Vertigo in children through drawing: an archetype?

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Abstract
The aim of this study is to evaluate whether drawing can be considered a complementary tool to identify the type of vertigo in children with balance disorders. The present study is based on the psycho-pedagogical analysis and parallel comparison of drawings made by pediatric patients, evaluated for balance disorders and collected in 15 years in three different Italian specialistic ambulatories (Audiology Department of Palermo, ENT Department - ASST Spedali Civili of Brescia, San Bernardino Outpatient Clinic of Salò). A total of 275 children's drawings were collected and analyzed by two expert otoneurologists and two expert psycho-pedagogists in children with vestibular rotational vertigo (Benign Paroxysmal Positional Vertigo – BPPV; Acute unilateral Vestibular Loss – AUVL), migraine-related vertigo (Benign Paroxysmal Vertigo of Childhood - BPVC; Vestibular Migraine - VM) and psychogenic vertigo (Persistent Postural Perceptual Dizziness – PPPD). Correlations between graphic characteristics of drawings for each group of children were made. A close relationship between type of drawings' graphic elements and clinical pictures was found, suggesting an unconscious and innate stereotyped archetype of children in representing their balance disturbances: Group 1 children diagnosed as rotatory vertigo (BPPV, AUVL) always draw themselves or arrows, and a clear perception of movement is perceived. Group 2 children, affected by migraine-related disorders (BPVC, MV), always draw closed circles, spirals or spots, representing their disabling symptom. In the Group 3 children (PPPD), no clear matter in their drawings was identified and they were always clinically diagnosed with psychogenic dysfunction or with a mix of other disorders (ocular, dental, hypotensive, metabolic, orthopedic, etc.). Drawing of dizzy children represents an interesting tool for diagnostic purposes in the pediatric vestibular field, laying the foundations for future more targeted treatments in the psycho-pedagogical field, in light of the scarcity of scientific evidence published on the topic.

Keywords: *Paediatric vertigo, paediatric dizziness, children balance disorders, drawing children, drawing vertigo.*

Abbreviations

ASST: Azienda Socio Sanitaria Territoriale
AUVL: Acute Unilateral Vestibular Loss
BPPV: Benign Paroxysmal Positional Vertigo
BPVC: Benign Paroxysmal Vertigo of Childhood
CNS: Central Nervous System
ENT: Ear Nose and Throat
MV: Migraine Vertigo
PNS: Peripheric Nervous System
PPPD: Persistent Postural Perceptual Dizziness
VEMPS: Vestibular Evoked Myogenic Potentials
VHIT: Video head Impulse Test

Introduction

Balance disorders in children are not uncommon, with a prevalence ranging from 10% to 15% in most clinical trials (Tusa et

al., 1994; Wiener-Vacher et al., 1998; Riina et al., 2005; Erbek et al., 2006; Balatsouras et al., 2007; Wiener-Vacher et al., 2008; Jahn et al., 2009; Szirmai et al., 2010; McCaslin et al., 2011; Humpriss et al., 2011; O'Reilly et al., 2011; Gruber et al., 2012; Gioacchini et al., 2014; Jahn et al., 2015; Davitt et al., 2017; Balzanelli et al, 2021), and sometimes a hearing dysfunction is associated (Rine et al., 2004; Suarez et al., 2007; Rine et al., 2013; Fernandes et al., 2015). One of the main difficulties in performing vestibular diagnostic assessment in pediatric age is cooperation and involvement of the young patient, worsened by his/her poor descriptive ability, the confusion between vertigo and fear, the easy distraction (Düwel et al., 2002; Niemensivu et al., 2007). Furthermore, the overpowering action of the parents is sometimes disturbing.

During the data collection of the past and present clinical history, the child often freezes, and during the clinical evaluation he lets him/herself fall to the ground refusing to cooperate, asks his/her parents to go home, cries and does not cooperate. It is therefore crucial to involve the child in the various activities proposed, possibly in a playful form, informing the parents in advance (D'Agostino et al., 1997; Crunkhorn et al., 2023).

