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Comparative study of emotional facial expression recognition among Prader–Willi syndrome subtypes

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Abstract

Background Prader–Willi syndrome (PWS) is a congenital disease caused by a rare and generally non-inherited genetic disorder. The inability to recognise facial expressions of emotion is an apparent social cognition deficit in people diagnosed with PWS. The main objective of the present study is to compare the ability to recognise emotional facial expression, in both non-contextualised and contextualised scenarios, among the main subtypes of PWS and a control group.

Methods The sample consisted of 46 children divided into three groups: deletion (n = 10), maternal uniparental disomy (mUPD) (n = 13) and control (n = 23). The protocol included the Facially Expressed Emotion Labeling and the Deusto-e-Motion 1.0.

Results The control group recognised facial emotions more accurately and quickly in both non-contextualised and contextualised scenarios than children with PWS, regardless of genetic subtype. Despite no differences being detected between PWS subtypes when non-contextualised scenarios were analysed, in contextualised situations, a longer reaction time was observed in children with the mUPD subtype.

Conclusions This is the first study to assess the ability to recognise emotional facial expressions in contextualised situations among PWS subtypes and a control group. The findings suggest that some of the social cognitive deficits evidenced in children with mUPD PWS may be similar to those in autism spectrum disorder.

Keywords autism spectrum disorder, deletion, maternal uniparental disomy, Prader–Willi syndrome, recognition of emotional facial expression, social cognition

Introduction

The term Prader–Willi syndrome (PWS) was first described by Langdon Down in 1887 and subsequently by Drs Prader, Labhart and Willi in 1956 (Down 1887; Prader *et al.* 1956). It is a congenital disease that is generally caused by genetic changes in the 15q11-q13 region. Four genetic mechanisms are considered to cause the syndrome: deletion (DEL) (65–75%), maternal uniparental disomy (mUPD) (20–30%), imprinting centre defects (1–3%) and chromosomal translocation (0.1%) (Angulo *et al.* 2015; Butler *et al.* 2019). Worldwide, between 350 000 and 400 000 people are diagnosed with PWS (Heyman 2017), making it a rare disease. In Europe, the prevalence of PWS is estimated at 1:50 000 inhabitants, while the annual incidence is 1:30 000 births (Gwenaëlle & Maithé 2019).

Prader–Willi syndrome is characterised by a complex lifelong trajectory involving neurodevelopmental, nutritional, endocrine,

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metabolic and behavioural changes. The main symptoms are a narrow forehead, almond-shaped eyes, hypotonia, short stature and hypogonadism (Cassidy *et al.* 2012; Tauber & Hoybye 2021; Höybye & Tauber 2022). It is also characterised by specific hypothalamic dysfunction, including hyperphagia, satiety deficit, high risk of obesity and endocrine dysfunction (Miller *et al.* 2011; Tauber & Hoybye 2021). Individuals with PWS exhibit mild to moderate intellectual disability (ID) (average intelligence quotient (IQ) 60–70) comprising cognitive deficits, delayed motor and language development and learning deficits (Höybye & Tauber 2022). Behavioural traits including temper outbursts, anxiety, obsessive–compulsive symptoms and rigidity are also common (Tunnicliffe *et al.* 2014; Höybye & Tauber 2022).

Social cognition (SC) is a neuropsychological domain that is defined as the cognitive ability to adequately understand social situations and act accordingly (Henry *et al.* 2016). Current theoretical models propose two cognitive components of SC: recognition of emotional facial expression and theory of mind (ToM) (Happé & Frith 2014; de Mello *et al.* 2022).

Theory of mind is defined as a metacognitive and socioemotional process that enables an individual to understand one's own and others' emotions, beliefs and intentions (Premack & Woodruff 1978). Children with PWS have less developed social skills and often present difficulties in recognising and understanding affective information (Lo *et al.* 2013; Guinovart *et al.* 2019). They also have difficulties in understanding the point of view of others as they have an average delay in ToM (Guinovart *et al.* 2019).

