

# Talent in Autism: Cognitive Style based on Weak Central Coherence and Special Sensory Characteristics in State of Kuwait: Case Study

Mariam Abdulaziz Y.Esmaeel

**Abstract**—The study aimed to identify the nature of autistic talent, the manifestations of their weak central coherence, and their sensory characteristics. The case study consisted of four talented autistic males. Two of them in drawing, one in clay formation and one in jigsaw puzzle. Tools of data collection were Group Embedded Figures Test, Block Design Test, Sensory Profile Checklist Revised, Interview forms and direct observation. Results indicated that talent among autistics emerges in limited domain and being extraordinary for each case. Also overlapping construction properties. Indeed, they show three perceptual aspects of weak central coherence: The weak in visual spatial-constructural coherence, the weak in perceptual coherence and the weak in verbal – semantic coherence. Moreover, the majority of the study cases used the three strategies of weak central coherence (segmentation, obliqueness and rotation). As for the sensory characteristics, all study cases have numbers of that characteristics that especially emerges in the visual system.

**Keywords**—Autism, Central Coherence, Savant, Sensory characteristics, Talent.

## I. INTRODUCTION

### A. Autism Disorder

THE autism disorder is classified as one of the pervasive developmental disorders according to the diagnostic and statistical Manual of Mental Disorders: Fourth Edition : Text Revised : DSM-IV-TR). Autism disorder is characterized with symptoms that appear before the age of three years. These symptoms emerge in three domains: communication with others, social interaction, and stereotyped behaviors [1]. Recently, researchers were interested in the study of autism in a comprehensive way; including the aspects of their strengths and weaknesses. There are a number of autistics who own special abilities in specific areas, despite their inability in other aspects such as communicating with others and social interaction. These special abilities may predict the emergence of talent among them.

### B. Savant Syndrome

The condition of the talent in autism known by the term of Savant Syndrome. That indicated a condition of mental or sensory disability paired with an outstanding capacity in a circumscribed domain of intellectual or artistic function [2]. Many researchers have described features or characteristics that seem to be essential in the savant syndrome, although it

seems that none of this description alone grasps the wide range of savant abilities or manages to explain the cause or causes of the savant syndrome. Nevertheless, each description is valuable in adding to our knowledge about the characteristics that seem to be required for savant syndrome to occur and may even offer a partial explanation as to why the savant syndrome may arise. Some of studies focused on the rote memory role in the talent rise. And others explained it as an injury in the left brain versus right brain compensation. Indeed of Waterhouse´ Theory which see that there are special characteristics in talented individual brain. And it is linked to the dysfunctional in one part of brain called "Amaygdala" that drives talented individual strongly to repeat the behavior many times; besides, other cognitive and sensory characteristics. Savant syndrome seems to be the most prevalent in people with autistic spectrum disorder. About 1 in 10 persons with autism have varying degrees of savant syndrome, and 50% of all people with savant syndrome have some form of autistic spectrum disorder while the rest may have central nervous system injury or disease [3].

### C. Savant Categories

There are three categories proposed by Reference [4] that the wide spectrum of savant skills can be divided into. First, in this spectrum of skills are *Splinter Skills*. This is the most common form of savant syndrome, and it means that a savant has a minor talent. For example, they may memorize small amounts of facts, like license plate numbers. Second, there are *Talented Savants* which have impressive talents when compared to their handicap. Their general appearance is of a mentally retarded, but still within some domain they can perform impressive tasks. Third, there are *Prodigious Savants* who have an extraordinary talent, and these talents would be remarkable even if the savant was not handicapped in any way. Prodigious savants are very rare, and probably there are only about 12-15 prodigious savants alive today [3].

### D. Talent Domains

The talent among autistics emerges in few specific areas compared with the areas of abilities in typical humans. Musical ability is one of them, so there are some of talented autistics have the ability to transpose music across keys and render imitations of specific musical styles. They also have exceptional memory for music. All musical savant described in the literature in displaying absolute pitch which is the ability to recognize , label , and remember pitch information

Mariam Abdulaziz Y.Esmaeel is with the Arabian Gulf University (Kingdom of Bahrain) (mariam-agu@hotmail.com).

without reference to an external standard. The calendar and numerical calculation is the second ability that talented autistics may excel in. Calendar calculation involves the generation of the appropriate day of the week of a given date in a matter of only few seconds. Their calculation span vary from at least 5 years to 40000 years. Some talented autistics are very excellent in the artistic domain. They have the ability to understand the complex geometries for the viewed three-dimensional world to be transcribed into two-dimensional canvas. Also, their drawings feature in being realistic and accurate. Indeed others abilities like doing jigsaw puzzles are remarkably well [5],[6].

#### *E. Cognitive Style of Talented Autistics*

Studies show that talented autistics characterized with special cognitive style called "weak central coherence" which is a result of poor integration between the information. In addition to enhancing discrimination for the individual elements. And this is what explains their capability that often begins with compulsive interest to the small details. That is why their perception acute and excellent to the details information. That cognitive style is the opposite of what happens among normal individuals; They characterized usually with good central coherence. And it is emerge in their ability to process information in general more than details . Indeed to their ability to link between the information [7].

Reference [8] found that males children was faster than females children in the performance of the Embedded Figure Test which measures the weakness in central coherence. That result prove autistic children superiority in that test more than normal children . This is because the autistic disorder occurs in males four times than it occurs in females; moreover, the talent occur in male autistic children six times than it occurs in autistic females. It also shows through a number of studies that aimed to measure the intelligence of individuals with autism [9], [10], [11] that autistic individuals perform very well in the block design test , which is one of the subtests in the WISC intelligent test . And it also measure the weak central coherence [12].