The causes of the reported data regarding balance disorders in children is highly variable, due to the different functional capacities of the growing visual, vestibular or proprioceptive-somesthetic system, or to syndromic or non-syndromic genetic-hereditary alterations, with developmental abnormalities of the central nervous system (CNS) or peripheral nervous system (PNS) (Heidegger et al., 1957), but vestibular migraine is certainly one of the most frequent in all age groups (Weisleder et al., 2001; Pagnini et al., 2003; Batson et al., 2004; Erbek et al., 2006; Marcelli et al., 2006; Balatsouras et al., 2007; Strupp et al., 2010; Lempert et al., 2012; Langhagen et al., 2013; Gioacchini et al., 2014; Balzanelli et al., 2021;). Based on the review by Davitt et al. in 2017, BPVC and VM constitute about 37.5% of the causes of vertigo in children. Idiopathic causes account for 11.7% of cases, followed by AUVL (vestibular labyrinthitis/neuritis), post-traumatic vertigo, orthostatic hypotension/syncope, and PPPD. Meniere disease, neurological, otolithic, upper respiratory and middle ear infections are less frequent (Table I) (Rodgers et al., 1997; Akagi et al., 2001; Aust et al., 2005; Davitt et al., 2017). The great variety of vertigo clinical pictures justify a multi-specialistic diagnostic approach, involving otoneurologists, neuropsychiatrists, psychologists, cardiologists, internists, geneticists, orthopaedists, physiatrists, ophthalmologists, dental gnathologists, etc. (Redfern et al., 2001). The general otorhinolaryngological evaluation and the audiological framework are followed by a complete age-related neurotological "bedside" clinical examination and by an instrumental vestibular examination (D'agostino et al., 1997; Wiener-Vacher et al., 2001; Balzanelli et al., 2021; Crunkhorn et al., 2023). Only in cases where vestibular investigations are negative, targeted neuroradiological evaluations will be scheduled (Anoh-Tanon et al., 2000). To collect reliable data, it is essential that the child feels comfortable in the ambulatory room. The use of toys, pencils, balls, dolls, micromachines, etc. and dedicated staff serve to obtain reliable diagnostic investigations. In addition, it is necessary to gain his/her trust: one of the most effective methods is to let him/her draw, taking advantage of the moment to explain to the parents the type and results of the tests performed (Riedel et al., 1998; Uzunboylinu et al., 2017).

Early and appropriate diagnosis of a balance dysfunction in the pediatrics is difficult, but it should be considered that a misdiagnosis could lead the young patient to disturbances of the entire subsequent psychophysical development, sometimes with irreversible cognitive and behavioural repercussions during growth and maturation (Cumberworth et al., 2007; O'Reilly et al., 2011; Srivastava et al, 2011; Van Hecke et al., 2019; Božanic et al., 2024). Non-specific symptoms and signs such as poor attention, distraction, listlessness, sleep or memory disorders, social isolation, difficulty read-

ing and writing, delayed learning to walk or ride a bike can be early warning signs (Wiener-Vacher et al., 1997; Wiener-Vacher et al., 1998; Van Hecke et al., 2019; Wiener-Vacher et al., 2013). The interpretation of a drawing could therefore represent an additional quick and effective complementary method of diagnostic orientation (Heiddeger et al., 1957). The language of images represents one of the most personal and archaic forms of human language: as allegorical systems, images express different perspectives on reality (Riedel, 1998). When a child draws, he/she represents his/her inner world in that moment and in that situation, and we have the opportunity to grasp the psycho-physical and non-verbal relational message he/she unconsciously transmits to us, as it were an archetype (Jung, 1981; Uzunboylu et al., 2017).

The aim of the study was to verify whether the psycho-pedagogical analysis of the graphic representation through drawings of vertigo in children can really represent a diagnostic integration tool in the overall assessment of paediatric balance disorders. The task requested to the child was: *"draw your vertigo"*. The drawings produced by the dizzy children from various clinical forms of vertigo, were collected in Italy at the Audiology Department of Palermo, ENT Department - ASST Spedali Civili of Brescia, and San Bernardino Outpatient Clinic of Salò, in order to analyze their contents and identify any correlations with the type of vertigo.

There are very few published scientific reports in which the representation of one's disorder by drawing is considered for the purposes of clinical investigation in pediatrics. Recently, Ferro F. et al carried out a narrative review on the topic, in relation to headache, emphasizing its clinical usefulness in the diagnosis and management of migraine children, with evidence of a close correlation between graphic representations and clinical diagnosis, underlying an accuracy of 80% (15). Stafstrom C.E. et al, in a previous study, identified how the type of pattern represented by migraine children even facilitates the differential diagnosis of the various forms of headache (Strafstrom et al., 2002).