Recognition of emotional facial expressions is a key component of SC (de Mello *et al.* 2022). The ability to interpret and respond appropriately to others' emotions is crucial for establishing adaptive interpersonal relationships in childhood (Fairchild *et al.* 2009; Dan 2020). Evidence supports that the inability to read facial expressions of emotion is an apparent SC deficit in people diagnosed with PWS. In fact, they make 10–20% more errors identifying and assigning emotions than the normotypic population (Dykens *et al.* 2019). Primarily, children with PWS present difficulties in facial recognition of negative emotions, such as sadness, anger and fear (Dykens *et al.* 2019).

Findings have demonstrated differences regarding social cognitive processes between the main subtypes of PWS (DEL and mUPD). Children with the DEL subtype have been found to score better on social skills than children with the mUPD subtype, who show greater mood fluctuations and an inability to control their emotions (Ogata *et al.* 2014). Children with the mUPD subtype present deficits in social cognitive functioning similar to children with autism spectrum disorder (ASD) (Dimitropoulos *et al.* 2019) and have an increased risk of presenting ASD traits compared with children with the DEL subtype (Hogart *et al.* 2010; Dimitropoulos *et al.* 2013). Furthermore, it has been shown that pretend play behaviour, which is closely related to socioemotional skills development, may also vary depending on genetic subtype, with children with mUPD subtype having a lower capacity to play than children with DEL subtype (Dimitropoulos *et al.* 2019).

So, given the literature on SC in PWS, we expect that the ability to recognise emotional facial expression also varies depending on the genetic subtype. Therefore, this study presents a comparative analysis of emotional facial expression recognition (in terms of both response accuracy and reaction time) among children with DEL and mUPD subtypes of PWS and a control group. To this end, we will analyse two scenarios: non-contextualised (correctly identifying a type of emotional facial expression) and contextualised (associating an emotional facial expression with a virtual reality interaction) scenarios. The control group is expected to obtain higher response accuracy and shorter reaction time than children with PWS. In terms of PWS subtypes, children with DEL PWS are expected to have higher response accuracy and shorter reaction time than children with mUPD PWS in emotional recognition.

Methods

Design

This study used an *ex post facto* comparative design among children with the DEL and mUPD subtypes of PWS and a control group.

Participants

The sample was composed of 46 boys and girls divided into three groups: DEL (n = 10), mUPD

(n = 13) and control (n = 23). There were no significant differences among the three groups in the age variable (H = 0.146; P = 0.930).

The clinical sample (n = 23) was composed of 16 boys (69.6%) and 7 girls (30.4%) diagnosed with PWS who were divided into two subgroups according to the genetic mechanism causing the syndrome. The subtype with DEL was composed of 9 boys (90%) and 1 girl (10%) whose ages range from 6 to 13 years (9.4 ± 2.2), while the subtype with mUPD was composed of 7 boys (53.8%) and 6 girls (46.2%) with ages ranging from 6 to 14 years (9.2 ± 2.4). Sociodemographic and clinical data for both subtypes are presented in Table 1.

Participants were recruited from different entities, including public child and adolescent mental health centres and associations of affected persons in Spain. They were selected according to the following inclusion criteria: (1) diagnosis of PWS; (2) verbal language abilities (speaking, listening, reading and writing skills); and (3) familiarity with computer usage. Exclusion criteria were as follows: (1) ages not included between 6 and 14 years; (2) diagnosis of psychotic disorders; (3) severe neurological symptoms preventing the correct application of the tests; (4) lack of language skills; and (5) refusal to participate in the study.

The control group consisted of 14 healthy boys (60.9%) and 9 healthy girls (39.1%) aged 8 to 12 years (9.26 ± 1.1). This is a baseline sample. Participants were randomly selected from a database previously carried out by the research team. In the initial sample collection study, the inclusion criteria were as follows: (1) cognitive development according to their developmental stage; (2) compulsory schooling; (3) third to sixth grade of primary education; and (4)