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#### *F. Weak Central Coherence: Evidence at Three Levels of Processing*

##### 1. Perceptual Coherence:

Studies have suggested that the reason behind the effects of weak central coherence as possible to be within the perceptual level, which lies specifically in enhancing discrimination ability and reduced generalization ability [1]. Therefore, fails autistic children in the ability to integrate information makes it difficult for them to understand the physical environment around them in an integrated being consisting of a coherent Group of components [6].

##### 2. Visual Spatial-Constructional Coherence:

Studies which search in the central coherence among autistic children have shown that those children have special and good ability to recognize detail things, although their weak ability to integrate the thing parts. Also, they show detail draw style for drawing the paints parts . As well as it differentiate them in the exact copy ability for the shapes and graphics [1].

##### 3. Verbal – Semantic Coherence:

References [13], [14] that individuals with autism have weak in the verbal semantic coherence. It shows by not benefit as usual from the stored meaning in their memory. They are able to recall sentences consist of words which are not related to each other better than sentences of related words. So they do not use the semantic or grammatical relations in storing and calling the information from memory [15], [6].

#### *G. Weak Central Coherence Strategies:*

Reference [16] has found that autistics use three strategies that depend on their weak central coherence. It is emerged by their performance on the block design test . The first strategy is the segmentation, which means the individual tends to realize the design displayed in front of him when it is divided (that mean it is parts are separate from each other) better than integrated parts design . And the second strategy is the obliqueness, it is to be in individual accurate aware to the design that contain oblique diameters better than designs that only contain the horizontal and vertical lines . The third strategy is the rotation, it means that individual has good ability to perceive the design when it displays in different direction to his view . Those three strategies support the ability to pay attention to the detailed information thereby it confirm the weak central coherence.

#### *H. The Sensory Characteristics among Talented Autistics:*

Most of autistics differ in how their sensory systems work. And this system affect on the way to receive the information

from the surrounding environment through the senses. Therefore, their actions response and behaviors are also affected. So the child senses constitute his experiences since coming to life. As every sense from the human senses receive information by different device. The vision sense comes through the eyes. The hearing sense comes through the ears . The tactile sense comes through the skin. The olfactory sense comes through the nose. The taste sense comes through the mouth and tongue. The vestibular sense (balance sense) comes through the inner ear . The proprioception sense comes through contracting and stretching muscles, bending, and compression of joints . And after that information enters through the sensory device, it is transmitted to the brain to process and explain it . But this is happening differently in children with autism [17].

A range of unusual sensory characteristics emerges in children with autism in general and in talented autistic children in particular. And reference [17] has noted twenty sensory characteristics that may autistic have:

1. Gestalt Perception: Autistic child faces difficulties to distinguish between foreground and background information that resulting from gestalt perception. And it is leading to rigidity of thinking and less ability to generalization. There are too much information coming in because of the difficulty in separation , it is hard to know which stimuli to attend. As the stock of knowledge accumulated by autistic individuals is different, their attention would also be different . The theory of weak central coherence starts working at the next stage of the perception processing when gestalt perception inevitably leads to distortions and fragmentation, in order to limit the amount of information to be processed.

2. Hyper \ Hypo Sensitivities: It is the intensity in senses work. Some of autistics senses work in very severe form causing excessive response. This means that their sensory channel has to be very open, and as a result it enters a lot of information to the brain in order to deal with. In contrast, some autistics have low sensitivity which indicate that their senses does not work enough well. Because his sensory channel is not open enough, so it is allows for few information to get in; then, deprives brain to deal with. Hypersensitivity may lead either to the disturbance of certain sensory stimuli or by contrast fascination with certain stimuli and those disturbing or fascinating stimuli vary from one individual to another.

3. Disturbance by Some Stimuli: That Express the variation of autistic children reactions to the different stimuli; also, reflect the variation in the quality of environmental stimuli that impact negatively on their behaviors. There is some certain stimuli upset autistic individual and causes pain for them.

4. Fascination with Certain Stimuli: It is the opposite of the previous character. That two characteristics are like two sides of one coin, but the fascination gives pleasant experiences and brings calm and peace to autistic people although it is lead them to withdrawal. The sources of fascination are vary from one autistic to another; therefore, same stimuli could be impressive for individual and disturbing for another.

5. Inconsistency of Perception: It is the fluctuation in perceive sensory stimuli. Two types of this inconsistency can be distinguished. First type, the fluctuation between hyper and hypo. Second type, the fluctuation between hyper/hypo and normal.

6. Fragmented Perception: As a result of gestalt perception, when too much information needs to be processed simultaneously , very often people with autism are not able to break the whole picture into meaningful and understood objects surroundings as constituents of a whole situation. Fragmented perception caused by inability to break gestalt into integrated and meaningful parts fits into the definition of weak central coherence. Thus that may conclude that weak central coherence theory may be applied at later stages of sensory perceptual processing.

7. Distorted Perception: It is mean that autistic child perceive poorly and untrue the sensory stimuli in the environment around him. So his perception of the form, space, distance, depth and weight become wrong.

8. Sensory Agnosia: It is mean the difficulty in interpreting a sense. Sometimes we find that autistic individuals although they are able to see, their ability is limited comprehension of what seen when they are focusing on something else; therefore, some autistics cannot even identify people as people and identify them as a noisy objects.

9. Delayed Perception: It is mean that autistic individuals delay in processing the information that come from outside. And they need more time to do it. Also find it difficult to follow the quick change in the social interactions. In addition, to be late in the interpretation of some auditory stimuli or visual stimuli or tactile stimuli etc.

