

# Perception of precocious puberty among school-aged children in South Korea with the experience of treatment for precocious puberty: a Q methodological approach

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**Purpose:** This study aimed to investigate the perceptions of precocious puberty and elucidate the distinct characteristics of each type of perception related to precocious puberty among school-aged children who had undergone treatment for the condition.

**Methods:** This study applied the Q methodology to identify and classify the perceptions of precocious puberty among school-aged children who had undergone treatment for the condition. The analysis involved 34 questions from the Q sample and data from 35 individuals in the P sample, using the PC-QUANL Program for analysis.

**Results:** The perceptions of precocious puberty among school-aged children who had undergone precocious puberty treatment were classified into the following four types: "shyness - passive self-management," "resentment - suppression," "anxiety - fear," and "adaptation - acceptance." **Conclusion:** This study investigated the experiences and perceptions of children who have undergone treatment for precocious puberty. Through the identification of four types of perceptions, we can see that there is a need to develop an intervention program for nursing that is tailored to the specific type of precocious puberty.

**Key words:** Puberty, precocious; Child; Schools; Perception

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## INTRODUCTION

The number of Korean children receiving treatment for precocious puberty has surged by 58.6% over the past 5 years, rising from 87,000 in 2016 to 138,000 in 2020. Although the diagnosis rate for girls remains higher than for boys at 12.9%, the rate for boys has seen a significant increase, jumping to 35.8% over the same 5-year period [1]. In response to this trend, the government designated precocious puberty as a "disease of public interest" in 2012 and included it in the "top 100 diseases closely related to people's lives and of high public interest" in 2018. The government is currently analyzing and managing the status of the disease and related medical practice statistics [2]. The rapid rise in precocious puberty is believed to be due to factors such as environmental pollution from industrialization, obesity resulting from dietary changes like increased consumption of instant or fast food, pituitary gland hyperfunction caused by television or smartphone use, and a family

history of early puberty. Regarding obesity, the increase in endocrine disruptors, which are similar to female hormones, and the secretion of female hormones from fat cells are thought to have a particularly significant impact on girls [3,4].

Precocious puberty is characterized by an unusually rapid development of adolescence, compared to peers of the same age. The diagnostic criteria used in Korea stipulate that boys who develop a testicular volume of 4 mL or more before the age of 9 years, and girls who exhibit breast development before the age of 8 years, are experiencing precocious puberty. This condition is also identified by the appearance of secondary sexual characteristics, such as the onset of menarche before the age of 9 years [5]. Individuals with precocious puberty typically enter puberty 2 to 3 years earlier than their peers. This early onset can result in them being shorter than their peers due to the premature expression of secondary sexual characteristics and accelerated bone maturation, driven by the action of sex hormones. Other potential issues include

early pregnancy, sexual abuse, and a higher likelihood of psychosocial or behavioral problems, such as alcohol or drug addiction [6]. Precocious puberty is also linked to the development of serious conditions like central nervous system or ovarian tumors. Therefore, it is crucial to diagnose and treat this condition as early as possible [7]. Given these potential risks, many parents are understandably anxious about the symptoms of precocious puberty and closely monitor their child's development. As a result, there has been a significant increase in interest in this condition [8].

In the treatment of precocious puberty, gonadotropin-releasing hormone (GnRH) agonists are commonly used. These agents have the effect of desensitizing the gonadotropin cells in the pituitary gland to endogenous GnRH stimulation. Typically, this treatment is applied for a period of 2 to 5 years, and is usually discontinued around the age of 11 years for girls and 12 years for boys [4,9]. The use of traditional Asian medicine in the treatment and management of precocious puberty has recently gained traction, leading to an increase in treatment rates [10,11]. However, hormone therapy can have side effects such as weight gain, decreased bone density, psychological atrophy, depression, mild headaches, nausea, and facial flushing [12]. As a result, the mothers of children undergoing treatment for precocious puberty often experience significant anxiety and concern about the continuation and use of the treatment.

School-aged children who have undergone precocious puberty become aware of their physical differences in height, weight, and secondary sexual characteristics, and they often react sensitively to these differences compared to their peers [13,14]. As a result, they have limited time to accept and understand these body changes, which can lead to feelings of fear and confusion about their rapid development [15]. Specifically, in cases of precocious puberty, a child's treatment experiences and the duration of treatment can vary based on the mother's approach to healthcare. However, considering that individual perceptions of health issues within a specific socio-cultural context can influence overall disease management [16], children who have undergone treatment for precocious puberty may experience either positive or negative effects on their psychosocial adaptation and disease progression [17]. Therefore, the subjective perceptions of children who have experienced treatment for precocious puberty can determine their healthcare approach and influence their coping process [18].

Medical research is actively being conducted to validate the effects of treatments for precocious puberty. However, the majority of these studies have focused solely on the experiences of elementary school girls undergoing hormone therapy [19], or the experiences of mothers with children suffering

from precocious puberty [20-22]. Consequently, there is a significant lack of comprehensive analysis regarding the psychological, social, and behavioral aspects of children who have undergone treatment for precocious puberty. Most importantly, school age is a critical period for the formation and completion of self-identity, preceding adolescence. The potential for negative body image and low self-esteem, which may arise during treatment for precocious puberty, can significantly impact personality development during childhood [23].

