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# LANGUAGE TRAINING PROGRAM COUPLED WITH FEINGOLD DIET FOR CAREGIVERS TO DEVELOP AUTISTIC` RECEPTIVE LANGUAGE SKILLS

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## Abstract

**Background:** Autism is a life-long developmental disability that prevents people from understanding what they see, hear, and otherwise sense resulting in severe problems with social interaction, communication, and behavior. The prevalence of autism in Egypt estimated to be 33.6% among children with developmental disabilities. Early intervention is effective to improve the quality of life for autistic child but single intervention is going to be insufficient to meet child's needs therefore, it was urgent to develop individualized comprehensive treatment program including behavioral, nutritional and educational approaches, this study aimed to assess the effectiveness of a language training program coupled with Feingold diet on developing autistic children` receptive language skills in centers caring for children with special needs at Mansoura city, and to assess knowledge and practice of caregivers regarding receptive language and Feingold diet. Quasi-experimental design was used to carry out this study at three centers caring for children with special needs including autism at Mansoura city in Dakahlia governorate. The sample size was (30) autistic children and their caregivers (30) distributed randomly into three intervention groups (language intervention group, Feingold diet intervention group and language + Feingold diet (coupled) intervention group)and children were chosen according to inclusion criteria, but care givers were chosen without any inclusion or exclusion criteria The study was conducted throughout preparation phase and operational phase including initial data collection, developing training programs, implementation of programs` sessions, and evaluating effectiveness of programs toward developing children` receptive language skills and increasing caregivers` knowledge and practice toward receptive language and Feingold diet. Non-significant differences were detected between pre-post interventions among children regarding to their performance on language training and their developmental level of receptive language skills of three groups. While there were a significant differences (P= 0.002), (P<0.001), between pre-post interventions for caregivers related to their knowledge and their practice about receptive language. Also there was a significant differences (P = 0.025) between pre-post interventions of caregivers knowledge related to Feingold diet. **Conclusion:** Although the coupled program of a language training with Feingold diet was effective in increasing caregivers` knowledge and practice about receptive language and Feingold diet, but it wasn`t effective in developing autistic children` receptive language skills.

**Keywords:** Autism, Feingold diet, language, language training, receptive language, special needs.

## Introduction

Autism defined according to the last updated of American Psychiatric Association, (2018) as a complex developmental condition that involves persistent challenges in social interaction, speech, nonverbal communication, and restricted/repetitive behaviors **(1)**. The latest estimation according to (CDC), 2018 based on report released from Autism and Developmental Disabilities Monitoring Network (ADDM) that extracted from 11 communities in USA among 8 years

children exceeds by 15 percent from 2016, 1 in 68 1.5% to become currently 1 in 59, 1.7% of children **(2)**. Boys are still affected four times more than girls **(3)**. Similarly Arab world countries shows also a wide variation in prevalence of autism in which Oman had the lowest rate 1.4/ 10,000 children, while the highest rate is found in Saudi- Arabia 1,250/ 10,000 children **(4)**. In Egypt the prevalence rate of autism among children with developmental disabilities has been increased despite the inadequacy of researches that illustrate the epidemiology of this disorder **(5, 6)**. One out of two studies that were relevant addressed epidemiology of ASD in Arab countries, conducted at 2008 and involved two Northern African Countries (Tunisia & Egypt) and concluded that prevalence of autism was 11.5% and 33.6% among children with developmental disabilities respectively **(7)**. The prevalence of ASD among screened toddler children. In a community based study enrolled to primary health care units reported that 23.8% of toddlers enrolled to primary health care units suspected to have ASD. Recently dr. Ghada Waly, in a published article in Al- Masry Al-Youm newspaper on April 2, 2017 via Egypt Independent News website reported that the number of people with autism in Egypt is estimated as 800,000 and one in every 160 children shows signs of having this disorder and the ratio is more among male than among female during an event at the ministry of Social Solidarity on the occasion of World Autism Day, **(8)**. Egyptian study addressed the common risk factors of autism among Egyptian population summarized as the following: increase maternal age, consanguinity, positive family history, low birth weight, postnatal hypoxia **(9)**, Male children, highly and moderate socioeconomic classes **(10)**, finally Cesarean section and neonatal jaundice **(11)**. Recently two studies in Egypt revealed that highly maternal exposure to insecticides, and altered microbiota composition secondary to dysregulated hyperactive immune responses during pregnancy increases odd of autism among their offspring **(12, 13)**.