10. Vulnerability to Sensory Overload: Autistic individuals affected by the increasing of sensory stimuli in the environment around them. And that may be disturb them thus their responses become unusually and troubled. The causes of overload information can be: the inability to filter out irrelevant information, delay processing and person works in mono but is forced to attend to the information from several channels.

11. Mono-Processing: To avoid overload of sensory information only one modality is processed consciously by the brain. The person might focus on one sense and lose awareness of any information coming through other senses. According to the number of senses working at a time the person can be classified into multi-track versus mono-processing.

12. Peripheral Perception: Some autistic individuals avoid central and direct recognize to the stimuli especially human stimuli. And they are tend to receive those stimuli indirectly. Avoiding direct eye contact is one example for that kind of perception.

13. Systems Shutdowns: Too much sensory overload may result in systems shutdowns, in which person loses some or all of the normal functioning. When the person cannot cope with sensory information he may shutdown some or all sensory channels. Systems shutdowns are considered as an involuntary

adaptation when the brain shuts certain systems off to improve the level of functioning in others.

14. **Compensating for Unreliable Sense by Other Senses:** Because of hypersensitivity, fragmented, distorted perception, delayed processing and sensory agnosia, one sense is never enough for autistic people to make sense of their environment. Therefore they prefer to use other senses that they do not have disorder with as a compensation of their not enough sense work.

15. **Losing Oneself in Stimuli:** It is a state when person becomes resonant with certain things. Here they used to denote the higher degrees of fascination with sensory stimuli. The person can merge with different sensory stimuli as if he become a part of the stimulus itself . That make him process that stimuli continuously and ignore other stimuli in the environment .

16. **Daydreaming:** It is a clairvoyance and form of extra-sensory perception. So some autistic individuals sees others people thinking or feeling or listening to what they think. They may reach up to hallucinations in the sensory system.

17. **Synaesthesia:** It is a join sensation or cross-sensory perception. And there are two types of synaesthesia: First type, two-sensory synaesthesia, when stimulation of one modality triggers the perception in a second modality, in the absence of direct stimulation of this second modality. Second type, multi-sensory synaesthesia.

18. **Perceptual Memory:** It is the good ability among autistic individuals to remember and recall information linked to a specific sensory system like visual memory, hearing memory, tactile memory, olfactory memory and taste memory.

19. **Associative Memory:** It is non-linear, multi-dimensional, sort of spatial and can be triggered by sensory stimuli such a smells, certain colors or patterns, touch and physical movement. Many autistics individuals use this associative memory as a compensation for their inability to process information quickly.

20. **Perceptual Thinking:** It is mean that autistic thinks by specific sensory stimuli which make his thinking better .There are two types of it among autistic individuals: First type, totally perceptual thinkers usually visual thinkers. Second type, the music, math and memory thinkers. Perceptual thinkers can experience through as reality. It is mean when they think about something, they relive it visually, auditory, etc. And that may result for the visual thinker in easily solves jigsaw puzzles or remembers routes and places.

## II. RESEARCH PROBLEM

Autistic individuals face difficulties in social interactions and communication with others. That difficulties affect negatively on autistics behaviors. But in spite of that there are a number of individuals with autism appear to have distinctive talents and abilities, and that may be rare but exceptional and unique. The talents prevalence rates estimated not exceeding 10% of the total community of individuals with autism [4]. When the researchers interest in those talents and study it very well they can help talented autistics in care and develop their talents. So they can prove that talent emerges among autistics

individuals not just among normal individuals [18]. But the nature of talent among autistic individuals is different than the talent among normal individuals. Autistic talents emerge in specific domains and particular context. Moreover it differs also inside the talented autistics. Every talented autistic is different case from any other talented autistic in terms of talent type, level and components. Which make every talent has special prerequisites [19]. Because of this has not been reached to one explanation for existence talent and then circulated to all talented autistic individuals [4].

The studies and researches vary in their approach to these talents, each of them had a special perspective looking in. References [20], [21] indicated that the talent among autism linked to their character of specific interest and stereotyped behaviours. While reference [22] found that the talents emerge among autistics with average IQ. But there is an agreement between a number of studies that talent in individuals with autism due to weakness in one of their cognitive systems is the central coherence. It is mainly cognitive system that based on the brain's ability to understand the overall picture of things more than attention to details. And that what happen in normal individual usually, but what happen in autistic individuals is the opposite of that. They focus highly on the detailed information and understand poorly to the global information. The weak in central coherence among autistics emerge in levels begin with simple and end with severe . The researchers thought that talented autistics are located in the severe level of weak central coherence [23], [24], [25], [16]. Reference [26] found that the weak in central coherence is a reason of special sensory characteristics in autistics. And the most prominent sensory character is the hyper sensitivity to stimuli. Which make them able to receive big number of stimuli. This association between weak central coherence and sensory characteristics is what might prepares for the talent among them. Which appears among autistic when he has hypersensitivity in the sensory system that related to the field of talent he owned. But that weakness in the central coherence and hypersensitivity may differ in their degree and forms according to the talent itself and autistic individual himself.

## III. RESEARCH QUESTIONS

- 1) What is the nature of talent among talented autistic individuals?
- 2) What are the manifestations of weak central coherence among talented autistic individuals ?
- 3) What are the sensory characteristics that talented autistic individuals have ?

## IV. METHOD

Qualitative method was used by type of (case study) in this research. That method is suitable for the study sample and the nature of it variables. Because it is help to study the talent among autistics in deep way and explain it comprehensively. And there were a number of studies that used case study method to research about talented autistics individuals [27], [22], [28], [29], [30], [31].