To the best of our knowledge, our report is the first to describe the relationship between the graphic features of dizzy children's drawings and their relationships to different types of balance disorders, and we hypothesize an unconscious, innate and stereotyped archetype of representation by drawings of their balance disorder, based on Jung's theories (Jung, 1981).

Materials and Methods

A total of 275 children aged between 2 and 14 years were included in the study, evaluated in three different health facilities in the period 01/01/2010 - 30/06/2025: Audiology Department of Palermo (01/01/2010-31/12/2015), ENT Department - ASST Spedali Civili of Brescia (01/01/2010-30/06/2019) and San Bernardino Outpatient Clinic (01/01/2020-30/06/2025). All children were affected by vertiginous symptoms and in all cases an informed consent was obtained from the parents. The authorization of the Ethics Committee the ASST Spedali Civili di Brescia was obtained in 2019 (protocol number 83787). Some children initially enrolled were not included in the study, because they were unavailable to draw (due to excessive sickness or lack of cooperation).

After complete diagnostic assessment (bedside and instrumental audio-vestibular testing, by means of Video-Nystagmoscopy - VNS, Video Head Impulse Testing - VHIT, Vestibular Evoked Myogenic Potentials - VEMPS) and multi-specialistic or radiologic assessment, if requested, three groups of patients were identified:

- Group 1: Patients suffering from rotatory vertigo, such as BPPV and AUVL;
- Group 2: patients suffering from non-rotatory and migraine-related vertigo, such as BPVC and MV;
- Group 3: patients suffering from psychogenic disorders (PPPD) or a mix of other forms of non-rotatory dizziness (ocular, dental, metabolic, orthopedic disorder, etc).

Each patient of Groups 1, 2 and 3 was asked to make a drawing with the following task: *"draw your vertigo",* in the presence of the otoneurologist and parents. The collected drawings were then submitted to the attention of two expert psycho-pedagogists, not informed about the clinical diagnosis, with the aim of identify any possible unifying graphic features of drawings.

This work was carried out taking into account only the graphic elements of the drawings, but any further hypothesis regarding the personality, emotional/family/affective/scholastic situation of the child involved was left out, not being the topic of this work and requiring further specific evaluation criteria (Table II) (Riedel, 1998). The data were obtained separately at the Audiology Department of Palermo, at the ENT Department - ASST Spedali Civili of Brescia, and at the San Bernardino Outpatient Clinic of Salò and were subsequently related to each other, in order to confirm or exclude a common link.

• Vestibular Migraine	23,8%
• BPVC	13,7%
• Idiopatic	11,7%
• AUVL	8.47%
• Psychogenic (PPPD)	6,27%
• BPPV	2,64%
• Other *(epilepsy, effusive otitis syncope/orthostatic hypotension, ocular/dental/orthopedic/methabolic disorder)*	19,15%

Table I – Epidemiological data concerning balance disorders in children (Fernandes et al., 2015).

- *Occupying space on the sheet*
- *Characteristics of the graphic tract (pen grip, pressure, shape, starting point, composition, size, ligaments, shading, transparency)*
- *Material used (pen, pencil, sheet)*
- *Human Figure Drawing*
- *Tree/house/family drawing*
- *Use and choice of colors*
- *Color symbolism*
- *Succession of the represented figures*
- *Child's expression and/or attitude during graphic expression*
- *Comparison between figures*
- *Size/placement of the figure in relation to the sheet*
- *Dynamism and movement (arrows, inclination of the body axis or objects)*
- *Schematization / stylization of the represented figure (lines / spirals / objects)*
- *Presentation (front / profile / back)*
- *Acclimatization*
- *Omissions*

Table II – Characteristics of the drawing taken into consideration in a psycho-pedagogical analysis (Riedel, 1998).