Moreover, the earliest clinical description of autism illustrated that language abnormalities are a major component of the disorder around 63% of autistic children and it exist in both the comprehension and the production of language. Language considered the conceptual processing of communication including receptive language (understanding), and expressive language (the ability to convey information, feelings, thoughts, and ideas) **(14)**. Receptive language is the ability to understand words and responding nonverbally to others' verbal stimuli. It involves gaining information and meaning from (routine, visual information within the environment, sounds, concepts such as shape, grammar and written information, and includes behavior such as nonverbally identifying objects, actions, persons, and locations **(15)**. While receptive skills were found to be relatively more impaired than expressive skills in autistic preschoolers **(16, 17, 18)**. In addition to deficits in following directions, identifying objects and pictures, and carrying out cooperative conversations **(19, 20, 21)**. These deficits affect how the child functions socially or academically, Also it has been suspected that autistic children may experience increased food sensitivity to a wide range of foods due to abnormalities in their digestive and/or immune systems **(22)**.

Autism is incurable and long life disorder; therefore the ultimate goals in management plan should be directed for improving the quality of life, minimizing

symptoms, decreasing disability, and maximizing abilities of autistic children. There is no doubt that improving children` skills mainly receptive language skills that belonged to communication composite considered the corn stone to achieve these goals and it can be attained through early intervention by providing caregivers intensive structured training based on the principles of applied behavior analysis (ABA) at home or community settings. This is the gold standard in autism` management **(23)**. Because their involvement in implementing and coordinating of interventions play an important role in improving outcomes and maximizing effectiveness in building children` social communication skills **(24,25)**. Also Feingold diet intervention is among the best-known dietary interventions, and most widely known and advocated . It is a form of food elimination diet which eliminates all artificial food colors, artificial food flavors, and preservatives and replaced with similar foods that are free of those additives **(26,27)**. Also non-food items containing an aspirin-like chemical called salicylate are also eliminated, and later tested for its tolerance. Autistic children who may helped by Feingold diet display more of the following symptoms: short attention span such as impatience, distraction, failure to complete projects, inability to listen to whole story, inability to follow directions; marked hyperactivity such as constant motion, running instead of walking, inability to sit still; cognitive and perceptual disturbance such as comprehension & short term memory difficulty, disturbed spatial orientation (up-down; left-right) **(28)**.

Since the disorder is chronic, incurable and disturbed life of both children and their caregivers. it`s important to increase caregivers` knowledge and practice continuously to be involved in the care of their children. Because the community health nurse has a role in developing and applying programs aimed to raise awareness and practice of families in all community setting, so it was important to assess the effect of a language training program developing receptive language skills of autistic children **(29)**

**Aim of the study:**

1. To assess the effect of applying language training program coupled with Feingold diet on developing receptive language skills of autistic children.
2. To increase care givers knowledge and practice about receptive language and Feingold diet, according to intervention (1st group submitted to language intervention, 2nd group submitted to Feingold diet, and 3rd Group submitted to coupled program)

**Subjects and Method**

**Design:**

A quasi experimental design was followed in this study.

**Setting:**

The study was conducted at three centers caring for children with special needs in Mansoura city at Dakahlia governorate, three private centers namely( Ana Ensan, Ehlam , and Resala).

**Sample:**

A convenient sample of children and their caregivers were recruited, the 1st subject was (30) autistic children who were both male and female, aged three and less than six years with no or limited receptive language skills and highly functioning autism without comorbidity with other disabilities. And the 2nd subject was their caregivers (30) without inclusion or exclusion criteria.

**Tools for data collection:**

Five tools were used in conducting the preliminary assessment (I, II, III, IV, and V) all of these filled by caregivers except second tool filled by the researcher:

1-**Autistic children performance on receptive language skills structured questionnaire**. It was consisted of two parts as following:

**Part one** for assessing sociodemographic data of children as (age, sex, birth order etc).

**Part two** for assessing autistic` receptive language skills using **psycho educational profile -revised (pep- 3) (pre and posttest) (30)**.This is a modified norm-referenced scale filled by the researcher which designed to assess and observe the autistic child` performance of communication, motor skills and mal-adaptive behaviors. This scale made up of 10 subtests, these subtests are combined to form 3 composites: communication (Cognitive Verbal/Preverbal, Expressive Language, and Receptive Language), motor and maladaptive behaviors. The researcher adopted the subtest scale of receptive language (communication composite) only to assess and observe autistic child performance in receptive language developmental skills. .

It presented to the child within the context of structured play activities included 20 tasks and divided into four columns, the first contains desired task, the second identify materials used also called a test kit which contains attractive toys and learning materials (e.g. ball, dog toy, picture booklet, spoon ), while the third contains instructions describe how to demonstrate the task, and the last column clarify scoring of child` performance on scale as passing (2 points), emerging (1 point) and failing (0). After summation of raw scores it converted into stander scores then developmental level.

Total score of children performance on receptive language (20 items= 40) ranged from zero to 40. This part from the scale was used as assessment tool and also as training program.