Therefore, we employed Q methodology in this study. This research method identifies correlations between individuals based on subjective attributes, which can be interpreted differently depending on personal experiences or perceptions. The aim was to understand how school-aged children, who have undergone treatment for precocious puberty, perceive this condition. By examining and explaining these children's perceptions and characteristics, we sought to provide valuable foundational data that can enhance our understanding of how school-aged children, who have been treated for precocious puberty, perceive their condition. Furthermore, the findings can help establish strategies for providing nursing care for children currently undergoing treatment for precocious puberty, as well as those who have completed treatment.

The purpose of this study was to explore perceptions of precocious puberty among school-aged children who have undergone treatment for the condition, using Q methodology. The specific objectives were as follows: First, to categorize the characteristics of precocious puberty perceived by school-aged children who have undergone treatment for precocious puberty. Second, to analyze and describe the characteristics of each type of perception of precocious puberty among school-aged children who have undergone treatment for precocious puberty.

## METHODS

**Ethics statement:** This study was approved by the Institutional Review Board (IRB) of Cheongam college (No. CA17-220428-HR-002-01). Informed consent was obtained from all participants.

### 1. Study Design

In this study, we utilized the Q methodology to examine the various perceptions of precocious puberty among school-aged children who have undergone treatment for the condition. We also sought to identify the unique characteristics of each perception type. This study followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) reporting guidelines [24].

## 2. Selection of the Q Population and Q Sample

First, we gathered a Q population for the perception of precocious puberty from various references. These included academic journals, professional magazines, books, and newspapers that focused on children with precocious puberty. This approach was taken to prevent the repetition of statements about children who are undergoing or have completed treatment for precocious puberty. From these sources, we extracted a total of 360 thematic elements in the Q population. Additionally, we conducted in-depth interviews to gather the perspectives of children who have personally experienced precocious puberty [3-9]. These interviews took place from January 1, 2022, to March 1, 2022, and involved two nurses from a pediatric ward, two elementary school health teachers, four parents of children who were receiving or had completed treatment for precocious puberty, and three children. The interview questions focused on the experiences of school-aged children in relation to precocious puberty and the psychological and physical support behaviors implemented for its treatment. We continued the interviews until the responses regarding the perception of precocious puberty began to show similarities. Moreover, we conducted in-depth interviews to understand the impact of precocious puberty on school-aged children's psychological, societal, body image, and interpersonal experiences. Each interview lasted approximately 1 to 2 hours. After obtaining consent from the interviewees, we voice-recorded all details to prevent any omissions. In addition to this, we extracted 425 thematic elements of the Q population by combining data from previous studies on the perceptions of precocious puberty, specialized books, and domestic academic journals. After a process of revision and re-extraction of statements through in-depth discussions with three nursing professors, we extracted a final total of 150 elements for the Q population.

The Q sample was created through a process of integrating and organizing statements with similar meanings to form mutually exclusive statements. Initially, the statements from the Q population were divided into four role categories. Each statement was then classified as affirmative, neutral, or negative. The composition of these statements was balanced according to the number of statements within the Q population, thus forming the Q sample. This process was repeated several times to integrate and streamline statements with similar or overlapping meanings. As a result, types of precocious puberty perceptions were categorized, with the number of statements in each category ranging from a minimum of 19 to a maximum of 112. To achieve this, we sought advice from the expert panel mentioned earlier on three separate occasions. Consequently, the Q sample was finalized with 34 representa-

tive statements that clearly conveyed their intended meanings. After the Q sample was prepared, a preliminary survey was conducted with two pediatric ward nurses who had over three years of clinical experience. The purpose of this preliminary survey was to verify the time required to classify the Q sample. Any statements that took longer than expected to classify or had unclear meanings were identified and corrected.

## 3. Selection of the P Sample

The Q methodology focuses on the significance of intra-individual differences and is a qualitative research study that emphasizes subjectivity. It is not significantly constrained by the number of individuals in the P sample, but instead adheres to the small sample doctrine. This is due to the potential statistical issues that may arise when the characteristics become indistinguishable due to the concentration of many individuals on a single factor when the sample P size increases. Therefore, in accordance with the small sample doctrine, the typical P sample comprises approximately  $40 \pm 20$  individuals [25].

In this study, the P sample consisted of school-aged children who had no other deformities or health issues, no chronic diseases, and who were either undergoing treatment or had previously undergone treatment for precocious puberty. This group included those who participated in in-depth interviews, forming the Q population. After determining the participants' gender, grade, and status of precocious puberty, we also identified whether they had any experience with treatment or hormone therapy. Thirty-five individuals who agreed to participate in writing, after receiving an explanation of the study's purpose and content, were involved from March 1, 2022, to August 30, 2022. The sample was selected using convenience and snowball sampling methods, facilitated through introductions from university hospitals and pediatric departments.