Table 1 Sociodemographic and clinical characteristics of the sample with PWS

	DEL (n = 10)	**mUPD (n = 13)**		
	M ± SD ***n* (%)**	**M ± SD** ***n* (%)**	***U*** χ^2	***P***
Age (years)	9.4 ± 2.2	9.2 ± 2.4	57.000	0.648
Sex			3.489	0.062
Male	9 (90%)	7 (53.8%)		
Female	1 (10%)	6 (46.2%)		
Academic year			2.383	0.881
1st of PE	2 (20%)	3 (23.1%)		
2nd of PE	2 (20%)	3 (23.1%)		
3rd of PE	2 (20%)	1 (7.7%)		
4th of PE	3 (30%)	3 (23.1%)		
5th of PE	0 (0%)	1 (7.7%)		
6th of PE	0 (0%)	1 (7.7%)		
1st of SE	0 (0%)	0 (0%)		
2nd of SE	1 (10%)	1 (7.7%)		
Type of education			2.253	0.133
Normotypic education	3 (30%)	8 (61.5%)		
Special education	7 (70%)	5 (38.5%)		
Treatment				
Growth hormone	10 (100%)	13 (100%)		
Endocrinology	10 (100%)	13 (100%)		
Nutrition	10 (100%)	13 (100%)		
Psychology	7 (70%)	10 (76.9%)	0.140	0.708
Speech therapy	8 (80%)	11 (84.6%)	0.084	0.772
Physiotherapy	5 (50%)	8 (61.5%)	0.306	0.580

%, percentage of participants; DEL, deletion; M, mean; mUPD, maternal uniparental disomy; *n*, number of participants; PE, primary education; SD, standard deviation; SE, secondary education; *U*, Mann–Whitney *U*-test.

proficiency in computer usage. Exclusion criteria were as follows: (1) diagnosis of psychiatric disorder; (2) presence of ID (IQ < 70); (3) being in psychiatric or psychological treatment; and (4) refusal to participate in the study.

Instruments and variables

Facially Expressed Emotion Labeling (Kessler et al. 2002)

The Facially Expressed Emotion Labeling (FEEL) assesses the ability to recognise basic emotions through the static facial expressions of 42 men and women. The administration of the test begins with the presentation of a pretest of six images, in which they are informed whether or not the response is correct and the time spent. During the execution of the test, the participant observes a neutral facial expression for 1.5 s, followed by an image with the emotional facial expression to be answered presented for 300 ms. The drop-down list of options is as follows: joy, surprise, fear, sadness, disgust and anger. The sequence of images for each trial is determined by a random generator to avoid a sequence effect. The test measures both response accuracy and reaction time (Kessler *et al.* 2002). The test has been administered to more than 400 participants, obtaining a reliability coefficient of 0.77 (Lázaro *et al.* 2019). In the study, the test corresponds to the non-contextualised scenario type, as the participant only has to correctly identify the type of emotional facial expression.

Deusto-e-Motion 1.0 (Amayra et al. 2015)

The Deusto-e-Motion 1.0 analyses the following variables: recognition of static and dynamic emotional expressions, empathic response to static and dynamic contextualised stimuli, and reaction time in milliseconds. This is a virtual reality (computer) program in which the children directly respond by using arrows (up–down or left–right) and the A key (to confirm). It begins with a baseline consisting of a laterisation exercise and an eye fixation test whose purpose is to focus the child's attention and familiarise him or her with the tool. It is composed of three blocks: (1) 14 items of static emotional expressions, in which the emotional expression to be guessed appears directly, and 10 items of dynamic emotional expressions, in which a neutral expression appears first and then changes to the emotional expression to be indicated; (2) 6 static scenarios with emotional content related to different social situations, in which the child must indicate the emotion he or she and other characters in the scene would feel [example scene: image of a group of friends celebrating a birthday party (question posed to the participant: imagine that it is your birthday and you get an unexpected party: 'What emotion would you feel?' and 'What emotion would your friends feel?')]; and (3) 24 social situations that simulate the school playground in which the child must indicate his or her own emotions and those of the characters involved [example item: a child wants to play, but he or she is in a wheelchair; one of the children playing wonders how he or she is going to play if he or she is in a wheelchair (question asked to the participant: 'What emotion will the child in the wheelchair feel if he/she cannot play?' and 'What do you feel?')]. The drop-down list of options in all of them is as follows: joy, surprise, fear, anger, disgust, sadness and no emotion. It is estimated to last approximately 15–20 min. Block 1 corresponds to the non-contextualised scenario type, because the participant must correctly identify a type of emotional facial expression, while blocks 2 and 3 correspond to the contextualised scenario, where the child must associate an emotional facial expression with a virtual reality interaction situation. In relation to reliability, medium and high levels were found in emotional facial recognition (0.63) and in reaction time in emotional facial recognition (0.84) and in virtual scenarios (0.86) (Amayra *et al.* 2015; Lázaro *et al.* 2020).

