36)**

N-Back is a task for assessing working memory as a subscale of cognitive-executive function. In current study, 1-Back was used (comparing current stimulus with recent stimulus). The whole time of performing test is 3 minutes. This test has a significant correlation with other tests that assessing working memory. Reliability of the test assessed in several studies and it is reported about 0.79, 0.81 and 0.84. Authors used experts' rate for validity and assessed reliability on a group of children (N=15) with Down syndrome (0.76).

- **Stroop Task – Day/Night Version (28)**

This task assesses the ability to inhibit a predominant response. In this task, participants were asked to say 'night' when they saw a picture of the sun drawn on a white card, and 'day' when they saw a picture of moon and stars drawn on a black card. After being given a brief practice trial, participants were then shown a sequence of 16 cards arranged in a set order. The minimum score was 0 and the maximum was 16, for experimental condition. Reliability is reported 0.86 and validity of the test is based on experts' rate. In addition, reliability (test-retest) of the test is assessed by authors on a group of children (n=15) with Down syndrome and it is obtained 0.78.

- **Tower of London Test (37)**

This test was used for planning abilities of patients with frontal lobe disorder. In current study, com-

puterized version of test is used. Tower of London Test includes two sets. Each set has three bases with three colored balls (green, blue and red). The subject has to change second set with the first one. The whole time for performing the test is 3 minutes. The correlation between results of this test and Proteus test is reported 0.41. Reliability of the test is reported 0.79. In addition, reliability (test-retest) of the test was assessed by authors on a group of children (n=15) with Down syndrome and it is obtained 0.81.

• *Emotion Facial expression Test (38)*

This test is common and reliable in emotion facial recognition. In the current study, from 110 pictures of original test, 36 pictures of 3 males and 3 females were selected. Pictures included 6 basic emotions (happy, anger, sad, hate, fear and surprise). Reliability of the test assessed in Iran and it is obtained 0.71. Validity of the test is based on experts' rate. In addition, reliability of the test assessed by authors through test- retest, on a group

of children (n=15) with Down syndrome and it is obtained 0.79.

In this study, after selection of sample and agreement of family to take part in research, schoolchildren' IQ is assessed by WISC-R. Then, mothers were asked to fill the Oxford happiness inventory. For assessing abilities of schoolchildren with Down syndrome the following tests is used: CPT, N-Back, Stroop test (day/night), London tower test and Emotion Facial expression test. These tests performed individually.

For data analysis, the descriptive and interfering statistics was used. First, data were categorized in tables and figures then by using Pearson correlation coefficient, the relation between variables was assessed.

**Results**

Obtained data were categorized in order and by using descriptive mathematics, mean and standard deviation were assessed for each variable. Findings are presented in Table 1.

**Table 1:** Mean and standard deviation of subjects for each variable

variables		$\bar{X}$	SD
Children with DS	CPT	123.6	20.22
	N-Back	55.06	19.52
	Stroop	5.43	2.82
	Tower of London	10.7	5.8
	Emotion Facial Expression Test	19.93	4.18
Mothers of Children with DS	OHI	39.9	10.03

For assessing the relation between mothers happiness level as an independent variable, with 5 dependent variable in research (attention, working

memory, inhibition, planning and facial emotional recognition), the Pearson correlation coefficient was used. Findings are showed in Table 2.

**Table 2:** Correlation coefficient between mothers' scores in OHI and their children (with Down syndrome) scores in cognitive-executive functions and facial emotional recognition

Variables	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. error of the estimate	Change statistics			
					R <sup>2</sup>	T	df	sig
CPT	0.636	0.404	0.383	15.8	0.404	4.35	28	0.05
N-Back	0.425	0.181	0.151	17.9	0.181	2.48	28	0.05
Stroop	0.528	0.279	0.254	2.4	0.279	3.29	28	0.05
Tower of London	0.691	0.477	0.458	4.2	0.477	5.05	28	0.05
Emotion Facial Expression Test	0.622	0.387	0.366	3.3	0.387	4.2	28	0.05

In Table 2, the correlation analysis between mothers' scores in OHI and their children (with Down syndrome) abilities in cognitive-executive functions and facial emotional recognition is indicated. The mathematical model used for analyzing research hypothesis – relation between happiness and each variable- is the *t* distribution. In comparing with critical value of *t* (df. =28,  $\alpha=0.05$ ,  $t=2.04$ ), Obtained *t* value for each variable is high, then zero hypothesis is rejected and research hypothesis is accepted. Moreover, as observed correlation coefficient between mothers' happiness with each variables is significantly higher than table critical value ( $\alpha=0.05$ ,  $p=0.36$ ), zero hypothesis is rejected and it is concluded that there is a positive and significant relation between mothers' happiness with their children abilities (attention, working memory, inhibition, planning and facial emotional recognition).

