Cognitive and Awareness Levels Among Female Teachers of Students with Learning Disabilities Related to Rare Syndromes in the Sultanate of Oman: A Case Study of Angelman and Prader-Willi Syndromes

Ahmad MJ O Alfawair , College of Arts & Sciences , University of Nizwa, Oman .
Email : fawair@unizwa.edu.om

Rehab Ahmed Hafez , Department of Curriculum and Teaching Methods , College of Physical Education for Girls , Alexandria University, Egypt
Email : rehab.hanfy@alexu.edu.eg

Abstract

The current study intended to identify the degree of teachers of learning disabilities' cognitive and awareness of the rare syndromes associated with learning disabilities at Sultanate of Oman: a case study of Angelman and Prader-Willi syndromes. Descriptive design was adopted. The study sample consists of (170) teachers of learning disabilities who were selected randomly. The researchers developed the Knowledge Validation Inventory, which consist of (26) items for Angelman syndrome and (34) items for Prader-Willi syndrome distributed in four domains. The results showed that the level of awareness of Angelman and Prader-Willi syndromes was low in general. Regarding the importance of knowledge, teachers of learning disabilities asserted that awareness of the rare syndromes associated with learning disabilities by teachers of learning disabilities is very important. According to variables, the results showed that there were no significant differences in the awareness of the Angelman syndrome or Prader-Willi syndrome due to major variables except diagnosis domain, there were significant differences in favor of special education majors. The results showed that there were no significant differences in the awareness of the Angelman syndrome or Prader-Willi syndrome due to years of experience variable except intellectual and cognitive characteristics domain, the results showed that there were significant differences in the awareness of the Prader-Willi syndrome in favor of teachers of learning disabilities experienced above five years. In light of results, the current study suggested several recommendations.

Keywords: Angelman syndrome, Prader-Willi syndrome, Learning Disabilities

Introduction

Angelman Syndrome and Prader-Willi Syndrome are two genetic disorders caused by an abnormality in chromosome 15. Each chromosome is inherited as a pair, one from each parent. Angelman Syndrome typically occurs when there is a loss or defect in the maternally inherited part of the chromosome, while Prader-Willi Syndrome occurs when there is a loss or defect in the paternally inherited part of the chromosome (Micheletti et al., 2016; Donze et al., 2020).

Angelman Syndrome was initially known as "happy puppet syndrome," but this term was later rejected. It was renamed Angelman Syndrome in 1965 in honor of Dr. Harry Angelman, a pediatrician. Prader-Willi Syndrome, on the other hand, was named in 1956 after the researchers Andrea Prader, Heinrich Willi, Alexis Labhart, Andrew Ziegler, and Guido Fanconi (Buiting, 2010).

Although both syndromes are considered rare, Angelman Syndrome is relatively more prevalent compared to Prader-Willi Syndrome. The prevalence of Angelman Syndrome varies, with estimates ranging from 1 in 12,000 to 1 in 24,000 individuals in the community, while the prevalence of Prader-Willi Syndrome ranges from 1 in 20,000 to 1 in 25,000 individuals. The variation in prevalence is influenced by factors such as diagnostic methods, environmental and health factors, wars, and other elements that affect the increase or decrease in prevalence. However, one constant fact is that the presence of behavioral, social, intellectual, and physical indicators that suggest Angelman Syndrome or Prader-Willi Syndrome does not necessarily mean that an individual has the syndrome. It indicates the need for a specialist to diagnose the condition by taking a blood or saliva sample from the child to determine whether there is a genetic disorder in chromosome 15 (Ramsden, 2010).

Another well-established fact is that there is no cure for Angelman Syndrome or Prader-Willi Syndrome. However, specialists and parents can follow a set of interventions and measures provided by a multidisciplinary team, including physical therapy, occupational therapy, speech and language therapy, medical care, special education, nutrition specialists, and other specialties. These interventions can help alleviate the impact of the syndrome on the child's social, psychological, physical, and academic life (Keute, 2021; Greco et al., 2021).

Research on both Angelman Syndrome and Prader-Willi Syndrome has brought numerous benefits to children with these syndromes and their families. It has shed light on the causes and accompanying symptoms of these syndromes. However, there is an urgent need to focus more on the cognitive, behavioral, emotional, social, and academic characteristics of individuals with these syndromes and to raise awareness in the community about these conditions (Whittington & Holland, 2022; Punatar et al., 2022).

Angelman Syndrome and Prader-Willi Syndrome are often referred to as sister syndromes because they share the same chromosome as the causative factor. They share several aspects and differ in others (Cassidy, 2000).