Results

Our sample included 275 children aged between 2 and 14 years (average 8.6 years), suffering from balance disorders. The psycho-pedagogical analysis of the drawings obtained from the patients of Group 1, 2 and 3, allowed the identification of some common graphic characteristics that are Group-specific (Figures 1, 2, 3; Table III). By associating each individual drawing with the respective clinical diagnosis previous-

ly identified, a surprising correspondence was found (Table III, IV):

- children belonging to Group 1, who suffer from rotational vertigo and/or nausea/vomiting, as in the case of BPPV or AUVL always represent themselves sick or the surrounding environment full of arrows or images of movement;
- children belonging to Group 2, suffering from BPVC or MV, produce drawings that indicate their disorder and their disabling symptom, with closed, concentric, spiral spots and scribble-like lines;
- children belonging to Group 3, suffering from PPPD or a miscellany of other diseases, draw non-specific images.

Group 1	• *The child almost always represents himself* • *It also often represents the environment in which the vertiginous episode occurs* • *Unstable body axis, often deviated to one side* • *In the drawing pervades a clear sensation of movement (lines of movement, arrows, perception of the moving environment)* • *The graphic stroke is decisive and light colors are often used*
Group 2	• *The child tends to draw his own disorder, not himself* • *If the patient represents himself, he is put inside within concentric, spiral-shaped or closed lines* • *The vestibular migraine attack is represented as an impending external "somatomorphic" entity* • *Something overpowering occurs independently of the patient's wishes and cannot escape* • *Closed lines and dark colors (especially blue) pervade the entire design* • *Drawings clearly suggests the patient's feeling of oppression and helplessness*
Group 3	• *Description of non-specific disorders* • *History of numerous multi-specialist evaluations, always negative* • *Medical history collection influenced by the presence of the parent who overpowers the child* • *Frequent family problems (parents, siblings) or relational problems (bullying)* • *Children often nervous and anxious* • *Perception of a discomfort that the child tries to communicate (completely random and non-specific representation of everyday or environmental situations)*

Table III – Psycho-pedagogical subdivision of the drawings into 3 groups with constant and common characteristics.

Group 1	*Drawings of patients diagnosed with rotational vertigo, such as Acute Unilateral Vestibular Loss (AUVL) and Benign Paroxysmal Positional Vertigo (BPPV)*
Group 2	*Drawings of patients diagnosed with vestibular migraine (VM) and Benign paroxysmal vertigo of childhood (BPVC)*
Group 3	*Drawings of patients with psychogenic vertigo (PPPD) and a miscellany of other minor causes, including otitis with effusion, epilepsy, visual, dental, metabolic, orthopedic disorders, orthostatic hypotension, trauma, viral infections*

Table IV **-** *Correspondence between psycho-pedagogical subdivision of drawings and clinical diagnosis.*

These findings, with stereotyped graphic characteristics for each clinical group (Figures 2,3,4) obtained separately in three different health facilities distant from each other (Palermo, Brescia, Salò), were completely overlapping (Figure 4).