## 4. Classification of the Q Sample and the Method of Data Analysis

The distribution map for the Q sample was created following the principles of the Q methodology. This required the research participants to distribute the 34 statements selected as the Q sample. The Q classification procedure begins by reading the Q sample and categorizing it into three groups: positive, neutral, and negative. The most affirmative statements are then selected from the positive group and classified from the outer to the inner layers, ending with the neutral group. During this process, feedback was collected for each of the four statements, two of which were positioned on the positive poles (+4, -4). This feedback is valuable for later interpretation of the Q factor [25]. The collected data were scored starting

with 1 point for the most negative case (-4) and going up by 9 points for the most positive case (+4) in the sample Q distribution. The PC-QUANL Program was used to analyze the data. To determine the optimal number of factors, the classification type was chosen based on the results calculated by inputting the number of factors in various ways. This was done considering an eigenvalue of 1.0 or higher and the total explanatory variance [26].

## 5. Ethical Considerations

The research participants were provided with written explanations about the purpose of the study, the survey methodology, the materials used, the duration of the research, the time commitment required, the costs, the benefits, the ethical considerations, and the researchers involved. Consent was then obtained from those who agreed to participate in the study. The researcher met individually with each participant to further explain the purpose of the study and the survey method. The questionnaire, which included a written consent form, was presented to both the children and their parents. After obtaining the children's consent, the parents were also asked to provide their consent. Before securing their consent, the purpose of the study, the contents and methods of the survey, and any gifts or incentives provided after the survey were clearly communicated.

Participants did not incur any costs to take part in the study. However, as a gesture of appreciation for their participation, they received a thank-you gift valued at 20,000 won upon completion of the questionnaire.

## RESULTS

### 1. Formation of the Q Types

Four types were identified through Q factor analysis, examining the subjectivity of treatment experiences among school-aged children with precocious puberty. These four types accounted for 57.3% of the total variance. The explanatory power of each type was distributed as follows: 39.6% for type 1, 0.13% for type 2, 0.09% for type 3, and 0.05% for type 4.

Furthermore, the correlations among the types are depicted in Table 1. This table illustrates the degree of similarity among each type. The correlation among each type was moderate, with an r-value ranging from  $\pm.23$  to  $.47$ . This suggests that each type existed relatively independently (Table 1).

### 2. Characteristics of the P Sample

Table 2 presents the demographic characteristics and factor

weights of the P sample. A higher factor weight for each type represents the typical characteristics of that type to a greater extent. Type 1 consisted of 12 participants, eight girls and four boys, with an average age of 10.5 years. The average treatment period following the diagnosis of precocious puberty was 3 months. Four of these children had undergone hormone therapy, and all were perceived to be in good health. Type 2 included nine participants, seven girls and two boys, with an average age of 11.1 years. The average treatment period following the diagnosis of precocious puberty was 3.4 months. Three of these children had undergone hormone therapy, and all were perceived to be in good health. Type 3 comprised nine participants, seven girls and two boys, with an average age of 11.0 years. The treatment period following the diagnosis of precocious puberty was 3.9 months. Two of these children had undergone hormone therapy, and all were perceived to be in good health. Type 4 had five participants, four girls and one boy, with an average age of 11.0 years. The treatment period following the diagnosis of precocious puberty was 3 months. Two of these children had undergone hormone therapy. Four children reported their perceived health condition as good, while one child reported it as moderate.

### 3. Characteristics by Type

In this study, we aimed to analyze the subjective experiences of treatment among school-aged children with precocious puberty, categorized by type. We first analyzed 34 statements, focusing on those that demonstrated strong positivity (with a Z score of +1 or higher) and strong negativity (with a Z score of -1 or less). The characteristics of each type were highlighted based on the items where the standard score for a specific type significantly differed from the standard score of another type. For the analysis of each type of precocious puberty among school-aged children, we presented the 34 statements as described in Table 3. The types of precocious puberty experiences during treatment for school-aged children, as confirmed by the above analysis criteria, are presented in Table 4.

#### 1) Type 1: "shyness - passive self-management"

The statement that type 1 participants most strongly agreed with was Q13. "I feel embarrassed about the physical changes caused by precocious puberty ( $Z=2.09$ )", followed by Q14. "I worry that people will notice my physical changes ( $Z=1.86$ )". On the other hand, the statement that type 1 participants most strongly disagreed with was Q8. "I try to keep my condition as private as possible to avoid rumors among my friends ( $Z=-1.59$ )", followed by Q5. "I strive to eat a balanced diet, avoiding foods known to trigger precocious puberty ( $Z=-1.49$ )" (Table 4).