Both Angelman Syndrome and Prader-Willi Syndrome are considered common syndromes associated with learning disabilities. Children with these syndromes may experience various learning disabilities that can affect their academic performance, such as decreased attention and perception. Individuals with Angelman Syndrome, in particular, experience a decline in cognitive and memory functions, and they struggle to maintain their attention for extended periods. On the other hand, individuals with Prader-Willi Syndrome have good long-term memory and weakness in short-term memory. They exhibit perseverance and skill in acquiring the information they need, but sorting useful and non-useful information can be time-consuming. Individuals with Prader-Willi Syndrome also find it challenging to switch from one task to another or perform multiple tasks simultaneously. Therefore, individuals with Prader-Willi Syndrome tend to respond to situations in the same manner and with the same approach, despite their ability to respond differently. As a result, parents and some professionals believe that they have learning disabilities (Angelman Syndrome Foundation, 2022; Prader-Willi Syndrome Association, 2022).

Studies have indicated that individuals with Prader-Willi Syndrome generally have higher cognitive abilities compared to those with Angelman Syndrome. The cognitive abilities of individuals with Angelman Syndrome typically range from severe to profound intellectual disability, with an IQ score lower than 40. In contrast, individuals with Prader-Willi Syndrome have cognitive abilities that range from mild to moderate intellectual disability, with IQ scores ranging from 40 to 70, and some even reach IQ scores of 85. This suggests that children with Prader-Willi Syndrome may be able to integrate into regular education with appropriate support (The Cerebra Centre for Neurodevelopmental Disorders, 2022).

Individuals with Prader-Willi Syndrome outperform those with Angelman Syndrome in terms of verbal expressive abilities. Expressive language abilities in individuals with Angelman Syndrome are generally weak, and they often use non-verbal expressive methods such as touching, holding, and signaling to convey their needs (Pearson et al., 2019). Conversely, individuals with Prader-Willi Syndrome exhibit good verbal abilities, although some may face challenges in language development. They also demonstrate strong spatial-visual abilities and an understanding of spatial relationships (Walley & Donaldson, 2005).

There are several distinctive physical, health, and motor characteristics for individuals with both Angelman Syndrome and Prader-Willi Syndrome. In terms of physical appearance, the majority of individuals with Angelman Syndrome have a small head size, a prominent chin and tongue, a wide jaw, widely spaced teeth, wide blue eyes, pale skin, and yellow hair. Some individuals with Angelman Syndrome (1 in 10) may experience scoliosis (curvature of the spine), which becomes more pronounced during adolescence (Micheletti, 2016). In terms of health issues, the majority of individuals with Angelman Syndrome (8 in 10) experience frequent and severe epileptic seizures in childhood. They also face health issues associated with aging, such as muscle tension and stiffness resulting in motor disabilities. Additionally, they may experience digestive problems like frequent vomiting and chronic constipation (Bindels-de Heus, 2020). Regarding motor characteristics, the movements and gait of children with Angelman Syndrome are characterized by lack of balance and coordination, and they are

sometimes seen walking while raising their hands and bending their wrists and companions. Some children with Angelman Syndrome may also experience tremors and fluttering in their hands (den Besten, 2021).

Individuals with Prader-Willi Syndrome have several distinctive physical, health, and motor characteristics. In terms of physical appearance, individuals with Prader-Willi Syndrome are typically born with almond-shaped eyes, narrowing of the head at the temples, a downward-slanting mouth, thin upper lips, a narrow and short nose. They often have pale skin and skin coloration, along with blond hair. Crossed eyes (strabismus) are observed in 60-70% of them. Individuals with Prader-Willi Syndrome also commonly have short stature, reduced muscle mass, and increased body fat compared to typically developing individuals. These characteristics become more pronounced during adolescence. Additionally, some individuals with Prader-Willi Syndrome (40-80%) may develop scoliosis, which becomes apparent during adolescence (The Cerebra Centre for Neurodevelopmental Disorders, 2022).

Individuals with Prader-Willi Syndrome face various health problems. Several studies have indicated that they experience fluid retention in the legs due to excessive obesity. They also have a tendency to suck, scratch, and sometimes puncture their skin with sharp objects, leading to the development of ulcers and scars. Dental cavities are a significant problem due to reduced saliva production. On the psychological side, individuals with Prader-Willi Syndrome may experience depression, mood swings, and rapid mood changes (Sinnema et al., 2011).

Regarding motor characteristics, individuals with Prader-Willi Syndrome generally exhibit reduced muscle strength and flexibility, resulting in limited motor abilities. This weakness tends to improve as they age. Studies have confirmed that individuals with Prader-Willi Syndrome reach early aging (40-55 years) and become less mobile, requiring more assistance in self-care (Reus et al., 2011).