2-**Child` food preference structured interview questionnaire** to assess autistic child` food preference before training to act as reinforcement to the child during the training sessions, taking into consideration restricted food in child` diet for those exposed to diet intervention. It consisted of 16 open ended questions to clarify the preferred food to the child from each category as (child` preference from fresh fruits, dry fruits, desserts, sweet snacks, salty snacks, sandwich, drinks..etc).

3-**Caregivers' knowledge regarding receptive language and Feingold diet structured interview questionnaire**. This tool divided into three parts the first one aimed to assess source of knowledge on autism, previous autism training courses, duration of attendance to the clinic).Second part for assessing care givers` knowledge toward receptive language, which included 24 closed ended questions as (definition of language and receptive language, signs of receptive language problems), and the third part was designed to assess care givers` knowledge regarding Feingold diet included 11 closed ended questions as (definition, benefits, duration, and examples of restricted and allowed food). Two marks were awarded for each correct answers as following receptive language part (24 items= 48 marks) the total scores of receptive` knowledge ranged from zero to 48. The knowledge level was consisting of three categories as:

- Poor = scores less than 50% of total scores (0 – less than 24).

- Fair = scores 50% to less than 75% of total scores (24 – less than 31).
- Good = scores 75% of total scores (31 – 48).

Total score of diet` knowledge (11 item = 22 marks) ranged from zero to 22. The knowledge level was consisting of three categories as:

- Poor = scores less than 50% of total scores (0 – less than 11).
- Fair = scores 50% to less than 75% of total scores (11 – less than 14).
- Good = scores 75% of total scores (14 – 22).

4-**Observational checklist to assess care givers` practice regarding receptive language skills of children at home "(pre – post-test)**. It was divided into two categories the first category assessed training environment and included such as (presence of suitable table and two chairs, absence of distract items in environment,…etc) and the second one assessed training implementation such as (using understandable and accurate words, doing reinforcement,…). Both of these categories were composed of 29 questions. Two marks were awarded for each correct answer as the following: training environment (It includes 8 items = 16 marks), implementation of training (it includes 21 item = 42 marks). The total scores of the receptive language` practice ranged from zero to 58 the practice level was consisting of three categories as:

- Poor = scores less than 50% of total scores (0 – less than29).
- Fair = scores 50% to less than 75% of total scores (29 – less than 37).
- Good = scores 75% of total scores (37 – 58).

5-**Care givers` practice regarding Feingold diet structured interview**. To assess caregivers` subjective practice about Feingold diet toward their children before and after the program and included such as (duration of diet application, compliant with all allowed and restricted foods, preparing of alternative homemade food). Scoring system of this tool included 10 closed ended. Two marks were awarded for each correct answers as following (10 item = 20 marks). The total scores of diet` practice ranged from zero to 20. The practice level was consisting of three categories as:

- **Poor** = scores less than 50% of total scores (0 – less than 10).
- **Fair** = scores 50% to less than 65% of total scores (10 – less than 13).
- **Good** = scores 65% of total scores (13 –20).

**Method:**

**Preparation phase:**

**1-Administrative process**

- An official letters from the Faculty of Nursing was submitted to centers that caring for children with special needs in Mansoura city to obtain approval for conducting the study.
- Each center was informed about the study purpose and the study process in order to gain their cooperation and support during data collection.

**2-Literature review**

Review of national and international literatures on the various aspects of the autism, receptive language, and diet using scientific published articles, internet search and textbooks. This review was a guide for developing the study tools.

**3-Developing of the study tools:** Tools (tool 1 part one, III, IV, and V) were developed by the researcher after reviewing the related literature and (tool 1 part two) was adopted. Developed tools were tested for its content validity by five experts in the field of the study (three in nursing and two in education)

and the necessary modification were done. The developed and adopted tools were tested for their reliability which was carried out on 3 autistic children and their caregivers and the results were as the following: - The Cronbach's alpha for scales formula was 0.91 for the knowledge questionnaire sheet regarding receptive language. The Cronbach's alpha formula was 0.89 for the knowledge questionnaire sheet regarding diet. The Cronbach's alpha formula was 0.72 for the observational checklist regarding practice of receptive language. The Cronbach's alpha formula was 0.78 for the practice questionnaire sheet regarding diet. The reliability of the child` performance scale as measured by using the

Face validity of the developed tools was tested by using pilot study on 10% of the sample size carried out on 10% of subjects (3 autistic children and their caregivers) and didn`t include in the study sample. The purpose of this study was to test clarity of the questions and statement, feasibility, objectivity and consistency of tools. Based on finding of the pilot study; the necessary modifications were made on the study tools.

**4- Other technical issues:**

The researcher communicated with Feingold program association in U.S.A and got printed materials that help in implementation of the diet` program after its summarization and translation into Arabic hand book. The researcher obtained training courses and workshops in autism by specialists before conducting the study to be a qualified trainer. Trained specialists helped the researcher in implementing the language training program at centers. The researcher prepared training materials (a test kit) that already used during the language training.