**Table 1.** Subjectivity Q Factor Analysis on the Types of School-aged Children in South Korea with the Experience of Treatment for Precocious Puberty and the Correlation Using QUANL (N=35)

Variables	Type I	Type II	Type III	Type IV
Type I	1.00			
Type II	0.26	1.00		
Type III	0.47	0.22	1.00	
Type IV	0.24	0.21	0.23	1.00

**Table 2.** School-Aged Children in South Korea with the Experience of Treatment for Precocious Puberty Demographic Characteristics and Factor Weights for the P Sample (N=35)

Type	No.	Factor weight	Child's sex	Child's age (year)	Months after diagnosis (month)	Hormone treatment experience	Child's health
Type I (n=12)	3	0.66	Female	11	4	Yes	Good
	15	0.73	Female	11	4	No	Good
	32	0.55	Female	10	3	No	Good
	1	0.74	Male	9	2	Yes	Good
	17	0.63	Female	11	4	No	Good
	30	0.47	Male	10	3	No	Good
	5	0.46	Female	12	2	Yes	Good
	18	0.39	Male	11	5	No	Good
	11	0.45	Female	9	1	No	Good
	6	0.37	Female	10	2	No	Good
	9	0.26	Female	12	2	No	Good
	34	0.48	Male	10	4	Yes	Good
Type II (n=9)	24	0.52	Female	11	5	No	Good
	25	0.13	Female	9	2	Yes	Good
	12	0.65	Male	12	2	No	Good
	26	0.29	Female	12	5	Yes	Good
	21	0.80	Female	10	3	No	Good
	13	0.92	Female	12	3	No	Good
	23	0.28	Male	11	4	No	Good
	22	0.77	Female	11	4	No	Good
	14	0.29	Female	12	3	Yes	Good
Type III (n=9)	8	0.60	Female	11	2	No	Good
	27	0.15	Male	12	5	No	Good
	20	0.24	Female	12	5	Yes	Good
	33	0.56	Female	12	5	No	Good
	28	0.41	Female	10	4	No	Good
	29	0.21	Female	12	5	Yes	Good
	10	0.40	Female	8	1	No	Good
	7	0.27	Female	11	4	No	Good
	31	0.68	Male	11	4	No	Good
Type IV (n=5)	4	0.69	Female	12	2	Yes	Good
	16	0.45	Male	11	3	No	Good
	35	0.21	Female	10	5	No	Moderate
	2	0.10	Female	11	2	Yes	Good
	19	0.79	Female	11	3	No	Good

Furthermore, the statements where type 1 showed a strong agreement with a standard score difference of +1.00 or more compared to type 2 included Q13. "I feel embarrassed about

the physical changes caused by precocious puberty ( $Z=2.09$ )", and Q14. "I worry that people will notice my physical changes ( $Z=1.86$ )". The statement that showed a strong disagreement

**Table 3.** 34 Question Items Proposed for Precocious Puberty Analysis by Each Type of School-Aged Children in South Korea with the Experience of Treatment for Precocious Puberty

No.	Questions
1	I find it hard to believe that I'm dealing with precocious puberty.
2	I suspect my consumption of fast food or instant food could be leading to my precocious puberty.
3	My parents are obese, which suggests that precocious puberty might be hereditary.
4	I am optimistic because I am currently undergoing treatment for precocious puberty.
5	I strive to eat a balanced diet, avoiding foods known to trigger precocious puberty.
6	I exercise regularly to manage precocious puberty.
7	I feel self-conscious due to my precocious puberty.
8	I try to keep my condition as private as possible to avoid rumors among my friends.
9	When it comes to treating precocious puberty, I trust and follow my doctor's advice.
10	To alleviate symptoms of precocious puberty, some might suggest using herbal medicine or folk remedies.
11	Due to precocious puberty, I have to avoid snacking.
12	Listening to my mother's advice may help me manage the symptoms of precocious puberty.
13	I feel embarrassed about the physical changes caused by precocious puberty.
14	I worry that people will notice my physical changes.
15	I wish I were more slender.
16	My mother's dietary habits might have contributed to my precocious puberty.
17	I'm shorter and heavier than most of my friends.
18	I worry about not growing taller.
19	I've developed secondary sexual characteristics earlier than my peers.
20	My mother constantly worries about me.
21	To grow taller, I feel the need to consume ample food.
22	I make it a point to sleep early at night for better growth hormone secretion.
23	The treatment process presents several challenges.
24	Getting medical treatment at the hospital can be quite inconvenient.
25	I dread medical examinations and injections.
26	I get teased by my friends.
27	Disagreements arise about whether to continue treatment.
28	I feel somewhat unpopular among my friends.
29	I understand the causes and diagnosis of precocious puberty.
30	I harbor some resentment towards my parents for my precocious puberty.
31	When I fail to control my eating or exercising habits, it makes me frustrated.
32	It's crucial for society to understand that precocious puberty isn't a bad condition.
33	I am not keen on hormone therapy, but I am undergoing it due to my mother's insistence.
34	I must confront and overcome my feelings of depression.