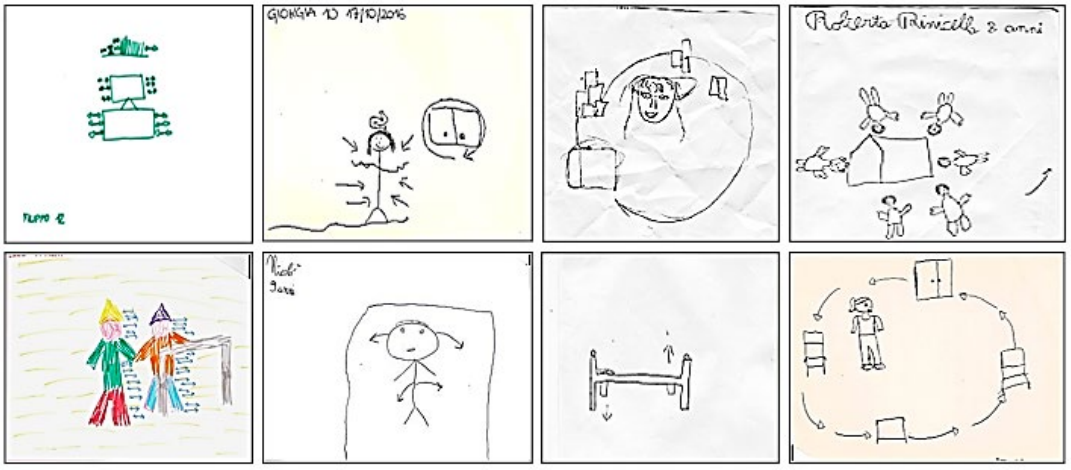


*Figure 1 – Group 1: Drawings of children with rotatory vertigo (BPPV, AUVL). **

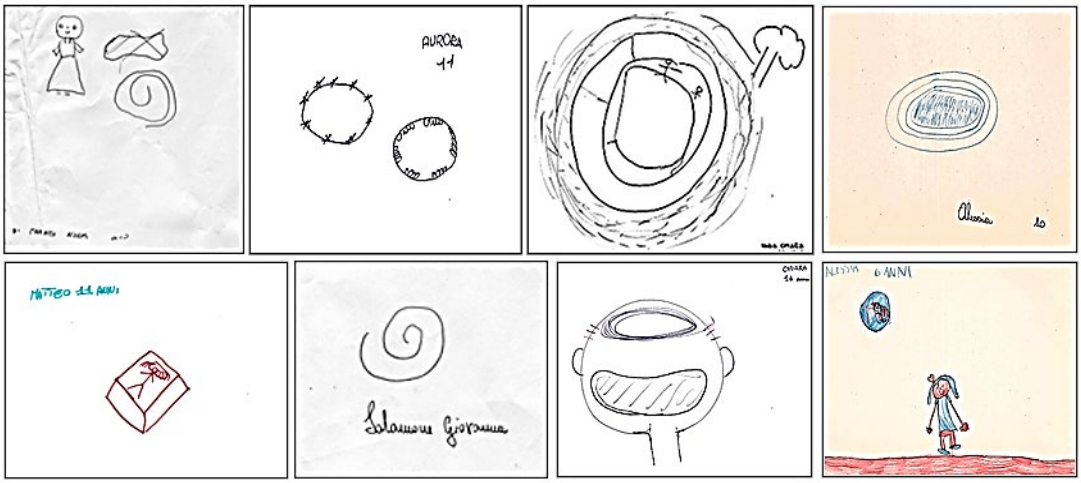


*Figure 2 – Group 2: Drawings of children with migraine-related vertigo (BPVC, VM). **



*Figure 3 – Group 3: drawings of children suffering from psychogenic disturbances (PPPD) or miscellaneous of other disorders.**