**Operational phase:**

This phase was consisted of the following steps:

**a) Initial data collection**

The researcher started by introducing herself to caregivers and giving them a brief orientation about objectives and sessions of education programs. Pretest questionnaires were distributed to explore children and caregiver` socio-demographic data, children food preference and performance on receptive language skills and to explore care givers knowledge and practice toward receptive language skills and Feingold diet. Each questionnaire consumed about (25-30 minutes) to be filled.

The studied children and their care givers were divided into three quasi experimental groups randomly. The first one received language training intervention, the second received diet intervention and the third one submitted to couple intervention (language training and diet).

Before applying the programs pre-test (tool I) was conducted to all children groups. Caregivers groups were interviewed by using the following tools:

1- Part one and part two in tool III & tool IV (Group 1).
2- Tool II, part one and three from tool III and V tools (Group 2).
3- Tool II, part one, two and three of tool III& tool IV and V (Group 3).

**b)Development of receptive language health education and training programs**

According to results of the preliminary assessment the researcher developed two health education programs directed for caregivers and one language training program directed for children as following:

**Program (1)**: language training program directed for children (two groups) aimed to assess and develop their receptive language skills. The sessions were practical directed to children recruited to first and third groups. The researcher used only the subtest scale of receptive language skills from Psycho educational profile -revised (pep- 3) and it was consisted of 20 tasks and child asked to respond to orders by using toys, picture book.

**Program (2)**: Health education and training language program directed for care givers (of children recruited in group 1 &3) (consisted of two parts the first one was health education developed by the researcher exploring knowledge on receptive language and the second one was practice training aimed to teach the care givers how to develop receptive language skills of their children. The researcher demonstrated all training session with children and their caregivers were attended. These sessions included the following topics (definition of language and receptive language, Importance, when to begin, normal receptive language development and warning signs of receptive language problems),

**Program (3)**: Health education and training program concerning Feingold diet for care givers (of children recruited in group 2&3) in order to exploring knowledge and subjective practice on Feingold diet. The sessions of (Feingold diet program) including the following topics (what is Feingold diet program, benefits, stages of the program, duration, allowed and restricted foods, how to prepare alternative homemade foods) was developed by the researcher after got the program from Feingold association at U.S.A and made adaptation and translation into Arabic and developed diet hand book that distributed among care givers. Sessions were presented individually to care givers of children recruited in the second and third group by using diet hand book. Diet` hand book was adopted, summarized, translated, and designed by the researcher in Arabic version and distributed among caregivers of children exposed to diet intervention. It included 10 section regarding the following: definition of Feingold diet, which symptoms can be reduced by the program, phases of the program, list by the allowed and restricted foods (stage one), suggested meals, Recipes Section, how to do homemade natural colors, how to monitor child progress, salicylate readmission (stage two) , food` shopping list and example of planned meals.

**Implementation of sessions**

a) **Implementation of language training sessions (directed for children)**. Sessions conducted in the selected centers in suitable room from width, ventilation and lightening included one suitable table and two chairs and training materials and free from distractions. Each child received training from the researcher one to one on average two sessions per week (25 hrs. / Week which distributed to be one hr. of training by the researcher at center. The caregivers conduct the training 24 hrs at home). The allowed time for each session is fixed 30 minute. Each session divided into short units, the duration of each unit was five minutes contains one activity or trail divided into stimuli- response-feedback and repeated all over the session until child` mastery. When session finished without child` mastery of activity it was repeated in the next session. Individual differences between children regarding their abilities to mastery of tasks affect number of sessions received by each one. Some of

them reach mastery in short time less than it was planned through 24 sessions during three months and others needed 72 sessions during six months. The study conducted began from November 2016 to April 2017.

b) **Implementation of both education and training sessions (directed for care givers)**.The educational sessions for language and diet were conducted one time individually or grouped according to availability of care givers add to training session of diet using hand book with a list of restricted and allowed foods and substances. While the training sessions regarding language were individualized achieved by attending every caregiver the sessions of his child at centers to learn by observing the trainer technique. Their sessions were equal to those of children from number, duration and length. The same training activities had been observed and followed by care givers with their children using the same materials daily (approximately three hours and half /day distributed through the day) at home within the duration of the program in order to help children generalize receptive language skills.

**Evaluation**

Evaluation was conducted immediately after implemented the programs for all groups' (children and their care givers) by using the following tools:

Tool 1 part 2 evaluated the children in the three studied groups.

Tool III part two & tool IV evaluated caregivers recruited in the1st group.

Part three of tool III and tools V evaluated caregivers recruited in the 2nd group.