**Table 4.** Q-statements and Z-Scores by Type of the Types of Precocious Puberty of School-aged Children in South Korea with the Experience of Treatment for Precocious Puberty (N=35)

Type	No.	Q-statement	Z-score
Type 1. Shyness - passive self- management (12)	13	I feel embarrassed about the physical changes caused by precocious puberty.	2.09
	14	I worry that people will notice my physical changes.	1.86
	19	I've developed secondary sexual characteristics earlier than my peers.	1.49
	18	I worry about not growing taller.	1.34
	2	I suspect my consumption of fast food or instant food could be leading to my precocious puberty.	1.28
	12	Listening to my mother's advice may help me manage the symptoms of precocious puberty.	1.15
	17	I'm shorter and heavier than most of my friends.	1.05
	7	I feel self-conscious due to my precocious puberty.	-1.19
	6	I exercise regularly to manage precocious puberty.	-1.37
	15	I wish I were more slender.	-1.40
	22	I make it a point to sleep early at night for better growth hormone secretion.	-1.48
	5	I strive to eat a balanced diet, avoiding foods known to trigger precocious puberty.	-1.49
8	I try to keep my condition as private as possible to avoid rumors among my friends.	-1.59	
Type 2. Resentment - suppression (9)	30	I harbor some resentment towards my parents for my precocious puberty.	1.96
	21	To grow taller, I feel the need to consume ample food.	1.71
	22	I make it a point to sleep early at night for better growth hormone secretion.	1.31
	19	I've developed secondary sexual characteristics earlier than my peers.	1.29
	34	I must confront and overcome my feelings of depression.	1.26
	15	I wish I were more slender.	1.22
	32	It's crucial for society to understand that precocious puberty isn't a bad condition.	1.16
	4	I am optimistic because I am currently undergoing treatment for precocious puberty.	-1.03
	16	My mother's dietary habits might have contributed to my precocious puberty.	-1.06
	3	My parents are obese, which suggests that precocious puberty might be hereditary.	-1.43
	6	I exercise regularly to manage precocious puberty.	-1.76
	26	I get teased by my friends.	-1.77
28	I feel somewhat unpopular among my friends.	-1.94	
Type 3. Anxiety - fear (9)	31	When I fail to control my eating or exercising habits, it makes me frustrated.	1.95
	34	I must confront and overcome my feelings of depression.	1.88
	30	I harbor some resentment towards my parents for my precocious puberty.	1.83
	29	I understand the causes and diagnosis of precocious puberty.	1.63
	23	The treatment process presents several challenges.	1.29
	27	Disagreements arise about whether to continue treatment.	1.15
	19	I've developed secondary sexual characteristics earlier than my peers.	1.11
	28	I feel somewhat unpopular among my friends.	-1.05
	11	Due to precocious puberty, I have to avoid snacking.	-1.17
	7	I feel self-conscious due to my precocious puberty.	-1.32
	3	My parents are obese, which suggests that precocious puberty might be hereditary.	-1.42
	14	I worry that people will notice my physical changes.	-2.03
Type 4. Adaptation - acceptance (5)	6	I exercise regularly to manage precocious puberty.	1.80
	5	I strive to eat a balanced diet, avoiding foods known to trigger precocious puberty.	1.74
	9	When it comes to treating precocious puberty, I trust and follow my doctor's advice.	1.67
	19	I've developed secondary sexual characteristics earlier than my peers.	1.54
	22	I make it a point to sleep early at night for better growth hormone secretion.	1.51
	23	The treatment process presents several challenges.	1.22
	11	Due to precocious puberty, I have to avoid snacking.	-1.12
	20	My mother constantly worries about me.	-1.14
	10	To alleviate symptoms of precocious puberty, some might suggest using herbal medicine or folk remedies.	-1.19
	30	I harbor some resentment towards my parents for my precocious puberty.	-1.22
	21	To grow taller, I feel the need to consume ample food.	-1.30
	34	I must confront and overcome my feelings of depression.	-1.36
12	Listening to my mother's advice may help me manage the symptoms of precocious puberty.	-2.12	

with a score difference of more than -1.00 compared to type 2 was Q5. "I strive to eat a balanced diet, avoiding foods known to trigger precocious puberty ( $Z=-1.49$ )". The statements that showed a strong agreement with a standard score difference of more than +1.00 between type 1 and type 3 included Q13. "I feel embarrassed about the physical changes caused by precocious puberty ( $Z=2.09$ )", and Q14. "I worry that people will notice my physical changes ( $Z=1.86$ )". The only statement where type 1 had a score difference of -1.00 or more compared to type 3 was Q5. "I strive to eat a balanced diet, avoiding foods known to trigger precocious puberty ( $Z=-1.49$ )". The statements that showed a strong agreement with a standard score difference of more than +1.00 between type 1 and type 3 included Q13. "I feel embarrassed about the physical changes caused by precocious puberty ( $Z=2.09$ )", and Q14. "I worry that people will notice my physical changes ( $Z=1.86$ )". The statement where type 1 had a score difference of -1.00 or more compared to type 3 was Q5. "I strive to eat a balanced diet, avoiding foods known to trigger precocious puberty ( $Z=-1.49$ )", and Q22. "I make it a point to sleep early at night for better growth hormone secretion. ( $Z=-1.48$ )". The statements that showed a strong agreement with a standard score difference of +1.00 or more compared to the final type 4 included Q13. "I feel embarrassed about the physical changes caused by precocious puberty ( $Z=2.09$ )", and Q14. "I worry that people will notice my physical changes ( $Z=-1.86$ )". The statement that showed a strong disagreement with a score difference of more than -1.00 compared to type 4 was Q5. "I strive to eat a balanced diet, avoiding foods known to trigger precocious puberty ( $Z=-1.49$ )".