## V. RESEARCH VARIABLES

- A. *Taxonomical Variables*: Central Coherence – Sensory Characteristics.
- B. *Standardized Variables*: Talent Domain

## VI. RESEARCH SAMPLES

The research sample contained of four talented autistic individuals who are studying in Kuwait schools and centers. Their ages were between (11) and less than (20) years old.

## VII. RESEARCH TOOLS

### A. *Embedded Figures Test (EFT)*:

It was designed by Witkin, Oltman, Raskin, & Karp. It was used in this study to detect the level of the cognitive style that based on weak central coherence, and it is the same term of field independence. The test includes 18 items, each involving location of a simple figure that is embedded within a complex realistic picture. The higher score in this test reflect person tendency to perceive the information in detailed way more than global. Also this test indicates two of the perceptual aspects of weak central coherence which are the perceptual coherence and Visual spatial-constructural coherence [8].

### B. *Block Design Test (BDT)*:

It was designed by Kohs (1923). And it has been applied according to procedures that have been followed by Shah & Frith (1993) research. This test detects the three strategies were behind the weak central coherence. So that used by individuals in focusing on detailed processing at the account of global processing. These strategies are the segmentation, obliqueness and rotation. Moreover this test indicates two of the perceptual aspects of weak central coherence which are the perceptual coherence and Visual spatial-constructural coherence [16].

### C. *Sensory Profile Checklist Revised (SPCR)*:

This tool was authored by Olga Bogdashina [17] aimed to detect the unusual sensory characteristics that may rise in one of the seven sensory systems of autistic individuals. That system is the visual system, hearing system, tactile system, olfaction system, taste system, vestibular system and proprioceptive system. The total number of sensory characteristics that were detective by this tool is 20 character. Those sensory characteristics are gestalt perception, hyper \ hypo sensitivities, disturbance by some stimuli, fascination with certain stimuli, inconsistency of perception, fragmented perception, distorted perception, sensory agnosia, delayed perception, vulnerability to sensory overload, mono-processing, peripheral perception, systems shutdowns, compensating for unreliable sense by other senses, losing oneself in stimuli, daydreaming, synaesthesia, perceptual memory, associative memory and perceptual thinking.

### D. *Mothers Interview Form*:

Researcher has developed a special form to interview mothers of talented individuals with autism, where she adopted the questions of the semi-open type, which are non-

specific answer. This interview was consisted of seven parts: basic information about the case, information about case family status, information about the psychological and cognitive and social status of the case, information about weak central coherence among the case, information about the talent among the case, information about sensory characteristics among the case and information about the researcher notices.

### E. *Teachers Interview Form*:

Researcher has developed a special form to interview teachers of talented individuals with autism, where she adopted the questions of the semi-open type, which are non-specific answer. This interview was consisted of six parts: information about the case status in the school, information about the current status of the case, information about weak central coherence among the case, information about the talent among the case, information about sensory characteristics among the case and information about the researcher notices.

### F. *Observation*:

The researcher used the observation for the talented autistic individuals during doing their works that confirm their talents. And to know how they do it. And find out which variables were affect on their talent. In addition to monitor the special sensory characteristics that may appear while they were working. Research used the video camera in the observation. The observation form was consisted of five parts : information about observation situation, information about case status in the observation situation, explanation of the general and particular goals of the observation, information about special sensory characteristics that appear among talented autistic in observation situation and information about the researcher notices.

## VIII. PROCEDURES

Approval has been obtained from the administrator of the schools and centers to apply the research. Then was interviewed teachers in those schools and centers to nominate number of autistic student that they have special abilities in some areas. And the cases files were checked to ensure of the choice and take an overview of the case. Approval was obtained from cases parents for their participation in the research. Then researcher verified the talent owning in the case by displaying their works on specialized arbitrators and compare their performance with children in the same Chronological age.

Mothers and teachers were interviewed individually first time to collect information about the case. Then mothers were interviewed for the second time also individually to answer the (SPCR). After that the cases were interviewed individually first time to make friendly relationship with them. Then they were interviewed second time to apply the (EFT) on them. And third time was to apply the (BDT) on them.

For the observation it was agreed with the teacher about the place of the observation. And it was identified three days for it. The duration for the observation was open until the case finished doing his works.

## IX. RESULTS

The research results indicated in four talented autistic cases that will be displayed separately:

### A. Case Study (1) : Mansour

He is a 17 years old autistic child . He has a special talent in jigsaw puzzle solving. Mansour's mother and teacher said that he has a highly specified interest and intensive practice to solve pictured puzzles that diverse in their forms and levels of difficulty. Thus, his excellence in the puzzles solving confirms his talent and special ability in comparison to his peers from the same age and the same level of disorder. His talent emerged in the age of two years . In that time he was doing small numbers of puzzle pieces, which were above his developmental age . It is important to know that he had not received any training which helped him to develop his abilities to solve pictured puzzles . Later, he became able to solve puzzles with more complex details and larger numbers of pieces . In the past, the resolve of puzzles range in size from 100-200 pieces, but now he can solve puzzles of 1,500 pieces even if it takes days. Currently, there is an increase in the number of puzzles pieces that he can solve. In addition, the design of puzzles became more various; through solving puzzles design that includes images, natural scenes, and more small details. Now, He can solve puzzles that displayed on the computer. Data collection tools that consisted of the interview of case mother and teacher, group embedded figures test, block design test and observation showed that Mansour has featured capabilities in the cognitive aspects such as attention speed to stimuli, high concentration, and good remembering. Especially, when the stimuli was in the detailed level, which explains his excellent performance in solving puzzles that require more detailed processing than global processing . Group embedded figures test indicated that he has a medium level of weak central coherence. The block design test found that he uses the three strategies of weak central coherence, so his performance was better in the segmented, oblique and rotated designs . These two tests show that he has two perceptual aspects of weak central coherence: Visual-spatial constructional coherence and perceptual coherence. That two aspects are linked to his talent domain because it needs the ability to distinguish the small details for the puzzles and solve it quickly and correctly from first try even if it was segmented or rotated. Also, his talent was linked with other characteristics most importantly the special sensory characteristics that revealed by mother and teacher interview, sensory profile checklist revised (SPCR) and observation. The sensory system that contained pronounced sensory characteristics was the visual system, which is related strongly to the talent domain. He showed hyper sensitivity to the stimuli, disturbance by some stimuli , fragmented perception for the parts , gestalt perception that show poor ability in stimuli integrating , and fascination with certain stimuli. All of these characteristics help him to process the small details of the puzzles and confirm that his cognitive style is featured with weak central coherence. Moreover, the SPCR showed that he had the character of losing oneself in stimuli,