Part two and three in tool III, tool IV, and tool V evaluated caregivers recruited in the 3rd group

**Statistical Analysis:**

Data was sorted, coded, organized, categorized and then transferred into especially designed formats. Analysis performed using SPSS (Stands for Statistical Product and Service Solutions) version 20.0. Data were presented by using descriptive statistics in the form of frequencies and percentage. ANOVA test was used for comparison between and within groups. T test was used for comparison between 2 paired within one group. $P< 0.05$ was considered to be statistically significant. Pearson correlation coefficients were used estimate correlation between the study variable to clarify positive or negative correlation. Spearman correlation was used to estimate correlation between study variables to clarify strength of correlations.

**Results:**

Table *Table (1)* illustrates that the age of studied children ranged from three to less than six years. The majority (80%) of 1st and 3rd studied groups and (90%) of the 2nd group are males; and less than three fourths (70%) of 2nd and 3rd studied groups are the 1st birth order.

Table *Table (2)* shows that the age of care givers ranged from 20 to more than 40 years and half (50%) of them recruited in the 1st and 2nd studied groups and 40% of the 3rd group their aged ranged from 20-30 years old. Less than two third (60%) of fathers to children recruited in 2nd studied group were highly educated in comparison to half (50%) of those in 1st and 3rd groups who got primary and diploma degree respectively.

Regarding to mothers` education half (50%) of them in the 1st & 2nd studied groups moderately educated equal to their counterpart in the 3rd group who got primary education and most (80%) of them in the third group were housewife. Half (50%) of caregivers in 2nd study

group experienced with diet intervention in comparison to less than one third (30%) of 3rd group.

*Table (3)* illustrates a significant difference was detected between pre-post language intervention of care givers recruited in 1st, and 3rd studied groups related to their knowledge about receptive language (P=0.018), (P=0.002) respectively.

*Table (4)* shows that only a significant relationships were detected between pre- post diet intervention of care givers enrolled in third study group regarding their knowledge toward Feingold diet (p=0.025).

*Table (5)* illustrates that a significant relationships between pre-post language interventions of care givers enrolled in 1st &3rd studied groups regarding their practice toward receptive language (p=0.001), (P<0.001) respectively.

*Table (6)* explores a significant relationships found between pre-post interventions of children enrolled in 2nd studied group according to their performance on receptive language (P=0.007).

*Table (7)* shows there was no statistically significant difference was found in pre-post intervention between studied groups and their developmental level of receptive language skills.

**Discussion:**

Over the past 10-15 years autism has increasingly and considered a multiform disorder each case has a unique of manifestation. But the diagnosis of this disorder based on core symptoms that are remaining the same for all autistic including impairment in three domains **(31)**. One of these is language and communication domain which are fundamental abilities for the development of others skills **(32, 33)**. Limitation in communication and difficulty developing language skills mainly receptive skills making autistic child self-absorbed and negatively affect other forms of behavior. Such impairment suggests that receptive skills should be the key target for language intervention in ASD which can be attained through examining various modalities of treatment including behavioral, educational, and nutritional approaches taking into consideration the importance of early intervention, and caregivers' involvement to assure better outcome **(34)**.

The finding of present study showed that the range of autistic children` age was (3- less than 6 years), most of them were males, and their caregivers` age ranged from pre- twenties to mid-40s and these findings were in agreement in the area of children and caregivers` age with a study aimed to evaluate the effectiveness of parent training in improving autistic child` language and communication skills in Oregon state, USA **(35)**. Also the result regarding children` sex was matched to American study in Illinois State illustrated that most of enrolled 105 autistic children were males **(36)**.

Regarding parental education the current finding revealed that two third of children were belonged to moderately and highly graduated parent and this showing somewhat inconsistent with Egyptian study which showed that most of autistic children belonged to families with a lower paternal education level**(37)**. While a largely agreement noticed when compared to randomized trials conducted at 6 centers affiliated to (Emory University, Indiana University, Ohio State University, University of Pittsburgh, University of Rochester, and Yale University) in USA and stated that more than two third of parent of autistic children were highly educated **(38)**.

By looking for the primary caregiver for children of current study we found that mothers were the primary caregivers for all of them, and this finding was partially agreed by the last mentioned researcher, in addition to a study in USA that aimed to evaluate the importance of parent involvement in autistic child intervention and exhibited that mothers representative the majority of their study participant. In my point of view this finding is normally because mother will remain the first caregiver in normal and unusual times for her child despite distress and frustration caused by this disorder **(39)**.

Another comparative point in current study finding was relevant to residence of participants and it was obvious that two third out of them are living in rural area and this finding was matched with another Egyptian study which revealed that approximately two third of the mentally challenged children live in rural areas and countryside **(40)**.

From my opinion the hypothesis of genetic transmission may explain the distinction between rural and urban representativeness secondary to prevailing of relatives marriage in rural, but further researches needed for assurance.

Regarding training courses, this study revealed that nearly three fourths of caregivers were previously received training courses about autism. This finding was counter with a quasi-experimental Egyptian study enrolled 100 autistic children and their caregivers and pointed out that less than three fourths of caregivers didn`t receive training courses about autism **(41)**.