It's worth noting that individuals with Angelman Syndrome experience sexual maturation at a typical age, similar to typically developing individuals. In contrast, individuals with Prader-Willi Syndrome go through sexual maturation at a later age compared to their typically developing peers. However, their reproductive organs tend to develop poorly, with smaller and shorter genitalia (Greco et al., 2021).

Indeed, both Angelman Syndrome and Prader-Willi Syndrome share certain behavioral and characteristics features. One commonality is the issue of excessive appetite and overeating, which leads to severe obesity and the potential for developing diabetes, especially in individuals with Prader-Willi Syndrome due to their complete lack of satiety (Tauber et al., 2014; Bindels-de Heus, 2020). Additionally, both syndromes are associated with sleep problems. Individuals with Angelman Syndrome experience sleep issues such as reduced sleep duration, nocturnal awakenings, and bedwetting. On the other hand, individuals with Prader-Willi Syndrome may experience sleep disorders characterized by breathing disabilities during nighttime due to airway obstruction and prolonged daytime sleepiness (Cataldi et al., 2021; Spruyt et al., 2018).

Behaviorally, both Angelman Syndrome and Prader-Willi Syndrome exhibit similar features to those seen in autism spectrum disorder, such as repetitive behaviors, poor interaction skills, and disabilities in both verbal and non-verbal communication (Veltman, 2005; Dimitropoulos & Schultz, 2007).

However, there are unique behavioral features that distinguish individuals with Angelman Syndrome. Studies have suggested that individuals with Angelman Syndrome often display a cheerful and happy personality, enjoying interaction with others. They may exhibit aggressive behaviors, such as pulling their hair without intending to cause harm (Peters et al., 2004). Many individuals with Angelman Syndrome cannot learn to walk independently until around the age of 5, and they often display hyperactivity and impulsivity, which tends to improve gradually with age. They may also require assistance during the early years of life (Waite, 2014).

On the other hand, there are specific behavioral characteristics that are distinctive to individuals with Prader-Willi Syndrome. They typically possess good independent skills but might still require assistance, especially in the early years. They can experience episodes of anger, mood swings, and destructive behaviors during adolescence. Due to severe obesity, their behavior tends to be marked by sedentary habits, lethargy, constant fatigue, and a lack of interest in physical or sports activities. Their behavior often follows a routine, and repetitive actions are common, particularly questions related to food or the future. If they do not receive food on time, they may inadvertently harm others (Holland, 2003).

It's important to raise awareness about these rare syndromes within the community and among professionals to ensure that individuals with Angelman Syndrome and Prader-Willi Syndrome receive the support and care they need.

Study Problem

Many studies have focused on examining Angelman syndrome and Prader-Willi syndrome from a medical perspective. These studies have delved into the genetic structure of individuals with Angelman and Prader-Willi syndromes, as well as the causes and symptoms associated with these syndromes. However, there is a scarcity of research that addresses Angelman and Prader-Willi syndromes from an educational and academic standpoint, particularly within the Arab context, to the best of the researcher's knowledge.

Furthermore, the connection between Angelman syndrome and Prader-Willi syndrome with other groups, such as individuals with learning disabilities and autism spectrum disorder, and their shared characteristics and indicators, necessitates the importance of assessing the awareness of professionals in the field of special education regarding these syndromes. It is crucial to evaluate their ability to distinguish these syndromes from other accompanying conditions. It is worth mentioning that there are no accurate statistics indicating the number of students diagnosed with Angelman syndrome and Prader-Willi syndrome in the Sultanate of Oman

Therefore, this study aims to assess the level of awareness among teachers of individuals with learning disabilities in Oman about these rare syndromes and to shed light on the two sibling syndromes, Angelman and Prader-Willi. The primary research question addressed in this study is: What is the level of awareness among learning disabilities female teachers of the rare syndromes associated with learning disabilities at sultanate of Oman: angel man and prader-willi syndromes as a sample.

Study Objectives

In light of the research problem and its questions, the study aims to evaluate the cognitive and awareness levels of female school teachers working with children diagnosed with Angelman and Prader-Willi syndromes. The goal is to ensure their scientific and academic qualifications align with the specialized needs of these children by addressing the following:

1. Assess the level of teachers' knowledge about Angelman and Prader-Willi syndromes.
2. Evaluate the perceived importance and awareness of these syndromes from the teachers' perspectives.
3. Identify statistically significant differences in teachers' knowledge based on their specialization and years of experience.
4. Identify statistically significant differences in teachers' awareness of the importance of these syndromes based on their specialization and years of experience.

Methods

Procedures

To achieve the study's objectives and address its problem and research questions, the researchers employed a descriptive methodology.