Participant #5 in the study, who had the highest factor weight of 2.09 in type 1, was a healthy 12-year-old girl. The statement she most strongly agreed with was, "I feel embarrassed about the physical changes caused by precocious puberty. Her reasoning for this choice was, "Even before I realized I had precocious puberty, I was extremely embarrassed by the development of my breasts, the start of my period, and weight gain. Knowing that these changes were due to precocious puberty only increased my embarrassment". Conversely, the statement she most strongly disagreed with was, "I try to keep my condition as private as possible to avoid rumors among my friends". Her rationale for this choice was, "I want to keep it a secret from everyone. I'm really embarrassed". This sentiment expressed by participant #5 could be seen as representative of the "shyness - passive self-management" type.

Upon reviewing these findings, we noted that type 1 treatment experiences for school-aged children with precocious puberty often involved a passive mindset. These children tend to feel embarrassed about their early puberty and prefer not to display their changes to others. This is a natural response, and it has been labeled as the "shyness - passive self-management"

type. This term refers to the children's attempts to modify their own behavior, such as improving their eating habits.

## 2) Type 2 "resentment - suppression"

The statement that received the highest agreement in type 2 was Q30. "I harbor some resentment towards my parents for my precocious puberty ( $Z=1.96$ )", followed by Q21. "To grow taller, I feel the need to consume ample food ( $Z=1.71$ )". However, the statement that received the most negative response from type 2 was Q28. "I feel somewhat unpopular among my friends ( $Z=-1.94$ )", followed by Q26. "I get teased by my friends ( $Z=-1.77$ )" (Table 4).

Furthermore, the items where type 2 showed a strong agreement with a standard score difference of +1.00 or more compared to type 3 included Q18. "I worry about not growing taller ( $Z=1.96$ )" and Q21. "To grow taller, I feel the need to consume ample food ( $Z=1.71$ )". Conversely, the items that showed a strong disagreement with a score difference of -1.00 or more compared to type 3 were Q28. "I feel somewhat unpopular among my friends ( $Z=-1.94$ )" and Q26. "I get teased by my friends ( $Z=-1.77$ )". Similarly, the items where type 2 showed a strong agreement with a standard score difference of +1.00 or more compared to type 4 included Q18. "I worry about not growing taller ( $Z=1.96$ )" and Q21. "To grow taller, I feel the need to consume ample food ( $Z=1.71$ )". On the other hand, the items that showed a strong disagreement with a score difference of -1.00 or more compared to type 4 were Q28. "I feel somewhat unpopular among my friends ( $Z=-1.96$ )" and Q6. "I exercise regularly to manage early puberty ( $Z=-1.76$ )".

Participant #26 in the study, who had the highest factor weight of 1.96 in type 2, was a healthy 12-year-old girl. The statement she most strongly agreed with was, "I harbor some resentment towards my parents for my precocious puberty". She explained her choice by saying, "I believe I am overweight because my parents are, and I hold a lot of resentment towards them for that". Conversely, she also strongly agreed with the statement "I exercise regularly to manage early puberty". Her reasoning for this choice was, "I regularly exercise to manage my precocious puberty, and I believe it will improve over time". This statement was made by participant #5 and could be seen as representative of the "resentment - suppression" type.

Upon examining the results, it was confirmed that school-aged children with type 2 experiences of precocious puberty experienced resentment towards their parents, felt self-conscious about their condition, and struggled with popularity among their peers. They also harbored feelings of resentment. However, this was termed the "resentment - suppression" type because it indicates that the child is attempting to suppress these feelings and manage their precocious puberty.



**3) Type 3: "anxiety - fear"**

The item that received the strongest agreement from type 3 was Q31. "When I fail to control my eating or exercising habits, it makes me frustrated ( $Z=1.95$ )", followed by Q34. "I must confront and overcome my feelings of depression ( $Z=1.88$ )". However, type 3 showed the most disagreement with Q14. "I worry that people will notice my physical changes ( $Z=-2.03$ )", and Q3. "My parents are obese, which suggests that precocious puberty might be hereditary ( $Z=-1.42$ )" (Table 4).

Furthermore, the items that showed a strong agreement from type 3, with a standard score difference of +1.00 or more compared to type 4, were Q18. "I worry about not growing taller ( $Z=1.96$ )" and Q21. "To grow taller, I feel the need to consume ample food ( $Z=1.70$ )". Conversely, the statements that showed a strong disagreement, with a score difference of -1.00 or more compared to type 3, were Q28. "I feel somewhat unpopular among my friends ( $Z=-1.94$ )" and Q26. "I get teased by my friends ( $Z=-1.76$ )". The statements that showed a strong agreement from type 2, with a standard score difference of +1.00 or more compared to type 4, were Q18. "I worry about not growing taller ( $Z=1.96$ )", Q21. "To grow taller, I feel the need to consume ample food ( $Z=1.70$ )", and the statements that showed a strong disagreement, with a score difference of -1.00 or more compared to type 4, were Q26. "I get teased by my friends ( $Z=-1.76$ )" and Q21. "To grow taller, I feel the need to consume ample food ( $Z=-1.70$ )".