By highlighting on caregivers` practice regarding language training the findings of this study revealed that there was a significant difference in pre-post intervention between caregivers. This finding was compatible with the finding of three studies the first was a Turkish case study aimed to determine the effect of applying training program prepared for mothers of child with autism on how to provide Discrete Trial Teaching (DTT) at home. The second study applied at USA, and the third one implemented at university of Manitoba, Canada, and all of those exhibited a positive significant difference showed in pre-post intervention toward parent practice on language training **(42, 43, 44)**.

In relation to caregivers` knowledge about receptive language the existing study revealed that there was a significant difference in pre and post language intervention for each studied group (language intervention group & coupled intervention group) (P=0.018), (P=0.038) respectively. These findings correspond with finding of studies two out of them applied in USA, and the third one implemented at Amman, Jordan. They clarified there was a statistically significant difference Pre and after intervention ($p = 0.03$); the caregivers of preschooler's autistic children aged 1–6 years gain level of knowledge concerning communication and language skills **(45, 46, 47)**.

With reference to children performance on language training program the current study` finding concluded that a slight increasing occurred in the median of raw score (1st group 10.5- 11.5; 2nd group 15.5-16.5) in pre-post intervention of ascertained children toward receptive language skills but it didn`t rise to be significantly different. On the other hand these finding was agreed with findings of study conducted in Australia, and two American studies **(48, 49, 50)**. They revealed that there was no significant difference in receptive language skills

between their studied groups post language training.

The researcher interpreted outcome relevant to children` performance on receptive language skills by the probability of existence some influential factors, such as shortness of children` attention span, lack of commitment to training at home, and caregivers` boredom, frustration, and despair as expressed by some of them, also hypersensitivities of autistic children to noise and crowding environment as rationalized by the researcher mentioned lastly.

Researcher assumed that this slight increase in raw scores of current studied children is a predictor for better outcome regarding receptive language over a longer duration and more continuous training hours of children at home. This view is confirmed through Australian systematic review and meta-analysis achieved that explore the findings of three separate studies that were accomplished at University of Wisconsin-Madison in USA, The Netherlands, and San Diego concluded that an improvement in receptive language skills had been observed among their studied children according to increasing of raw scores (20.35 to 28.44 over two years; 16.04 to 37.22over 1.5 year; and 13.39 - 29.19 over one year) sequentially, but this improvement achieved after children submission for long periods of training **(51, 52, 53, 54).**

On the other hand fully disagreement achieved with two studies conducted in America. They summarized that positive significant difference was observed in pre-post intervention among all studied children resulting in an improvement in their receptive language skills, also a study conducted at India agreed with that there was a pre-post significant difference at ($p < .01$, $n = 8$). Moreover, American study assured that experimental group that received language training outperformed the control group pre-post intervention and the differences between them were 4.94-15.21 points **(56, 57)**.

From my point of view the results of children` performance in current study were parallel to the result of their care givers` practice on language training at home. There was also negative significant difference in pre-post intervention each group this confirmed that caregivers did not train their children everyday living at home. Two studies performed at Australia and USA corporate my point of view and reported that the most efficacious interventions used a combination of specific intervention procedures, including parent involvement in intervention, and providing greater intensity and duration of the interventions by parents at home **(58, 59)**.

**Conclusion:**

The study concluded that coupled program receptive language and Feingold diet induced an improvement in caregivers` knowledge and practice. But development of receptive language skills in autistic children` doesn't take place. While slight positive outcome happened for the sake of autistic group exposed to Feingold diet only.

**Recommendation:**

1. Continuous health education and training program for caregivers concerned with autism intervention
2. counseling for caregivers about coping strategies to overcome frustration as expressed by many participated mothers
3. More studies are required to investigate variables which stands hail in front of improvement of children capabilities although presence of support.

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**Table (1):** Distribution of children according to their socio- demographic data

| Socio-demographic characteristics | Group 1 (n =10) | | Group 2 (n =10) | | Group 3 (n =10) | | Significance test | P value* |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | | |
| **Child age (years)** | | | | | | | | |
| **- 3-4** | 5 | 50 | 1 | 10 | 3 | 30 | Monte Carlo test | 0.112 |
| **- >4- less than 6** | 5 | 50 | 9 | 90 | 7 | 70 | | |
| **Sex** | | | | | | | | |
| **- Male** | 8 | 80 | 9 | 90 | 7 | 70 | Monte Carlo test | 0.844 |
| **- Female** | 2 | 20 | 1 | 10 | 3 | 30 | | |
| **Residence** | | | | | | | Chi square test | |
| **- Rural** | 6 | 60 | 3 | 30 | 6 | 60 | $\chi 2 = 2.400$ | 0.301 |
| **- Urban** | 4 | 40 | 7 | 70 | 4 | 40 | | |
| **Child birth order** | | | | | | | Monte Carlo test | |
| **- 1st** | 8 | 80 | 7 | 70 | 7 | 70 | | 1.000 |
| **- In between** | 2 | 20 | 3 | 30 | 3 | 30 | | |
| **No. of siblings** | | | | | | | | |
| **- None** | 2 | 20 | 0 | 0 | 0 | 70 | Monte Carlo test | 0.178 |
| **- 1-2** | 7 | 70 | 5 | 50 | 4 | 30 | | |
| **- More than 2** | 1 | 10 | 5 | 50 | 6 | 60 | | |