Participant

The study's sample consists of teachers specializing in learning disabilities in schools in the Sultanate of Oman during the study's application period. The total number of teachers in this category was 1051 female teachers of learning disabilities (Annual Educational Statistics Book, 2022). A pilot sample of 30 female teachers specializing in learning disabilities was selected and the study instrument was applied to them to assess its suitability for use on the primary sample. The psychometric properties (validity and reliability) were then calculated using appropriate statistical methods. The primary study sample was selected randomly, and the instrument was applied to all teachers specializing in learning disabilities in the Sultanate of Oman. The total number of responses received was 170. The following table provides a description of the study sample based on its variables, as outlined in Table (1).

Table 1 The distribution of sample according to study variables

Variable	Category	No.	Percentage
Specialization	Special education	102	60%
	Other specialization	68	40%
Experience years	Less than five years	117	68.8%
	Five years and above	53	31.2%

Study Instrument

To achieve the study's objectives, Teachers' Awareness Inventory was developed to measure the awareness of teachers specializing in learning disabilities about both Angelman Syndrome and Prader-Willi Syndrome. The Inventory developed was done after reviewing the relevant literature and previous studies. The Inventory was developed following steps:

1. A review of the theoretical literature and previous studies that addressed rare syndromes in general and Angelman Syndrome and Prader-Willi Syndrome in particular was conducted. The most relevant information was selected for the current study.
2. The Inventory items were formulated to align with the needs of teachers specializing in learning disabilities.
3. The initial version of the Inventory was prepared, which consisted of two parts: the first part assessed the level of awareness of teachers about Angelman Syndrome and included 26 items. The second part assessed the level of awareness of teachers about Prader-Willi Syndrome and included 34 items. The items in both parts were distributed across four domains: information related to diagnosis, information related to physical and health characteristics, information related to mental and cognitive characteristics, and information related to behavioral characteristics.
4. The Inventory was reviewed by a group of experts.
5. The psychometric properties of the Inventory were calculated, including item validity and reliability to prepare the final version of the Inventory.

Content Validity:

The current researchers presented the scale in its initial form to 10 experts in counseling psychology, mental health, and special education. The experts assessed the scale in terms of its relevance to the study's objectives, suitability for the environment, and linguistic clarity. There was consensus among the experts regarding the suitability of the scale items for the study's purpose, their alignment with the intended dimensions, and their linguistic clarity. Some items were rephrased for improved clarity.

Item Validity:

The item validity was assessed by calculating Pearson correlation coefficients between each item and its corresponding dimension score, as well as between each item and the total scale score. The results indicated significant correlations at the 0.01 level, demonstrating the appropriateness of the items for measuring Teachers' Awareness. All four dimensions of the Teachers' Awareness Inventory are statistically significantly correlated with the total score of the scale at a significance level of 0.01. The correlation values ranged from 0.615 to 0.926 for the dimensions, as shown in Table 2, indicating a strong and statistically significant relationship. This is a good indicator of the scale's validity and internal consistency.

Table 2 Pearson Correlation Coefficients between Scale Dimensions and the Total Score

Dimensions	Correlation Coefficients	
	(Angelman)	(Prader-Willi)
Diagnosis	.772**	.894**
Physical and health characteristics	.686**	.926**
Mental and cognitive characteristics	.615**	.842**
Behavioral characteristics	.836**	.655**

** Statistically significant at the 0.01

Reliability:

To assess the reliability of the Teachers' Awareness Inventory of Angelman Syndrome and Prader-Willi Syndrome, Cronbach's Alpha was used to calculate the stability coefficient for the entire Inventory and its dimensions. The results showed that the overall stability coefficient for the Inventory of teachers' awareness of Angelman Syndrome was 0.857, and 0.889 for the teachers' awareness of Prader-Willi Syndrome. These values indicate that Teachers' Awareness Inventory has a high and appropriate level of stability for the study's objectives.

Table (3) illustrates the stability coefficients for each dimension of the Teachers' Awareness Inventory.