Participant #20 in the study, who had the highest factor weight of 1.95 in type 3, was a healthy 12-year-old girl. The statement she most strongly agreed with was, "When I fail to control my eating or exercising habits, it makes me frustrated". She chose this statement because she expressed a desire for her precocious puberty to improve quickly. However, she was frustrated with herself for her inability to control her eating habits and lack of exercise. Conversely, the statement she strongly disagreed with was, "I worry that people will notice my physical changes". She chose this statement because she disliked being overweight and developing breasts, and was afraid others would notice these changes. This statement from participant #20 could be representative of the "anxiety - fear" type.

Upon analyzing the results, it was observed that type 3 was associated with children who were often anxious about the prospect of being short-statured adults, which led them to seek treatment. However, the physical changes they undergo can draw attention from their peers, causing discomfort. As a

result, these children tended to be shy, preferred not to draw attention to their condition, and often experienced significant anxiety. Therefore, this category was aptly named the "anxiety - fear" type.

**4) Type 4: "adaptation - acceptance"**

The item that received the strongest agreement from type 4 was Q6. "I exercise regularly to manage precocious puberty ( $Z=1.80$ )", followed by Q5. "I strive to maintain a balanced diet, avoiding foods that may trigger precocious puberty ( $Z=1.74$ )". However, the statement that received the most negative response from type 4 was Q12. "Listening to my mother's advice may help me manage the symptoms of precocious puberty ( $Z=-2.12$ )", followed by Q34. "I need to overcome my feelings of depression ( $Z=-1.36$ )" (Table 4).

Participant #4, who had the highest factor weight of 1.80 in type 4, was a healthy 12-year-old girl. The statement she most strongly agreed with was, "I exercise regularly to manage precocious puberty". Her rationale for this choice was, "I believe that my precocious puberty will improve with regular exercise. I also need to lose weight through exercise". Conversely, the statement she strongly disagreed with was, "Listening to my mother's advice may help me manage the symptoms of precocious puberty". Her reasoning for this choice was, "My mother is eager for my precocious puberty to improve quickly, so she is very attentive. Therefore, I make an effort to listen to her". This statement from participant #4 could be seen as representative of the "adaptation - acceptance" type.

Upon examining these results, similarly to type 4, we found that the treatment experience of school-aged children with precocious puberty solidified their understanding of how to manage this condition. These children actively strive to overcome precocious puberty, often taking cues from their parents. Consequently, this approach has been termed the "adaptation - acceptance" type in relation to treatment.

**4. Matched Items between Types**

Upon examining the results, we classified the treatment experiences of school-aged children with precocious puberty into four distinct types. Each type demonstrated unique characteristics. However, there were commonalities in the statements about the treatment experiences of these children, corresponding to the four types, as presented in Table 5. The state-

**Table 5.** Consensus Items and Average Z-Scores for Commonly Agreed or Disagreed Statements about the Four Types of School-Aged Children in South Korea with the Experience of Treatment for Precocious Puberty

	Q-statement	Z-score
Q19.	I've developed secondary sexual characteristics earlier than my peers.	1.54

ment that most strongly resonated with the children's perception of their precocious puberty was "I've developed secondary sexual characteristics earlier than my peers." In other words, these children undergoing treatment for precocious puberty expressed concern and anxiety about the early onset of secondary sexual characteristics compared to their peers.

## DISCUSSION

This study was undertaken to identify the various perceptions of precocious puberty among school-aged children who have undergone treatment for the condition, and to verify the characteristics of each perception type. The findings revealed four distinct types of responses among the school-aged children who had experienced treatment for precocious puberty: "shyness - passive self-management," "resentment - suppression," "anxiety - fear," and "adaptation - acceptance."

The first category, "shyness - passive self-management," encompasses children who feel embarrassed about their precocious puberty and wish to conceal their bodily changes from others. Individuals in this category acknowledge their precocious puberty, avoid foods that may trigger early puberty, and make lifestyle changes such as going to bed early to stimulate growth hormone production. The characteristics of these children align with research findings that children experiencing precocious puberty, who notice physical differences from their peers due to rapid physiological changes, may have sensitive reactions and decreased self-esteem, leading to internalized body image issues [13,19]. It is particularly worth noting that these children, as they mature into adults, are predicted to be shorter in stature, which is perceived as a condition that needs treatment. They attempt to enhance their situation through hormone therapy, exercise, and dietary modifications. Interventions that can promote normal growth and development are necessary. Therefore, it is crucial to establish an educational and support system for children experiencing precocious puberty. This study confirmed that students felt a sense of shame about their experiences with precocious puberty treatment, which could potentially lead to negative behaviors among those who have undergone such treatment in the future. Therefore, it is important to provide support that allows individuals to reflect on their feelings and find meaning in their treatment journey, even in challenging situations. Additionally, education should be provided about the treatment plan for precocious puberty and the potential improvements post-treatment, using a gradual approach.