**Table (2):** Distribution of caregivers according to their socio- demographic data

| Socio-demographic characteristics | Group 1 (n =10) | | Group 2 (n =10) | | Group 3 (n =10) | | Significance test | P value* |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | | |
| **Age of care givers (yrs.)** | | | | | | | Monte Carlo test | 1.000 |
| **- 20-30** | 5 | 50 | 5 | 50 | 4 | 40 | | |
| **- >30-40** | 4 | 40 | 3 | 30 | 4 | 40 | | |
| **- >40** | 1 | 10 | 2 | 20 | 2 | 20 | | |
| **Care givers of children -Mothers** | 10 | 100 | 10 | 100 | 10 | 100 | | |
| **Father education** | | | | | | | | |
| **- Not read nor write** | - | - | 1 | 10 | - | - | | |
| **- Primary** | 5 | 50 | 1 | 10 | 1 | 10 | Monte Carlo test | 0.070 |
| **- Diploma** | 2 | 20 | 1 | 10 | 5 | 50 | | |
| **- High education** | 3 | 30 | 6 | 60 | 4 | 40 | | |
| **- Post-graduate** | | | 1 | 10 | | | | |
| **Mother education** | | | | | | | | |
| **- Not read nor write** | - | - | 1 | 10 | 1 | 10 | Monte Carlo test | 0.065 |
| **- Primary** | 3 | 30 | 2 | 20 | 5 | 50 | | |
| **- Diploma** | 5 | 50 | 5 | 50 | 4 | 40 | | |
| **- High education** | 2 | 20 | 2 | 20 | - | - | | |
| **- Post-graduate** | | | | | | | | |
| **Father occupation** | | | | | | | | |
| **- Worker** | 6 | 60 | 4 | 40 | 6 | 60 | | |
| **- Technician** | 3 | 30 | 4 | 40 | 3 | 30 | Monte Carlo test | 0.887 |
| **- On retirement** | 1 | 10 | 2 | 20 | 1 | 10 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Mother occupation** | | | | | | | | |
| **- Housewife** | 7 | 70 | 3 | 30 | 8 | 80 | Monte Carlo test | 0.336 |
| **- Worker** | 1 | 10 | 3 | 30 | 2 | 20 | | |
| **- Technician** | 1 | 10 | 2 | 20 | - | --- | | |
| **- On retirement** | 1 | 10 | 2 | 20 | - | | | |

∗ Significant if P ≤ 0.05

**Table (3):** Distribution of care givers in 1st& 3rd studied groups according to their knowledge level about receptive language in pre and post-intervention

| **Language` knowledge level (48 marks)** | **Group 1** | | | | **Group 3** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Pre** | | **Post** | | **Pre** | | **Post** | |
| | **N** | **%** | **N** | **%** | **N** | **%** | **N** | **%** |
| **Good** | 2 | 20 | 8 | 80 | 1 | 10 | 5 | 50 |
| **Fair** | 5 | 50 | 2 | 20 | 3 | 30 | 5 | 50 |
| **Poor** | 3 | 30 | 0 | 0 | 6 | 60 | 0 | 0 |
| **  S.D** | 32 ± 8.6 | | 38.9 ± 4.3 | | 19.5 ± 13.3 | | 37.5 ± 1.3 | |
| **Significance** | **t= -2.901 P=0.018** | | | | **t= -4.280 P= 0.002** | | | |

P value significant if ≤ 0.05
t for paired t test
Good= scores more than 65% of total scores. (More than 31)
Fair= scores 50% to 65% of total sores. (24- Less than 31)
Poor= scores less than 50% of total scores. (0 – less than 24)

**Table (4):** Distribution of care givers in 2nd &3rd studied groups according to their knowledge level about diet in pre and post-intervention

| **Diet` knowledge level (22 marks)** | **Group 2** | | | | **Group 3** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Pre** | | **Post** | | **Pre** | | **Post** | |
| | **N** | **%** | **N** | **%** | **N** | **%** | **N** | **%** |
| **Good** | 1 | 10 | 6 | 60 | 0 | 0 | 4 | 40 |
| **Fair** | 0 | 0 | 3 | 30 | 0 | 0 | 4 | 40 |
| **Poor** | 9 | 90 | 1 | 10 | 10 | 100 | 2 | 20 |
| **Median Min.-max.** | **19.5 (0-22)** | | **22 (8-22)** | | **0.5 (0-22)** | | **22 (20-22)** | |
| **Significance** | **Z = -1.859 P = 0.063** | | | | **Z = -2.238 P = 0.025** | | | |