perceptual thinking, perceptual memory and associative memory. Indeed, the sensory characteristics increased nowadays among the case, which is an evidence of his talent developing. The cognitive and sensory characteristics interfere with each other to construct the talent among him.

### B. Case Study (2): Aadel

He is a 14 years old autistic child. He has several difficulties in the cognitive aspects like paying attention, concentration and sorting; also, weakness in the social aspects like interaction, sharing, and initiative. Indeed, he has disabilities in the communication aspects such as absence of receptive language, severe lack of Expressive language and echolalia. Aadel has a very specific domain talent and special ability in making cartoon models from the clay. He has a strong relationship with the clay, he likes to hold it and touch it by his hands all the time and to smell it and bring it closer to his mouth. Clay formation is a very frequent behavior for Aadel; he likes to do it all the time. He can imitate the cartoon characters that he likes from the movies in an accurate way. He has high ability to maintain the details and colors of those characters, so that it becomes very similar to the original, and changes them continuously as long as existing in his reach to make it like the animated characters, which were watched by him from the cartoon movie. His talent has appeared since he was five years old, he did not receive any training to help him develop his talent and abilities, but the intensive practice enabled him to develop and advance his performance. Now, he can make more than one character by the clay in on scene. Moreover, he can add more small details on it. In addition, he has the ability to distinguish the quality and types of the clay. Data collection tools (mothers interview, teacher interview, group embedded figures test and block design test) indicate that Aadel has a low level of performance in the detailed information processing and global information processing. Except the processing that is linked to his talent domain. He has a better attention and interest to the information that is related to his talent especially the small details of cartoon characters. This is an evidence for the theory of weak central coherence. That emerges clearly in his talent domain. Despite that weakness was not clear in other domains because of the low level of functional performance and inability to perform each of the group embedded figures test and block design test, which reveal the weakness in the central coherence. They require a higher functional and cognitive level. Nevertheless, from the rest of the data collection tools emerged two perceptual types of weak central coherence: Visual-spatial constructional coherence and verbal-semantic coherence. The first type emerged from distinguishing the details while doing his talent. The other type emerged in repeating sounds and unrelated clips of words during the performance of the talent. Also, his talent was linked with other characteristics most importantly the special sensory characteristics, which is revealed by the interview of his mother and his teacher, sensory profile checklist revised (SPCR) and observation. The sensory systems that contain pronounced sensory characteristics were the visual system and tactile system,

which were related strongly to his talent domain. He has a special characteristics that may help in explaining his talent such as the hypersensitivity to the stimuli, fascination to certain visual and tactile stimuli, perceptual memory especially photographic memory and tactile memory and associative memory. Moreover, he has the fragmented perception and gestalt perception particularly in his talent domain, which support his weak central coherence in the domain of his talent. From Adel's case, we can prove that talent emerges among all cognitive and social levels in autism. In addition, it proves that the cognitive abilities are not the only reason of talent emergence. However, it interferes with a number of other characteristics such as the sensory characteristics and intensive practice.

#### *C. Case Study (3) : Hamad*

He is a 11 years old autistic child. He has an advanced level cognitively, functionally, and socially in comparison to his peers with autism disorders. He is Often stable emotionally and quiet, but he is characterized by some negative behaviors such as the stubbornness, the complaint, and the continuous discontent. With regard to the social interaction, he has weakness in social relationships with others and incapable of participating interests and feelings. Also, he does not tend to form friendships and social initiative, rather he interacts with a limited number of others around him almost exclusively his family and his teachers. As for communication, he has an acceptable level of verbal communication, so he uses speech and language in delivering what he wants to say to others. However, he has a weakness in non-verbal communication and difficulty in eye contact and using body language with others. He has a specific interest and repetitive behavior practiced extensively which is the compulsive love of Cleanliness and hand washing, and this is the problem suffered by. Nevertheless, Hamad has a special ability in drawing that reach him to the limit of talent. His talent Appears in a limited way in drawing cartoon characters and human faces and sometime in drawing natural scenes from his imagination. He showed that talent since he was five years old, he did not receive any training helped him to develop the talent he has, but the keen interest and continuity in the drawing for most of his day developed it. With his advanced age, he has become more accurate in his drawing. In addition he depends more on the memory with more complex forms and detailed information in his drawing. Nowadays, he tends to draw princes faces from the state of Kuwait. He is able to memorize the small details and features of their faces. Indeed, he paints it identically to the original image. Moreover, he was focusing on the paint's part more than broad lines. This special style in drawing shows that he is interested in the detailed information more than the global information. And this is an evidence for the weak central coherence among him, which was indicated from data collection tools consisted of mother and teacher interview, group embedded figures test, block design test and observation. Group embedded figures test indicated that he has good level of weak central coherence. As for the block design test found that he uses three strategies of