Table 3 Cronbach's Alpha Coefficients for Each Dimension Separately and for the Teachers' Awareness Inventory (N=30)

Dimensions	No. Items	Cronbach's Alpha (Angelman Syndrome)	No. Items	Cronbach's Alpha (Prader-Willi Syndrome)
Diagnosis	4	0.594	4	0.808
Physical and health characteristics	9	0.831	13	0.761
Mental and cognitive characteristics	4	0.520	9	0.572
Behavioral characteristics	9	0.808	8	0.739
Teachers' Awareness Inventory	26	0.857	34	0.889

Scoring

The Teachers' Awareness Inventory used in this study to assess the awareness of teachers regarding Angelman Syndrome and Prader-Willi Syndrome consists of two parts. The first part measures the level of teachers' awareness of Angelman Syndrome and contains 26 items. The second part measures the level of teachers' awareness of Prader-Willi Syndrome and contains 34 items. Respondents are asked to answer these items on a five-point Likert scale, where "4" indicates "I know it very well," "3" indicates "I know it well," "2" indicates "I know it moderately," "1" indicates "I know it a little," and "0" indicates "I don't know it at all." For the importance rating, a similar five-point Likert scale is used, where "4" means "very important," "3" means "important," "2" means "moderately important," "1" means "slightly important," and "0" means "not important at all."

To determine the five-point range for the Inventory, the lower and upper bounds were calculated, and the range (highest value - lowest value) was computed as (4-0 = 4). To obtain the category length, the range was divided by the largest value in the scale, which is 5 (4/5 = 0.8). The category length was then added to the lowest value in the scale, which is 0, to determine the upper limit of this category. The adopted standard for determining the level of teachers' awareness inventory is as follows: Very Low 0 – 0.79; Low 0.80 – 1.59; Moderate 1.60 – 2.39; High 2.40 – 3.19; and Very High 3.20 – 5. The scale also included instructions regarding confidentiality and the use of information solely for research purposes. Respondents were instructed to condense their responses to ensure the privacy of female teachers of learning disabilities in the Sultanate of Oman

Results and Discussion

This section presents the results of the study obtained through statistical analysis of the study sample's responses. It discusses these results and concludes by providing a set of recommendations and suggestions based on the study findings. The key findings of the current research are:

- The level of knowledge among teachers regarding learning disabilities associated with Angelman syndrome is low, while the importance of awareness regarding Angelman syndrome to a very high.
- The level of knowledge among teachers about learning disabilities associated with Prader-Willi syndrome is low, while the importance of awareness regarding Prader-Willi syndrome to a very high.
- There were no significant differences in the awareness of the Angelman syndrome or Prader-Willi syndrome due to major and years of experience variables.

The results of the sample's responses to the study questions are presented as follows:

Firstly, the mean scores and standard deviations of the responses of teachers to learning disabilities in Oman were calculated for their knowledge of Angelman and Prader-Willi syndromes, as shown in Table (4).

Table 4 Means and Standard Deviations for Participants' Responses on knowledge of Angelman syndrome and Prader-Willi syndromes

	Angelman			Prader-Willi		
Dimensions	*M*	*SD*	Level	*M*	*SD*	Level
Diagnosis	1.28	0.69	Low	1.56	0.76	Low
Physical and health characteristics	1.59	0.77	Low	1.22	0.69	Low
Mental and cognitive characteristics	1.76	0.84	Moderate	1.67	0.62	Moderate
Behavioral characteristics	1.63	0.68	Moderate	1.53	0.72	Low
Teachers' knowledge Overall	1.57	0.64	Low	1.45	0.62	Low

From Table (4), it is evident that the level of knowledge among teachers regarding learning disabilities associated with Angelman syndrome is low, with mean score of 1.57 and a standard deviation of 0.64. Similarly, the level of knowledge among teachers regarding learning disabilities associated with Prader-Willi syndrome is also low, with mean score of 1.45 and a standard deviation of 0.62.

The level of knowledge among teachers about the intellectual and cognitive characteristics of individuals with Angelman syndrome (M=1.76) and behavioral characteristics (M=1.63) is moderate. However, the knowledge level about the diagnosis of Angelman syndrome (M=1.63) and physical and health characteristics (M= 1.22) is low.

Regarding the level of knowledge among teachers about learning disabilities associated with Prader-Willi syndrome, it is low across all dimensions except Mental and cognitive characteristics. Their knowledge about the intellectual and cognitive characteristics of individuals with Prader-Willi syndrome ranks highest (M= 1.67), followed by their knowledge about the diagnosis of Prader-Willi syndrome (M= 1.56), knowledge about behavioral characteristics (M= 1.53), and lastly, knowledge about physical and health characteristics of Prader-Willi syndrome ranks lowest (M= 1.22).

Secondly, the mean scores and standard deviations of the responses of teachers in Oman regarding the importance of their awareness of Angelman and Prader-Willi syndromes were calculated, as shown in Table (5).