Z for Wilcoxon rank test
P value significant if ≤ 0.05
Good= scores more than 65% of total scores. (More than 14)
Fair= scores 50% to 65% of total sores. (11- Less than 14)
Poor= scores less than 50% of total scores. (0 – less than 11)

**Table (5):** Distribution of care givers in 1st &3rd studied groups according to their practice level related to receptive language in pre and post-intervention

| Language` practice level (58 marks) | Group 1 | | | | Group 3 | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre | | Post | | Pre | | Post | |
| | N | % | N | % | N | % | N | % |
| **Good** | 5 | 50 | 9 | 90 | 9 | 90 | 10 | 100 |
| **Fair** | 5 | 50 | 1 | 10 | 0 | 0 | 0 | 0 |
| **Poor** | 0 | 0 | 0 | 0 | 1 | 10 | | 0 |
| **S.D** | **38.5 7.3** | | **51.3 4.7** | | **44.6 7.8** | | **56 2.9** | |
| **Significance** | **t= -5.170 P= 0.001** | | | | **t= -5.845 P<0.001** | | | |

t for t test
P value significant if ≤ 0.05
Language intervention applied only on the first and third group
Good= scores more than 65% of total scores. (More than 37)
Fair= scores 50% to 65% of total sores. (29- Less than 37)
Poor= scores less than 50% of total scores. (0 – less than29)

**Table (6):** Distribution of care givers in 2nd &3rd studied groups according to their practice level related to diet in post-intervention

| Diet` practice level (20 marks) | Group 2 | | | | Group 3 | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre | | Post | | Pre | | Post | |
| | N | % | N | % | N | | % | |
| **Good** | 0 | 0 | 3 | 30 | 0 | 0 | 4 | 40 |
| **Fair** | 0 | 0 | 3 | 30 | 0 | 0 | 3 | 30 |
| **Poor** | 10 | 100 | 4 | 40 | 10 | 100 | 3 | 30 |
| **S.D** | | | **14.8□3.7** | | | | **9.6□4.5** | |

Good= scores more than 65% of total scores. (More than 13)
Fair= scores 50% to 65% of total sores. (10- 13)
Poor= scores less than 50% of total scores. (0 – less than10)
Diet intervention applied only on the second and third groups
Pre intervention not found because all of studied groups not follow Fein gold diet previously

**Table (7):** Distribution of children according to their performance on receptive language pre and post-intervention among studied groups

| Performance (total score =40) | Study groups | | | Significance |
|---|---|---|---|---|
| | Group 1 (n=10) | Group 2 (n=10) | Group 3 (n=10) | |
| **Pre intervention** | | | | **□2 = 0.862□** |
| **Median** | 10.5 | 15.5 | 12.5 | **P = 0.650** |
| **Min.-max.** | 4-27 | 6-25 | 7-17 | |
| **Post intervention** | | | | **□2 = 4.424□** |
| **Median** | 11.5 | 16.5 | 12.2 | **P = 0.109** |
| **Min.-max.** | 5-24 | 10-29 | 8-17 | |
| **Significance** | **Z= -0.712 P= 0.476** | **Z= -2.684 P= 0.007** | **Z= -0.957 P= 0.339** | |

*for Kruskal-Wallis test
P value significant if ≤ 0.05
z for Wilcoxon rank test

**Table (8):** Distribution of children according to their developmental level of receptive language skills pre and post intervention among studied groups

| Study phase | developmental level of receptive language skills | | | | Significance |
|---|---|---|---|---|---|
| | Appropriate N (%) | Mild N (%) | Moderate N (%) | Sever N (%) | |
| **Pre intervention** | | | | | |
| **Group 1 (n=10)** | 0 | 0 | 10 (100%) | 0 | |
| **Group 2 (n=10)** | 0 | 0 | 10 (100%) | 0 | |
| **Group 3 (n=10)** | 0 | 0 | 10 (100%) | 0 | |
| **Post intervention** | | | | | |
| **Group 1 (n=10)** | 0 | 2 (20%) | 8 (80%) | 0 | P1= 0.474 |
| **Group 2 (n=10)** | 0 | 2 (20%) | 8 (80%) | 0 | P2= 0.474 |
| **Group 3 (n=10)** | 0 | 0 | 10 (100%) | 0 | |

*for Fischer exact test

P value significant if ≤ 0.05

P1 significance with group 1 in the pre intervention phase

P2 significance with group 1 in the pre intervention phase

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