weak central coherence, so his performance was better in the segmented, oblique and rotated designs. The two tests showed that he has two perceptual aspects of weak central coherence: Visual-spatial constructional coherence and perceptual coherence. The two aspects are linked to his talent domain because it needs the ability to distinguish the small details and features of the paints. Also, his talent is linked with other characteristics most important the special sensory characteristics that revealed by mother and teacher interview, sensory profile checklist revised (SPCR) and observation. The sensory system that contains pronounced sensory characteristics was the visual system, which is related strongly to the talent domain. He showed vulnerability to sensory overload, so if there more stimuli viewed in front of him his senses work more severely. He has also the associative memory, perceptual thinking, hyper/hypo sensitivity to stimuli, perceptual memory especially, visual memory and losing oneself in stimuli especially, which he has an interest in. Moreover, he has some characteristics that are linked to his weak in central coherence such as fragmented perception for parts of stimuli and the gestalt perception that indicates his poor ability to integrate the stimuli. All that characteristics can predispose to the emergence of talent, which shows that his characteristics are not necessarily reflecting his weakness, but they reflect also his excellence and superiority.

#### *D. Case Study (4) : Omar*

He is an autistic child who is about 19 years old. He has a medium level of functional, cognitive, academic, and social performance. He can master what he receives and train skills such as matching and classification. In regard to his social interaction, he accepts the existence of others around him, but without sharing interests and feelings, and without initiates the formation of relationships with them. He has a difficulty in the process of communication, he knows some words but cannot always use them properly, with his attempt to that. He also has a weakness in the non-verbal communication such as poor direct eye contact with others, difficulty use of body language, and facial expressions. Omar has some stereotypes behaviors that he does while he is drawing like hands flapping, head shaking and issuing incomprehensible loud voices. He depends on his special style in drawing, so when he draws the line of his paints it becomes tortuous, which nevertheless be similar significantly and accurate to the picture that he is copying. The intensive practice for the drawing developed the talent of Omar. The observation showed that he focuses during drawing on the small details consisting in the image. Indeed, he does not forget any small part of it. In spite of his less interest to its background. He focuses specifically on drawing characters very quickly. All of that refer to his excellence weak in Central coherence, which is shown through the strong attention to small details in his drawings. Data collection tools consisted of mother and teacher interview, group embedded figures test, block design test and observation confirmed what was previously mentioned. Group embedded figures test indicated that he has a good level of weak central coherence. The block design test found that he used the three strategies of

weak central coherence, so his performance was better in the segmented, oblique and rotated designs. That two tests showed that he has two perceptual aspects of weak central coherence: Visual-spatial constructional coherence and perceptual coherence. That two aspects are linked to his talent domain because they are needed to enable him to distinguish the small details and features of the paints. Also, his talent is linked with other characteristics most importantly the special sensory characteristics that are revealed by mother and teacher interview, sensory profile checklist revised (SPCR), and observation. The most sensory system that contained pronounced sensory characteristics was the visual system, which is related strongly to his talent domain. Some of those sensory characteristics are linked to his cognitive style that is called weak central coherence like fragmented perception for parts of stimuli and gestalt perception. They show his poor ability to integrate between stimuli especially the visual one. Moreover, he has other sensory characteristics that support his ability in drawing like hyper sensitivity to stimuli, perceptual thinking, perceptual memory, and associative memory. All that characteristics interfere with each other to establish his drawing talent.

#### X. GENERAL DISCUSSION OF CASES RESULTS

By studying the cases of talented autistics the research showed that their talent is a unique condition. Indeed, there is no talent like the other one whether those were in the same field or different. So in Hamad and Omar cases which they were talented in the drawing field every one of them has a special nature of his own talent. With some common characteristics between the different and similar talent field. The talents fields such as the puzzle solving, drawing and forming clay linked to a group of abilities. The memory has big role in their talents. Also, the intensive practice developed their performance in it. However, this was not enough to explain the reason of the emergence of talent they have. Therefore, through data collection tools that were used in the research reached a number of characteristics that helped to explain the talent that they have. From the most important characteristics their distinctiveness cognitive system is based on weak central coherence, which was demonstrated through his strong attention to details and the ability to observe it accurately. That was confirmed by reference [7] that said the compulsive attention to small details in autistic individuals as possible to explain their superior abilities in the performance of their work indicative of their talent. Moreover, the sensory characteristics contribute in their talent emergence. Talent appeared among autistic individuals in a diverse range of cognitive, functional, psychological, social and communicational performance. Therefore, it is not limited to high function autistics. Some of the study cases suffers from a sever lack of cognitive aspects, social interaction and communication, while others have advanced level of the cognitive aspects versus varying social and communicational difficulties. All what is previously mentioned confirm that talent among autistic individuals is a result of variety and varying characteristics and skills .

With regard to the cognitive style of talented autistics that is based on weak central coherence, the results agreed that two perceptual aspects at least emerge in the study cases. The most common aspect among them was the weak in Visual-spatial constructional coherence. Which is the most aspects linked to the prerequisites of cases talents . Autistics' talents appear within the visual domain and thus require high recognition and accurate attention to detail of the visual stimuli that they use in the practice of their talent. This was demonstrated by reference [32] and reference [33], which indicated that autistics show good ability to recognize detailed things besides their excellent ability to accurate coping for the forms and graphics.