Procedure

In the case of the clinical sample, the psychologist of the association or the child psychiatrist of the mental health centre was contacted by telephone. An informative letter about the study was sent by e-mail to the families. After obtaining their consent, informed consent forms were sent and evaluation dates were agreed. On the day of evaluation, families provided the informed consent in compliance with the Psychologist's Code of Ethics and Organic Law 15/1999 of 13 December, which pertains to the protection of personal data. Afterwards, a brief initial interview was conducted with the parents or guardians to collect sociodemographic and clinical data about the children. Subsequently, the evaluation of children began with the administration of the FEEL and Deusto-e-Motion 1.0 tools.

The control group is a reference sample. The control participants were not recruited specifically for the study. They were drawn from a sample of more than 1700 students from public and private schools in the Basque Country (Spain) who were previously tested with FEEL and Deusto-e-Motion 1.0 tools by our research team.

The study was conducted in accordance with the ethical principles established by the Declaration of Helsinki and approved by the Research Ethics Committee of the University of Deusto (ref. ETK-16/22-23).

Statistical analysis

First, the normal distribution of all numerical variables in the sample was analysed using the Kolmogorov–Smirnov test.

Then, descriptive statistics and frequencies were calculated for sociodemographic and clinical data. To examine the differences between the main two subtypes of PWS in sociodemographic and clinical data, chi-squared test (χ^2) and Mann–Whitney *U*-test were used for categorical and quantitative variables, respectively.

Finally, the non-parametric Kruskal–Wallis test was used to analyse the differences among the three groups in the quantitative variables of response accuracy (total correct answer) in emotional recognition through facial expression in non-contextualised scenarios and reaction time to said stimuli and before the contextualised variables. Simultaneously, a Kruskal–Wallis Bonferroni *post hoc* analysis was performed to determine between which two groups the differences were found. The η^2 was calculated to measure the effect size, where $\eta^2 = 0.04$ is considered minimum necessary, $\eta^2 = 0.25$ moderate and $\eta^2 = 0.64$ strong (Ferguson 2009).

All statistical analyses were conducted using IBM SPSS STATISTICS version 28.0.0.0 (190) for Windows. A *P* value less than or equal to 0.05 was considered significant for a confidence level of 95%.

Results

The results of the study indicate the statistically significant differences obtained among a control group and two subtypes of PWS, DEL and mUPD, in the variables of emotional facial expression recognition in non-contextualised (correctly identifying a type of emotional facial expression) and contextualised (relating an emotional facial expression to a virtual reality interaction situation) scenarios.

Emotional facial expression recognition variables in non-contextualised scenarios

Kruskal–Wallis analysis showed statistically significant differences among the three study groups tested with the Deusto-e-Motion 1.0 virtual tool (block 1) in both response accuracy and reaction time. The Bonferroni *post hoc* analysis showed that the control group presented a greater response accuracy in the emotion of fear than the DEL group and a shorter reaction time than the mUPD group in static faces, fear, surprise and disgust. However, no statistically significant differences were found between PWS subtypes (Table 2).

Similarly, the FEEL test showed that significant differences in accuracy and response time were observed among all groups. The Kruskal–Wallis Bonferroni *post hoc* analysis revealed that the control group had higher response accuracy levels in the emotions of fear, surprise, disgust and total hits and shorter reaction time in every emotion compared with both PWS subtypes. However, no significant differences were found between PWS subtypes either (Table 3).

Emotional facial expression recognition variables in contextualised scenarios

Likewise, significant differences were found in the reaction time of some contextualised emotion items of the Deusto-e-Motion 1.0 (blocks 2 and 3) among all groups. Specifically, Bonferroni *post hoc* analysis revealed a shorter reaction time of the control group compared with both PWS subtypes and a shorter reaction time between DEL and mUPD in some contextualised situations (Table 4).