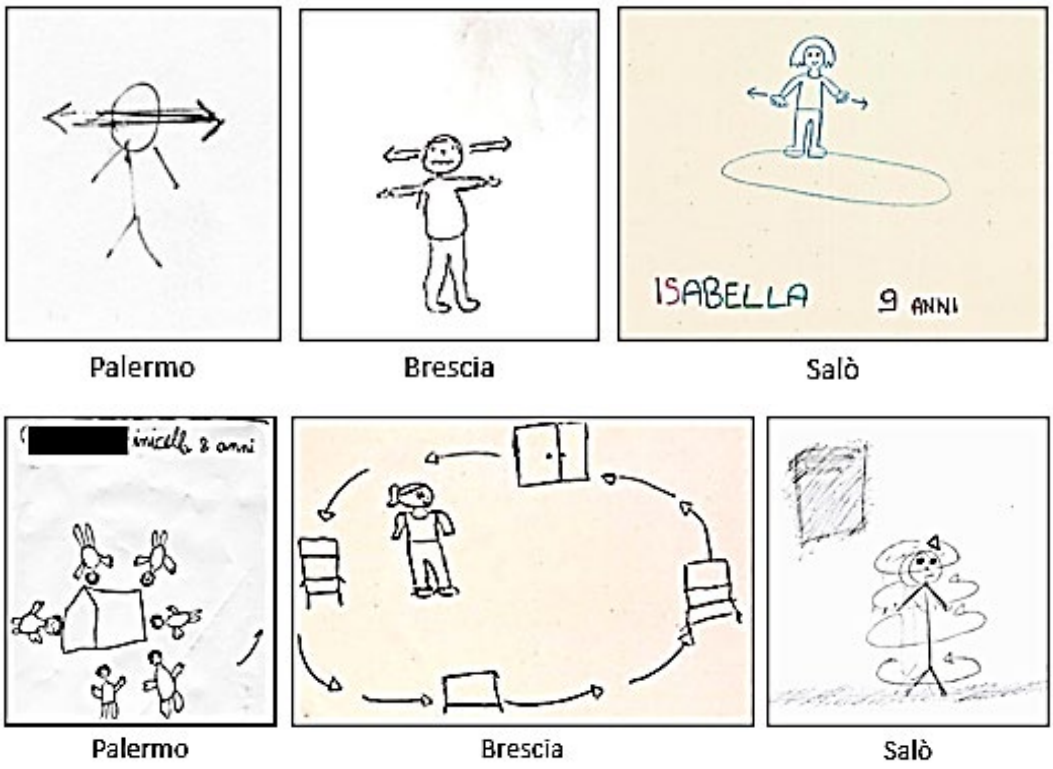


*Figure 4 – Examples of drawings obtained in 3 distant healthcare facilities with the same graphic characteristics. **

*(*) **NOTE**: The poor quality of images is a guarantee of the immediacy and originality with which they have been collected during daily clinical activity and captured over the years with non-professional photographic tools.*

Discussion

It is known that through drawing the child is able to represent part of his inner world (Heiddeger, 1957; Riedel, 1998; Strafstrom et al., 2002; Ferro et al., 2025). For a baby, the discovery that a gesture can leave a trace on a paper, on the sand or on a fogged glass, is accidental. By trying and trying again, the child gradually becomes aware of the relationship between the movement of the hands and the drawn tract, increasing his/her ability to integrate visual with graphic information, up to the representation of objects and people, enriching the details of the drawing more and more over the years. Furthermore, each child manifests different interests and attitudes towards drawing, while his/her figurative capacity may be delayed or anticipated depending on interfering factors of a general nature (age, motivation, genetic, character, psychological, environmental, economic, cultural influences), emotional or cognitive factors, such as the description of the to draw or the setting in which the drawing is collected. (Riedel, 1998; Reuter et al., 2011).

At all ages, drawing represents the inner reality of the child's present or past experience and this can be used by clinicians to complete the diagnostic data collection up to that moment. The drawing reflects the child's world in terms of relationship with himself (sensations, emotions, cognitive and intellectual abilities) and relationship with the outside world. The object of the drawing thus becomes an expression of one's own way of feeling, both physically and psychically, of relationships with significant adults or with the outside world (Heiddeger, 1957; Uzunboylu et al., 2017). The term *"Vertigo"* denotes body symptoms

and intense psychic experience at the same time: sensations of movement, fall and rotation are mixed with strong subjective emotions. What an adult is able to express in words, such as *"feeling of being in motion", "unstable equilibrium", "everything is rotating"* or "*the head is shaken from side to side", "near to fall", "not-standing up", "disorientation",* is extraordinarily and spontaneously expressed through drawing by children, even if they are very young, clearly expressing their psychic and physical, existential and somatic, symbolic and concrete feeling of that specific moment (Jung, 1981; Riedel, 1998).

One of the first things we observed in children's drawings, is the extreme variety of representation of the vertigo symptom. Each child uses the space on the paper trying to give shape to an experience that is difficult to define in words. Everyone lives *"his/her own vertigo"* and through drawing tries to represent what happens to them: many dizzy children, represent vertigo as a whirlwind turbine, or with spiral movements, or as an endless water vortex, but for others vertigo is expressed as a linear movement, right-left or up-down, as if they would describe their own nystagmus. For other children, vertigo is experienced as a force that unbalances to one or the other side. In most drawings, however, we noted that the *"vertigo event"* appears as a sign of a specific experience: it is like something happening drastically in one's own reality, involving the child's emotionality more or less intensely, guiding his own graphic representation, the objects and situations in which it all occurs. The spiral grapheme is the one most used to represent the acute vertiginous event of a rotational nature: the spiral can envelop and imprison the entire body in a succession of more or less numerous and dense concentric circles or hanging over his/her head like a hat. In other cases, vertigo is represented as an abstract entity that involves or traps the head or the whole body in the circle or spiral. Sometimes vertigo is represented as a line of force and appears in form of one or more arrows that target the body or the head, suggesting an effective sensation of movement. The axis of the objects also varies and sometimes the child represents the surrounding reality with a completely subverted verticality or even as if he were in the mirror. In some cases, the body or some objects, or some family members are not represented, was expression of an interior/family/situational conflict, as if the vertigo symptom was a means to erase a situation, a person, an object, for the unconscious fear it may return. Our expert psycho-pedagogists interpreted these evidences as the child's desire to make us understand how, for him/her, the dizzying experience modifies and shapes his/her perception of the body and the objects, offering him/her the opportunity to generate distorted elements over the drown scene. Other times, however, the child only draws the disorder, which bursts onto the scene annihilating the representation of himself. In the case of rotational vertigo, we observed that the child often represents himself and the head characterizing elements are present in detail, to emphasize sadness and discomfort (such as the mouth and eyes). On the other hand, in migraine children, if it appears, the head has no characterizing elements, and the body is often stylized, as if the only important thing to represent at that moment is the disorder that suddenly bursts into the scene. The absence of the body or face in these drawings seems to suggest us how the shocking effect of the vertigo and pain phenomenon is underlined in the drawing: its violence seems to annihilate his identity in that moment. In addition, we noted that migraine children, sometimes express their disorder with curved, closed, concentric or spiral lines, which enclose them, as if he/she had been imprisoned and unable to escape, almost swallowed up by the intensity of the symptom (Figures 1-3).