The results also confirmed that all of the study cases except Aadel used the strategies of weak central coherence (segmentation, obliqueness and rotation), which contributes to superiority in the perception of the detailed information more than the global information; and their faster performance on it in comparison to the normal people. This confirmed reference [16] that individuals with autism appear to have a special ability to build blocks design that contain strategies behind weak central coherence. References [34], [12] agreed that and said that autistic individuals accelerate their response time in tests that reveal weak central coherence. Also, it was consistent with reference [32] that indicated that the superior performance of autistics on the block design test and group embedded figure test is because of their ability to segmentation and focusing on the details more than The overall shape of the image.

As for the results of the sensory characteristics by (SPCR) showed that all study cases have the most of special sensory characteristics in their sensory systems previously and in the current time. However, the characteristics emerge in the most of the cases currently more than previously. The most sensory system that contained special sensory characteristics was the visual system. The most pronounced sensory characteristics in all of the study cases was each of gestalt perception, hyper/hypo sensitivities to stimuli, fascination with certain stimuli, inconsistency of perception, fragmented perception, distorted perception, sensory agnosia, peripheral perception, systems shutdowns, losing oneself in stimuli, perceptual memory, associative memory and perceptual thinking. The rest of the data collection tools in the research showed the emergence of hyper sensitivity in particular to the visual stimuli, so they can pay attention to large numbers of detailed information. As well as the emergence of fragmented perception for parts of the sensory stimuli in the majority of cases, what in turn is linked to their cognitive system that is based on weak central coherence, which they have and increases the degree of it. In addition, these tools also agreed in their distinctiveness with perceptual memory especially visual memory, and associative memory especially to visual stimuli, and losing oneself in the stimuli that is associated with the field of their talent in particular. Those results agreed reference [35] that a large proportion of individuals with autism appear to have unusual sensory characteristics in different levels of intelligence and cognitive abilities. Also



reference [36] showed that individuals with autism have sensory processing of stimuli differently from ordinary people.

The results showed an overlap between the characteristics among talented autistic individuals. Therefore, there are some sensory characteristics that support their cognitive style based on weak central coherence such as gestalt perception, hyper sensitivity to stimuli and fragmented perception. Gestalt perception supports their seeing for the parts of visual stimuli as a separate components. Thus, their fragmented perception allow them to focus on it more. Therefore, their hyper sensitivity for the parts details of those stimuli make their attention and focusing abilities better for it. Also, the emergence of losing oneself in stimuli character in visual domain in particular justifies their intensive practice for the work indicative of their talent. Moreover, they are distinguished with special perceptual memory and associative memory that help them with saving and retrieving visual stimuli associated with the field of talent more than other types of stimuli. Indeed, they have the perceptual thinking character, which means that their thinking is being better when they use visual stimuli. In addition, this confirmed the finding of the studies that four main areas of overlap have been identified: cognitive profiles, special interests, social difficulties, and sensory hypersensitivity [37], [38], [39], [40], [41], [42].