Table 5 Means and Standard Deviations for Participants' Responses on importance level of awareness of Angelman and Prader-Willi syndromes

	Angelman syndrome			Prader-Willi syndrome		
Dimensions	*M*	*SD*	Level	*M*	*SD*	Level
Diagnosis	3.18	0.51	High	3.28	0.58	Very High
Physical and health characteristics	3.35	0.45	Very High	3.22	0.39	Very High
Mental and cognitive characteristics	3.24	0.42	Very High	3.34	0.33	Very High
Behavioral characteristics	3.06	0.53	High	3.42	0.39	Very High
Teachers' importance Overall	3.24	0.33	Very High	3.30	0.33	Very High

From Table (5), it is evident that teachers of learning disabilities emphasized the importance of awareness regarding Angelman syndrome to a very high, with a Mean score of 3.18 and a standard deviation of 0.51. The importance of awareness regarding the physical and health characteristics of Angelman syndrome, from the perspective of teachers of learning disabilities, ranked first with a very high degree of importance (*M*= 3.35). Following closely in the second with a very high degree of importance was the awareness of the intellectual and cognitive characteristics of individuals with Angelman syndrome (*M*= 3.24). The importance of awareness regarding the diagnosis of Angelman syndrome came in the third position with a high degree of importance and a Mean score of 3.18. Lastly, the importance of awareness among teachers of learning disabilities regarding the behavioral characteristics of Angelman syndrome was noted with a high degree of importance and a Mean score of 3.06.

Similarity, the importance level of knowledge among teachers regarding learning disabilities associated with Prader-Willi syndrome is very high, with a Mean score of 3.30 and a standard deviation of 0.33. Furthermore, it is clear that teachers of learning disabilities emphasized the importance of awareness regarding Prader-Willi syndrome to a very high degree across all four dimensions. The importance of awareness regarding the behavioral characteristics of Prader-Willi syndrome ranked first (*M*= 3.42), followed by the importance of awareness regarding the intellectual and cognitive characteristics (*M*= 3.34). Next was the importance of awareness regarding the diagnosis of Prader-Willi syndrome (*M*= 3.28), and in the last position was the importance of awareness among teachers of learning disabilities regarding the physical and health characteristics of Prader-Willi syndrome, noted with a high degree of importance and an Mean score of 3.22.

Thirdly: means, standard deviations, and Independent T Test for the specialization and years of experience variables were used. Table (4) shows the means, standard deviations, and the t-test for the level of knowledge of teachers of learning disabilities associated with Angelman and Prader-Willi syndromes according to the specialization variable.

Table 6 Means, Standard Deviations, and t-test for Participants' Responses on knowledge of Angelman and Prader-Willi syndromes according specialization variable

Syndrome	Specialization	N	M	SD	t-value	df	Sig.
Angelman	Other specialization	68	1.46	0.65	-1.888	140	.07
	Special education	102	1.64	0.63			
Prader-Willi	Other specialization	68	1.37	0.63	-1.432	168	.154
	Special education	102	1.51	0.62			

It is evident from the t-test that there are no statistically significant differences at a significance level of (0.05) in the level of knowledge of teachers of learning disabilities associated with Angelman syndrome according to the specialization variable.

The results in the table 6 shows that there are no statistically significant differences at a significance level of (0.05) in the overall Inventory and in the remaining dimensions (physical and health characteristics, mental and cognitive characteristics, behavioral characteristics) for the level of knowledge of teachers of learning disabilities associated with Prader-Willi syndrome according to the specialization variable.

Table (٧) shows the means, standard deviations, and the t-test for the level of knowledge of teachers of learning disabilities associated with Angelman and Prader-Willi syndromes according to the specialization variable.

Table 7 Means, Standard Deviations, and t-test for Participants' Responses on knowledge of Angelman and Prader-Willi syndromes according years of experience variable

Syndrome	Experience	N	M	SD	t-value	df	Sig.
Angelman	Less than five years	117	1.55	0.69	-.581	134	.562
	Five years and above	53	1.61	0.50			
Prader-Willi	Less than five years	117	1.44	0.70	-.532	155	.596
	Five years and above	53	1.49	0.42			

The results show that there are no statistically significant differences at a significance level of (0.05) in the level of knowledge of teachers of learning disabilities associated with Angelman syndrome according to the variable of years of experience.

Also, the results show that there are no statistically significant differences at a significance level of (0.05) in the level of knowledge of teachers of learning disabilities associated with Prader-Willi syndrome according to the variable of years of experience.

Fourthly: The means, standard deviations, and t-test for the perceived importance of awareness of teachers of learning disabilities associated with Angelman and Prader-Willi syndromes from their perspective, according to the specialization variable were used as shown in table (8).