Type 2 individuals diagnosed with precocious puberty are characterized as the "resentment - suppression" type. These children often worry about being teased by their peers due to their height, harbor fears of unpopularity, and express resent-

ment towards their parents, believing that their height is a result of parental genetics. This aligns with previous research findings [19,22], which suggest that while these individuals may deny or express anger about their need for precocious puberty treatment, they generally comply with the treatment plan set by their parents, recognizing its necessity. Therefore, for type 2 children, it is crucial to implement communication training to identify their concerns when diagnosing precocious puberty and to help alleviate negative emotions. Additionally, psychological interventions should be developed and applied to bolster their resilience.

The third type identified was "anxiety - fear." These individuals expressed anger towards themselves for their inability to control their eating habits or lack of exercise. They also exhibited anxiety about potentially not growing tall due to inheriting their parents' obesity-induced precocious puberty. There was a prevalent concern about living with a short stature in adulthood. Despite receiving treatment, these individuals did not want others to notice changes in their bodies. They were often shy and experienced high levels of anxiety. School-aged children who do not resemble their peers in terms of height and weight become self-conscious about their physical differences. They are more likely to react sensitively to these differences [27]. The discrepancy between mental and physical maturity can lead to feelings of anxiety and mental confusion [28]. Therefore, it is evident that children with precocious puberty may fear their physical changes. As a result, a systematic program should be designed and implemented that allows children to express their anxiety and fear and identify stress-inducing factors.

Type 4 was classified as the "adaptation - acceptance" type. These individuals adhere to regular exercise and dietary restrictions that limit foods known to trigger precocious puberty. They are generally obedient to their mothers, work to alleviate symptoms of precocious puberty, and strive to overcome feelings of depression. Children experiencing precocious puberty often struggle to express themselves during treatment and typically follow their parents' instructions [19]. Given their need for emotional stability, psychological control, and prevention of unhealthy eating habits, exercise routines, and obesity through a practical care program [3], their situation aligns with the findings of this study. Notably, there were varying opinions regarding the treatment experiences of school-aged children with precocious puberty who fell into these four categories. It was clear that they harbored concerns about their visible symptoms and felt anxious. Therefore, a practical intervention program is necessary to improve dietary habits and maintain a suitable weight and nutritional balance. This will ensure normal growth and development through a multidisciplinary approach.

Generalizing the results of this study is challenging due to the specific participant group: namely, children undergoing treatment for precocious puberty in a certain region. Moreover, previous studies focusing on children who have undergone treatment for precocious puberty are notably scarce, complicating direct and comparative research. Additionally, as there were no children in this study who experienced side effects from precocious puberty treatment, it is difficult to extrapolate these findings to all children who have received treatment for precocious puberty.

This study utilized Q methodology to investigate and comprehend the perception of precocious puberty among school-aged children who have undergone treatment for the condition. Q methodology is a research technique that identifies correlations between individuals regarding subjective attributes, which can be interpreted differently based on personal experiences or perceptions. By verifying these perceptions and delineating the characteristics of each type, this study furnished fundamental data for a comprehensive understanding of how school-aged children who have received treatment for precocious puberty perceive the condition. This information is crucial for developing nursing strategies for children during and after treatment for precocious puberty.

According to the 2017 analytical results from the Health Insurance Review & Assessment Service in Korea, there was a significant increase in the number of cases of precocious puberty, with a 13-fold rise to 86,300 in 2016 [4]. It is noteworthy that this has contributed to the advancement of pediatric nursing practice and associated knowledge. This contribution is particularly evident in the categorization of children's perceptions of their experiences with precocious puberty treatment.

## CONCLUSION

In this study, we categorized the perceptions of precocious puberty among school-aged children who underwent treatment for the condition into four types: "shyness - passive self-management," "resentment - suppression," "anxiety - fear," and "adaptation - acceptance." The findings of this study can be used to enhance our understanding of how school-aged children perceive precocious puberty and their treatment experiences. By identifying and explaining the characteristics of each perception type, we can develop tailored nursing intervention programs for children with precocious puberty.

Based on the findings of this study, we propose several recommendations. Firstly, there is a need to develop a quantifiable evaluation tool capable of measuring the perception of precocious puberty among school-aged children who have undergone treatment for this condition. Secondly, we suggest a follow-up study to analyze the perceptions of precocious

puberty among school-aged children from various age groups and regions who have also experienced treatment for precocious puberty. Lastly, it would be beneficial to develop a program tailored to each type of perception of precocious puberty among school-aged children who have been treated for this condition, and conduct further research to verify its effectiveness.

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## Authors' contribution

Conceptualization: all authors; Data collection, Formal analysis: all authors; Writing-original draft: all authors; Writing-review and editing: all authors; Final approval of published version: all authors.

## Conflict of interest

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