## Discussion

Results show that happiness of mothers of children with Down syndrome has a positive and significant relation with cognitive – executive functions and facial emotional recognition ability in their children.

According to the authors search, there is no match study with the title search of current research. However, there are similar studies that used as supportive literature. These supportive findings are divided into two categories:

- In the scope of classical psychology; studies that evaluating the relationship between mothers' negative mood (opposite of happiness), with cognitive-executive functions and facial emotional recognition of their children.
- In the scope of positive psychology; studies that evaluating the relationship between happiness and its synonyms in mothers, with cognitive-executive functions and facial emotional recognition of their children.

### *Mothers' happiness & Cognitive-Executive functions of their children:*

A group of studies indicate that emotional and mental characteristics of mothers are the important factors that have influence on cognitive-emotional abilities of their children.

Depression (opposite form of happiness) as an emotional factor has a negative and significant impact on cognitive-executive function abilities of children. It means that mothers' negative emotion is a predictor of decreasing the abilities of children (39).

A researcher investigated the effects of mothers' depression on family communications. Findings show that mothers' depression has a negative impact on children. One of the negative impacts is the attention deficit in children (40). Children of mothers with depression are more likely with attention deficit (41). Forty one percent of children with attention deficit, affective disorder and anxiety have a depressed mother (42).

Mothers' depression can influence on brain and its functions like memory (43, 44). Its biological reason is increasing of production of stress hormone during pregnancy that leads to problems for brain growth (45). Vulnerability of infants with developmental disabilities is more than others (46). Brain activities of children with depressed mother will be changed. Children with depressed mother have more problems in the activity of frontal and prefrontal than children with non-depressed mother (47).

In another study, the effect of mothers' depression on cognitive-executive functions of children was evaluated. They conclude that mothers' depression has a negative and significant effect on inhibition ability of children (44).

In a classical view, the effect of mothers' depression during pregnancy is investigated and they figured the negative and significant effect of mothers' depression on planning ability of children (39, 48).

A group of research in the scope of positive psychology investigates the relationship between happiness and life-satisfaction in mothers of children with attention deficit. Findings figure a posi-



tive and significant relation between subjective-wellbeing in mothers and attention ability in their children. Parents of children with attention deficit (generally), and their mothers (specially) express a lower life satisfaction and lower happiness in comparing with normal population (49).

Family environment is an important factor that affects children's ability. When parents are not preparing to take new responsibilities, then stress and negative emotions cover their interactions. Continuous stress in family leads to common problems for children. A problem that affects children is the deficit attention. Moreover, life satisfaction and happiness, in this family, are in low level (50).

Mother's positive mood likely leads to positive interaction with children and cognitive-emotion will be affected by this atmosphere, so improvement in abilities of children will be seen (51).

In the scope of positive psychology, it is focused on the relation of happiness and cognitive abilities. Several studies indicate the effect of mothers' happiness on cognitive abilities of children (51, 52). Findings indicate that mothers' happiness leads to improvement in cognitive abilities of children (23). Increasing of life satisfaction in parents leads to increasing the ability of inhibition (53). Subjective well-being in mothers leads to the optimal planning function in their children (49).

### ***Mothers' happiness & facial emotional recognition of their children:***

Primary experiences of children have a significant effect on their facial emotional recognition ability (54).

In a classical view, the effect of parents' depression on regulation of emotion is investigated (55). If mothers are affected by depression, it is more likely that their child has a problem in emotional recognition (56). Mothers' severe depression is a powerful predictor for emotional problems in their children (57, 58).

Effects of mothers' depression on children behaviors are summarized as follow:

- Low adjustment
- Low awareness toward environment

- Decrease of interaction behaviors
- Finally, decrease of emotional recognition and empathy (42).

## **Conclusion**

Mothers' happiness level as an important factor is presented in cognitive abilities of children, especially mentally retarded children. Mentally retarded children with happier mothers show significant performance on cognitive executive functions (memory, attention, inhibition and planning) and facial emotional recognition abilities.

## **Ethical consideration**

Parents' agreements received before starting the research. In addition, special codes assigned instead the name of schoolchildren. Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

## **Acknowledgment**

We wish to express our appreciation to the managers and staffs of schools (Tohid, Resalat, and Pirouzi) and parents of school children for their helpful assistance in accomplishing the research. The authors declare that there is no conflict of interests.

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