Table 8 Means, Standard Deviations, and t-test for Participants' Responses on importance of awareness of Angelman and Prader-Willi syndromes according specialization variable

syndrome	Specialization	N	M	SD	t-value	df	Sig.
Angelman	Other specialization	68	3.32	0.31	2.558	168	.011
	Special education	102	3.19	0.34			
Prader-Willi	Other specialization	68	3.34	0.33	1.204	168	.230
	Special education	102	3.28	0.33			

It is evident from Table (8) and the t-test that there are statistically significant differences at a significance level of (0.05) in the perceived importance and awareness level of teachers of

learning disabilities associated with Angelman syndrome from their perspective, according to the specialization variable.

According to Prader-Willi syndrome, the results shows that there are no statistically significant differences at a significance level of (0.05) in the perceived importance and awareness level of teachers of learning disabilities associated with Prader-Willi syndrome.

Table (9) shows the means, standard deviations, and t-test for the perceived importance of awareness of teachers of learning disabilities associated with Angelman and Prader-Willi syndromes from their perspective, according to the years of experience variable.

Table 9 Means, Standard Deviations, and t-test for Participants' Responses on importance of awareness of Angelman and Prader-Willi syndromes according years of experience variable

syndrome	Experience	N	M	SD	t-value	df	Sig.
Angelman	Less than five years	117	3.29	0.33	3.188	168	.002
	Five years and above	53	3.12	0.31			
Prader-Willi	Less than five years	117	3.30	0.36	-.249	168	.804
	Five years and above	53	3.31	0.28			

It is evident from Table (٩) and the t-test that there are statistically significant differences at a significance level of (0.05) in the perceived importance of awareness of teachers of learning disabilities associated with Angelman syndrome due to years of experience. However, there are no statistically significant differences at a significance level of (0.05) in the perceived importance and awareness level of teachers of learning disabilities associated with Prader-Willi syndrome.

Conclusion:

The current research addresses Angelman Syndrome and Prader-Willi Syndrome as rare syndromes associated with learning disabilities, exploring their concepts, prevalence, and treatment. In addition, the current research addresses the intellectual, physical, health, motor, and behavioral characteristics of Angelman Syndrome and Prader-Willi Syndrome. Given the scarcity of studies on these syndromes in an educational and academic context, especially in the Arab literature to the best of the researcher's knowledge, this study aims to assess the awareness level among teachers of learning disabilities in Oman regarding these rare syndromes. The study's results indicate that teachers' awareness of rare syndromes is generally low, with those specialized in special education exhibiting higher knowledge and awareness compared to their counterparts in other teaching areas.

The study's results will help the Ministry of Education in the Sultanate of Oman, particularly the Special Education Department, to focus on raising awareness about rare syndromes, especially those associated with learning Disabilities.

Based on the results of the current study, a number of recommendations were made, as follows:

1. The need for the Ministry of Education in the Sultanate of Oman, particularly the Special Education Department, to focus on raising awareness about rare syndromes, especially those associated with learning Disabilities.
2. Conduct specialized training courses and workshops on rare syndromes such as Angelman syndrome and Prader-Willi syndrome, aimed at educating professionals working with special education populations about these syndromes.
3. Develop an informative guide for teachers of learning disabilities containing detailed information about rare syndromes associated with learning disabilities, including behavioral, academic, emotional, social, physical, and health characteristics.
4. Include rare syndromes in the developmental programs implemented by the Specialized Training Center in the Sultanate of Oman.
5. Conduct a similar study with a focus on other classification variables (gender, grade level, school type, etc.) to explore their relationship with the awareness and importance levels of teachers.
6. Consider reapplying the study using an interview method to ensure the accuracy of the results.

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Data availability:

The datasets generated during the current study are available from the authors on reasonable request.

Declarations Conflict of interest

The authors report there are no competing interests to declare.

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Appendix

The Knowledge & Awareness about Angelman & Prader-Willi Syndromes Validation Inventory

The Knowledge & Awareness about Angelman Syndrome											
		Important					Possess				
No.	Item	Not (0)	Somewhat (1)	Moderate (2)	High (3)	Strongly High (4)	Not (0)	Somewhat (1)	Moderate (2)	High (3)	Strongly High (4)
Diagnosis											
1	Angelman syndrome is caused by a genetic disorder on chromosome 15										
2	The prevalence of Angelman syndrome ranges between 1 in 12,000 and 1 in 24,000 individuals.										
3	Some indicators in individuals may suggest Angelman syndrome, but diagnosis requires a specialist.										
4	Diagnosing Angelman syndrome requires a blood or saliva sample to detect genetic abnormalities in chromosome 15										
Physical and Health Characteristics											
5	Children with Angelman syndrome exhibit uncoordinated movements and balance issues, often walking with raised arms and bent wrists and elbows.										
6	Some children with Angelman syndrome experience hand tremors and flapping.										
7	Distinctive physical features include a small head, prominent chin, broad jaw, wide-set eyes, and spaced teeth.										
8	They may have fair skin, light-colored hair, and blue eyes.										
9	Angelman syndrome individuals reach puberty at a similar age to typically developing peers.										
10	Most individuals (8 out of 10) experience severe and recurrent seizures during childhood.										
11	Some (1 out of 10) develop scoliosis (spinal curvature), particularly noticeable in adulthood.										