Table 2 Response accuracy and reaction time of block 1 of the Deusto-e-Motion 1.0 (non-contextualised scenarios) with statistically significant pairwise differences

	Emotion	Control (n = 23) M ± SD	DEL (n = 10) M ± SD	mUPD (n = 13) M ± SD	H	η^2	P Bonferroni	*Post hoc*
Response accuracy	Fear	1.57 ± 0.84	0.50 ± 0.85	0.85 ± 0.89	10.141	0.189	0.010	Control > DEL
Reaction time	Static faces	5885.98 ± 1273.59	7774.23 ± 3321.79	8311.38 ± 3157.27	7.060	0.118	0.035	Control < mUPD
	Fear	7620.24 ± 8330.34	7237.30 ± 2147.64	9260.03 ± 3332.03	9.184	0.167	0.010	Control < mUPD
	Surprise	5709.14 ± 2548.21	8033.41 ± 4950.11	9299.45 ± 3538.15	10.952	0.208	0.003	Control < mUPD
	Disgust	6655.88 ± 7059.91	9206.64 ± 7788.08	10 579.47 ± 5198.52	6.450	0.103	0.033	Control < mUPD

DEL, deletion; H, Kruskal–Wallis test; M, mean; mUPD, maternal uniparental disomy; n, number of participants; P Bonferroni, significance values adjusted by Bonferroni correction; SD, standard deviation; η^2, (eta squared) effect size.

Discussion

The main results of the study show that the control group recognises facial emotions more accurately and faster, in both non-contextualised and contextualised scenarios, than children with PWS, regardless of the genetic subtype. These results are consistent with some findings that prove the inability to read facial expression of emotion as an apparent SC deficit in individuals with PWS (Dykens *et al.* 2019).

Analysing the specific subtypes of PWS, the study concludes that no statistically significant differences exist between DEL and mUPD subtypes in response accuracy and reaction time in the recognition of emotional facial expression in non-contextualised scenarios. The results match with those found by Whittington & Holland (2011), who found no differences between subtypes in the processing of emotional content, either in the recognition of each emotion represented or in general. However, they observed that socialisation and age had a predictive impact on emotional recognition in children with the mUPD subtype, whereas this predictive nature proved insignificant for children with the DEL subtype. Key *et al.* (2013) also found no differences in accuracy and reaction time when children with DEL and mUPD subtypes performed the task of detecting positive facial expressions among negative ones. Similarly, facial discrimination studies in PWS also found no significant differences by genetic subtypes (Halit *et al.* 2008; Feldman & Dimitropoulos 2014).

Strikingly, the results of our study rejected the initial hypothesis that children with DEL PWS have higher response accuracy and shorter reaction time than children with mUPD PWS in emotional recognition of non-contextualised scenarios. Results may be due to the small sample size or limited power of the study. While it is true that between genetic subtypes we did not find statistically significant differences in the sociodemographic and clinical variables assessed, these may not be as influential on the performance of the measure as the participant's cognitive ability or clinical presentation. Whittington & Holland (2011) observed that the IQ of children with PWS correlated significantly with more accurate scores on emotional recognition. They also found a strong tendency for children with PWS who had been clinically depressed to have difficulties in recognising the emotion of fear and in those who had psychotic episodes to recognise anger. Thus, future research should take these considerations into account and include larger sample sizes and more clinical and cognitive data from participants in order to make the results representative and generalisable to the PWS population.

When it comes to contextualised scenarios, a significantly longer reaction time was observed for the subtype with mUPD compared with the subtype with DEL in situations of illicit behaviour, unexpected event and frustration tolerance. Thus, it seems that children with the mUPD subtype present greater reaction times in items that assess cognitive empathy,

Table 3 Response accuracy and reaction time of the FEEL tool (non-contextualised scenarios) with statistically significant differences by pairs