#### REFERENCES

- [1] Happé, F. (2005) . The weak central coherence account of autism . in : F. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds) . *Handbook of autism and pervasive developmental disorders : Diagnosis , development , neurobiology , and behavior* . 640 - 649 . New Jersey : John Wiley & Sons .
- [2] Bölte, S. , & Poustka, F. (2004) . Comparing the intelligence profiles of savant and non savant individuals with autistic disorder. *Intelligence Journal* , 32, 121–131.
- [3] Darius, H . , & Valli, K. (2007) . Savant syndrome : Theories and empirical findings. Institution of communication and information. University of Skövde . Sweden .
- [4] Treffert, D. (2009) .The savant syndrome: An extraordinary condition . A synopsis: past , present , future . *Philosophical Transactions of The Royal Society B*, 364, 1351- 1357.
- [5] Pring , L.(2005). Savant talent. *Developmental Medicine & Child Neurology*, 47 , 500 - 503.
- [6] Happé, F. (1999). Autism : Cognitive deficit or cognitive style ?. *Trends in Cognitive Sciences*, 3, 216-222.
- [7] Hill , E. , & Frith, U. (2003). Understanding autism : insights from mind and brain. *Philosophical Transactions of The Royal Society B* , 358 , 281-289 .
- [8] Witkin, H., Oltman, P., Raskin, E. & Karp, S. (1971). *A manual for the Embedded Figures Test*. Consulting Psychologists Press, Inc.
- [9] Tymchuk, A. J., Simmons, J. Q. & Neafsey, S. (1977). Intellectual characteristics of adolescent childhood psychotics with high verbal ability. *Journal of mental deficiency research*, 21, 133-138.
- [10] Ohta, M. (1987). Cognitive disorders of infantile autism: a study employing the WISC, spatial relationship conceptualization, and gesture imitation. *Journal of Autism and Developmental Disorders*, 17, 45-62.
- [11] Venter, A., Lord, C., & Schopler, E. (1992). A follow-up study of high-functioning autistic children. *Journal of Child Psychology and Psychiatry*, 33,489-507.
- [12] Jolliffe, T., & Baron-Cohen , S. (1997). Are people with autism and asperger syndrome faster than normal on the embedded figures test ?. *Journal of Child Psychology and Psychiatry*, 38, 527-534.
- [13] Tager-Flusberg , H. (1991). Semantic processing in the free recall of autistic children : further evidence for a cognitive deficit. *British Journal of Developmental Psychology*, 9, 417– 430.
- [14] Hermelin, B. ,& O'Connor, N. (1967). Remembering of words by psychotic and subnormal children .*British Journal of Developmental Psychology*, 58, 213–218.
- [15] López, B., & Leekam, S. (2003). Do children with autism fail to process information in context?. *Journal of Child Psychology and Psychiatry*, 44(2), 285-300.
- [16] Shah, A, & Frith , U. (1993).Why do autistic individuals show superior performance on the block design task ?. *Journal of child Psychology and Psychiatry*, 34(8),1351-1364.
- [17] Bogdashina, O. (2003). *Sensory perceptual issues in autism and asperger syndrome: different sensory experiences, different perceptual worlds*. London: Jessica Kingsley Publishers .
- [18] Bardhan –Quallen , S. (2005). *Understanding diseases and disorders* . Hampshire : Thomson Gale Publisher .
- [19] O'Brien, M., & Daggett, J. (2006). *Beyond the autism diagnosis : a professional's guide to helping families*. Baltimore : Brooks Publishing Co.
- [20] Howlin, P., Goode, S., Hutton, J, & Rutter, M. (2009). Savant Skills in autism : psychometric approaches and parental reports. *Philosophical Transactions of The Royal Society B*, 364, 1359-1367.
- [21] Vital, P., Ronald, A., Wallace, G., & Happé, F. (2009). Relationship between special abilities and autistic like traits in a large population based sample of 8-year-olds. *Journal of child Psychology and Psychiatry* , 50(9), 1093-1101.
- [22] Heaton, P., Pring, L , & Hermelin, B. (1999). A pseudo – savant : A case of exceptional musical splinter skills. *Neurocase* ,5(6),503-509.
- [23] Gagnon, L., Mottron, L., Bherer, L, & Joanne, Y.(2004). Quantification judgment in high functioning autism: superior or different?. *Journal of Autism and Developmental Disorders* , 34(6), 679-689.
- [24] Happé, F. (2001). *Why success is more interesting than failer : Understanding assets and deficits in autism*. in: J. Richer & S. Coates (Eds), *Autism: The search for coherence* . 71-74 . London : Jessica Kingsley Publishers .
- [25] Ryder, N., Pring, L, & Hermelin, B. (2002). Lack of coherence and divergent thinking : Two sides of the same coin in artistic talent ? . *Current Psychology: Developmental Learning. Personality. Social Summer*, 21 (2), 168-175.
- [26] Baron-Cohen, S., Ashwin, E., Ashwin, C. , Tavassoli, T , & Chakrabarti, B. (2009).Talent In autism: hyper-systemizing , hyper-attention to detail and sensory hypersensitivity. *Philosophical Transactions of The Royal Society B* , 364, 1377-1383.
- [27] Young, R., & Nettelbeck, T. (1995). The abilities of a musical savant and his family. *Journal of Autism and Developmental Disorders* , 25(3), 231-248 .
- [28] Mottron, L., Peretz, I., Belleville, S., & Rouleau, N. (1999). Absolute pitch in autism : a case study. *Neurocase* , 5 , 485-501 .
- [29] Pring , L., & Hermelin , B. (2001). Numbers and letters: exploring an autistic savant's unpractised ability. *Neurocase* , 8(4) , 330-337.
- [30] Wallace, G., Happé, F, & Giedd, J.N. (2009). A case study of a multiply talented savant with an autism spectrum disorder: neuropsychological functioning and brain morphometry. *Philosophical Transactions of The Royal Society B* , 364,1425 -1432.
- [31] Soulières, I., Hubert, B., Rouleau, N., Gagnon, L., Tremblay, P., Seron, X, & Mottron, L. (2010). Superior estimation abilities in two autistic spectrum children. *Journal of Cognitive Neuropsychology* , 27 (3) , 261-276.
- [32] Jolliffe, T ,& Baron-Cohen, S. (2001). A test of central coherence theory: Can adult With high-functioning autism or Asperger syndrome integrate fragments of an object?. *Cognitive Neuropsychiatry* , 6(3) , 193-216.
- [33] Jarrold, C., Russell, J. (1997). Counting abilities in autism : possible implications for central coherence theory. *Journal of Autism and Developmental Disorders*, 27(1) ,25- 37 .
- [34] Keehn, B. , Brenner, L., Ramos, A., Lincoln, A., Marshall, S. ,& Müller, R. (2009). Brief Report: Eye-Movement Patterns During an Embedded Figures Test in Children with ASD. *Journal of Autism and Developmental Disorders*, 39, 383–387.
- [35] Leekam, S.R., Nieto, C., Libby, S.J., Wing, L,& Gould, J. (2007). Describing the sensory abnormalities of children and adults with autism. *Journal of Autism and Developmental Disorders*, 37 , 894-910.
- [36] Kientz, M., & Dunn, W.(1997). A comparison of the performance of children with and without autism on the Sensory Profile. *American Journal of Occupational Therapy* , 51, 530–537.

- [37] Gallagher, S. A., & Gallagher, J. J. (2002). Giftedness and Asperger Syndrome: A new agenda for education. *Understanding our Gifted*, 14, 7-14.
- [38] Little, C. (2002). Which is it? Asperger's Syndrome or giftedness? Defining the differences. *Gifted Child Today*, 25, 58-63.
- [39] Lovecky, D. V. (2004). *Different minds: Gifted children with AD/HD, Asperger Syndrome, and other learning deficits*. Philadelphia, PA: Jessica Kingsley Publishers.
- [40] Neihart, M. (2000). Gifted children with Asperger's Syndrome. *Gifted Child Quarterly*, 44, 222-230.
- [41] Webb, J. T., Amend, E. R., Webb, N. E., Goerss, J., Beljan, P., & Olenchak, F. R. (2005). *Misdiagnosis and Dual Diagnoses of Gifted Children and Adults*. Scottsdale, AZ: Great Potential Press.
- [42] Doobay, A.F.(2010). Comparison of cognitive, psychosocial, and adaptive behavior profiles among gifted children with and without autism spectrum disorder. Doctor Thesis. University of Iowa. USA.