12	They may face mobility difficulties and muscle stiffness as they age.										
13	Gastrointestinal problems like frequent vomiting and chronic constipation are common.										
Cognitive and Intellectual Characteristics											
14	Cognitive abilities range from severe to profound intellectual disability.										
15	They show low levels of perception, memory, and attention.										
16	Angelman syndrome is associated with learning disabilities and short attention spans.										
17	Expressive language skills are weak, often relying on non-verbal communication such as gestures and touch.										
Behavioral Characteristics											
18	Repetitive stereotypical behaviors like hand flapping are common.										
19	Hyperactivity and impulsiveness are typical but may improve with age.										
20	About 60% show excessive appetite, leading to obesity, and may consume harmful non-food items.										
21	Most cannot walk independently until around age 5.										
22	Sleep disturbances, including short sleep cycles, night awakenings, and bedwetting, are common.										
23	They tend to have a cheerful personality and enjoy social interactions.										
24	Aggressive behaviors, such as hair-pulling, may occur.										
25	Some display behaviors resembling autism spectrum disorder.										
26	Persistent smiling and cheerfulness between 3–6 months of age may indicate Angelman syndrome.										

The Knowledge & Awareness about Prader-Willi Syndrome

	Important					**Possess**				
Item	**Not (0)**	**Somewhat (1)**	**Moderate (2)**	**High (3)**	**Strongly High (4)**	**Not (0)**	**Somewhat (1)**	**Moderate (2)**	**High (3)**	**Strongly High (4)**
Diagnosis										

1	Prader-Willi syndrome is caused by a genetic disorder on chromosome 15										
2	The prevalence ranges from 1 in 20,000 to 1 in 25,000 individuals										
3	Some indicators may suggest Prader-Willi syndrome, but diagnosis requires a specialist										
4	Diagnosis involves testing blood or saliva to detect genetic abnormalities in chromosome 15										
Physical and Health Characteristics											
5	Distinctive features include almond-shaped eyes, a narrow head at the temples, a downward-slanting mouth, thin upper lips, and a short, narrow nose.										
6	Strabismus (crossed eyes) occurs in 60–70% of cases.										
7	Infants often have weak muscles, making feeding difficult, resulting in low weight, but muscle strength improves with age.										
8	Underdeveloped genitalia are common, with small or short organs.										
9	Some (1 in 3) have fair skin and attractive hair and eye colors.										
10	They are shorter than peers in adulthood, with low muscle mass and high body fat.										
11	They may age prematurely (40–55 years) and require more assistance with self-care.										
12	Delayed puberty is common compared to peers.										
13	Fluid retention in the legs, caused by obesity, may occur.										
14	40–80% develop scoliosis, especially noticeable in adulthood.										
15	Many tend to scratch, pick, or pierce their skin, causing sores and scars.										
16	They have high rates of dental issues, such as cavities, due to low saliva production.										
17	Psychological issues like depression, mood swings, and irritability are common.										
Cognitive and Intellectual Characteristics											
18	Cognitive abilities range from mild to moderate intellectual disability, with some having borderline IQs around 85.										
19	They may experience multiple learning difficulties but can attend mainstream education with appropriate support.										
20	They excel in long-term memory but struggle with short-term memory.										

21	Cognitive abilities vary, with some showing borderline intelligence levels.										
22	Verbal skills are relatively strong, but some face delays in language development.										
23	They find it difficult to switch between tasks or multitask.										
24	They tend to respond to situations in fixed ways despite having other options.										
25	They demonstrate persistence in gathering information, but sorting useful from non-useful data takes time.										
26	Strong spatial-visual abilities are common										
Behavioral Characteristics											
27	Most have excessive appetites and never feel full, leading to obesity and diabetes; they may eat unsafe items.										
28	They show good independence skills but need help, especially in early childhood.										
29	Many display autism-like traits such as repetitive behaviors, weak social interactions, and communication difficulties.										
30	Temper tantrums, mood swings, and destructive behaviors emerge during adolescence, particularly when meals are delayed.										
31	They often exhibit laziness, fatigue, and reluctance to engage in physical activities.										
32	Repetitive questioning, usually about food or future events, is common.										
33	Sleep disorders include nighttime breathing difficulties and prolonged daytime sleep.										
34	They tend to follow fixed routines and repetitive patterns.										