	Emotion	Control (n = 23) M ± SD	DEL (n = 10) M ± SD	mUPD (n = 13) M ± SD	H	η^2	P Bonferroni	*Post hoc*
Response accuracy	Total	31.45 ± 5.33	21.31 ± 6.82	21.31 ± 7.13	20.186	0.423	0.001	Control > DEL
							0.000	Control > mUPD
	Fear	4.22 ± 1.91	3.00 ± 1.63	2.62 ± 1.71	6.989	0.116	0.041	Control > mUPD
	Surprise	5.83 ± 1.53	3.20 ± 1.75	2.46 ± 1.66	22.403	0.474	0.000	Control > mUPD
							0.003	Control > DEL
	Disgust	5.04 ± 2.16	1.70 ± 1.34	1.92 ± 1.49	19.045	0.396	0.001	Control > DEL
							0.001	Control > mUPD
Reaction time	Fear	4165.16 ± 2751.04	8372.38 ± 1704.26	16 806.35 ± 29 824.16	25.305	0.542	0.001	Control < DEL
							0.000	Control < mUPD
	Joy	3977.15 ± 7314.46	4148.79 ± 751.59	11 223.74 ± 22 335.82	19.012	0.396	0.012	Control < DEL
							0.000	Control < mUPD
	Surprise	3300.56 ± 1396.47	13 087.49 ± 13 246.92	10 165.27 ± 8410.23	31.130	0.678	0.000	Control < mUPD
							0.000	Control < DEL
	Disgust	3427.45 ± 1903.11	8656.13 ± 2076.51	9391.66 ± 3063.60	29.622	0.642	0.000	Control < DEL
							0.000	Control < mUPD
	Sadness	3370.53 ± 1341.06	6250.39 ± 2158.89	7547.64 ± 4052.66	22.987	0.488	0.002	Control < DEL
							0.000	Control < mUPD
	Anger	3852.25 ± 1522.92	7901.46 ± 2408.44	9209.47 ± 5604.63	28.228	0.610	0.000	Control < DEL
							0.000	Control < mUPD
	Total	3432.56 ± 1378.94	8085.49 ± 2264.13	10 703.50 ± 12 015.21	30.311	0.658	0.000	Control < mUPD
							0.000	Control < DEL

DEL, deletion; FEEL, Facially Expressed Emotion Labeling; H, Kruskal–Wallis test; M, mean; mUPD, maternal uniparental disomy; n, number of participants; P Bonferroni, significance values adjusted by Bonferroni correction; SD, standard deviation; η^2, (eta squared) effect size.

Table 4 Response time of blocks 2 and 3 of the Deusto-e-Motion 1.0 (contextualised scenarios) with statistically significant differences by pairs

Items	Descriptor of the contextual scene	*H*	η^2	*P* Bonferroni	*Post hoc*
9.1	Unlawful conduct situation	7.094	0.118	0.041	DEL < mUPD
10.2	Unexpected event situation	9.013	0.163	0.008	DEL < mUPD
12	Situation of social inclusion of people with functional diversity	23.053	0.490	0.001	Control < DEL
				0.001	Control < mUPD
14.1	Situation of social exclusion of people with functional diversity	7.628	0.131	0.023	Control < DEL
14.2	Situation of social exclusion of people with functional diversity	19.155	0.399	0.001	Control < DEL
				0.001	Control < mUPD
14.3	Situation of social exclusion of people with functional diversity	10.179	0.190	0.008	Control < DEL
19.1	Frustration tolerance	13.427	0.266	0.003	Control < DEL
				0.025	Control < mUPD
22.1	Situation of interpersonal conflict	9.406	0.172	0.016	Control < mUPD
22.2	Situation of interpersonal conflict	7.521	0.128	0.029	Control < DEL
23.2	Sharing situation	6.948	0.115	0.027	Control < DEL
26	Frustration tolerance	9.165	0.167	0.025	Control < DEL
				0.015	DEL < mUPD

DEL, deletion; *H*, Kruskal–Wallis test; mUPD, maternal uniparental disomy; *P* Bonferroni, significance values adjusted by Bonferroni correction; η^2, (eta squared) effect size.

which require more complex mentalisation skills than items referring to the emotion itself. This could be due to the higher propensity of presenting ASD traits in children with mUPD PWS (Hogart *et al.* 2010; Dimitropoulos *et al.* 2019). In fact, children with mUPD PWS score similarly to children with ASD in domains of SC, communication and motivation (Dimitropoulos *et al.* 2013).

Lázaro *et al.* (2019) presented the validation of the FEEL test in a Spanish sample of healthy children and children with attention-deficit hyperactivity disorder (ADHD) aged 8–11 years. The results of the study supported the evidence that the FEEL test is a valid and reliable tool for assessing the ability to recognise facial expressions in children. The study showed significant differences by age and gender in response accuracy and reaction time and possible deficits in social skills within the ADHD. In a subsequent study, Lázaro *et al.* (2020) validated the Deusto-e-Motion 1.0 instrument in a sample of healthy children aged 8–12 years. The results supported the suitability of the test for the assessment of emotional facial expression recognition and social skills in children. In addition, the Deusto-e-Motion 1.0 showed concurrent validity with the FEEL face recognition test.

Recently, some studies have been carried out using the FEEL and Deusto-e-Motion 1.0 instruments as a measure to assess the socioemotional functioning of children with neurodevelopmental disorders. Oliva-Macías *et al.* (2018) compared the ability to recognise emotional facial expressions between children with ADHD and a control group. The results indicated statistically significant differences in the recognition of dynamic facial expressions in both non-contextualised and contextualised scenarios. However, no significant differences were found in the recognition of static facial expressions. Perosanz *et al.* (2024) conducted a comparative analysis of emotional facial expression recognition and empathy in children with PWS and ASD and a control group. The results showed that children with PWS had a lower response accuracy in emotional facial expression recognition and empathy than the control group. Longer reaction times were also found in both clinical groups (PWS and ASD) versus the control.

Regarding limitations, it should be noted that the FEEL and Deusto-e-Motion 1.0 tools have not been validated in the population with IDs or borderline IQ. Likewise, it is important to note the small sample size and limited power of the study. In addition, cognition ability was not assessed for any of the participants. However, the control group developed according to their developmental stage, whereas children with PWS, being clinically diagnosed, necessarily had to have mild to moderate ID (Höybye & Tauber 2022). Considering the clinical sample, it should be mentioned that only children with the DEL and mUPD subtypes of PWS were included, so it would be interesting to include all genetic subtypes in future studies. Regarding gender, the control and DEL groups were predominantly male, whereas the subtype with mUPD had a more balanced gender. However, no gender differences in response accuracy in emotional facial recognition have been reported in other studies (Godard & Fiori 2010). Regarding age, the control group was composed of children aged 8–12 years, while the PWS sample consisted of children aged 6–14 years. Nevertheless, it is important to note that no significant differences were found in the age variable among the three study groups. In fact, individuals with PWS have an atypical developmental trajectory in emotional recognition (Dykens *et al.* 2019), so older children do not necessarily perform better than younger ones.

In summary, it appears that the inability to recognise emotional facial expressions is an apparent SC deficit in individuals with PWS, which likely contributes to the difficulty they have in relating to typically developing peers. Surprisingly, the results of this study evidenced that specific emotion recognition is not related to genetic subtype when it comes to non-contextualised scenarios. Nevertheless, in contextualised situations, differences were found between genetic subtypes in reaction time. In fact, a longer reaction time was observed in children with the mUPD subtype, which could be due to the fact that they behave more similarly to children with ASD, as they have a higher risk of presenting ASD traits than the DEL subtype.

Thus, some of the social cognitive deficits evidenced in children with mUPD PWS may be similar to those of ASD, which appears to contribute difficulty in relating to peers. Despite recent findings suggesting a lower prevalence of ASD in the PWS population (12.3% versus previous findings of 25–41%), a large proportion of children with PWS still present significant difficulties in social interactions, conditioning their daily functioning and subsequent development (Bennett *et al.* 2017; Dykens *et al.* 2017). Therefore, further studies analysing the social cognitive ability of PWS children, focusing on the different genetic subtypes in early stages, are needed in order to improve their quality of life and social development.

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Conflict of Interest

The authors declared that they had no conflicts of interest.

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Ethics Statement

The study was approved by the Research Ethics Committee of the University of Deusto (ref. ETK-16/22-23) and was conducted in accordance with the ethical principles established by the Declaration of Helsinki. Written informed consent was obtained from all parents or legal guardians of study participants.

Data Availability Statement

The data sets generated and analysed during the present study are not publicly available because they belong to the University of Deusto, but are available from the corresponding author upon reasonable request.

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