In our study, the psycho-pedagogical analysis carried out on many graphic features expressed in the drawings of young dizzy patients, has made it possible to denote a clear existing correlation between drawing and clinical diagnosis, with precise graphic connotations in relation to the aetiology of

the clinical disorder. Variability of symptom expression and different outpatient settings must be taken into account when collecting data from the drawings, which may be a limitation of the study, however the common graphic features in the three groups of patients divided by pathology, were evident:

- Group 1: includes patients suffering from a predominantly rotatory symptom, such as BPPV and AUVL. Almost always, the child is able to represent with details himself and/or in a defined way the environment in which the vertigo episode occurs. The body axis appears unstable, often deviated to one side and throughout the design pervades a clear sensation of movement, with coloured lines or large arrows (Figure 1).
- Group 2: it includes patients diagnosed with BPVC or MV, in which the child almost always represents the disorder and not himself or the surrounding reality. If it represents one's own body, it is without somatic characteristics, or wrapped in curved, spiral or closed lines. Other times the vestibular migraine attack is represented as an external "somatoform" entity appearing over the scene, as something overlying and inevitable, independent of the patient's will and from which it cannot escape. Closed lines and dark colors (especially black, blue or violet) pervade the entire drawing, which always and effectively conveys the patient's feeling of oppression and impotence (Figure 2).
- Group 3: it includes children with a frequent diagnosis of a psychogenic disorder (PPPD). This group are not expression of a vertigo sensation, in fact the imbalance depends on muscle tension, fear, anxiety or visual, dental, metabolic, orthopedic and non-vestibular problems. The drawings are non-specific and impersonal. Other times the discomfort that the child tries to communicate through the representation of daily, family or environmental situations is perceived. In these cases, the anamnestic data of numerous evaluations in a multi-specialist setting, all always negative, and the overriding attitude of the parent during the visit is almost constant. Important family problems (parents, siblings) or relational problems (bullying) are also frequent, which must be taken into account (Figure 3).

This subdivision of the drawings into Group 1, 2 and 3 and all these considerations are perfectly overlapped by comparing the samples examined at the Audiology Department of Palermo, ENT Department - ASST Spedali Civili of Brescia, and San Bernardino Outpatient Clinic of Salò. This suggest the existence of an unconscious archetype of children's own balance representation: according to Jung theories, archetypes are universal and innate patterns of behavior, thought, and representations found in the collective unconscious. These models, derived from human experience and evolution accumulated throughout history, are primordial forms or empty "containers" that are filled with specific images determined by an individual's cultural and personal context (Jung, 1981). In general, archetypes are innate, they serve to shape the human experience, and it is what happens also for the children's ability to express its own emotions and sensations through drawings (Uzunboylu et al., 2017).

The meticulous collection of drawings made by dizzy children, by any professional oriented on balance disorders in childhood (doctors, psychologists, psycho-pedagogists, child neuropsychiatrists, pediatricians and even teachers), as we have done with our work, can become a useful tool for investigating children with vertigo, allowing the exploration of how they live their dizzying experience and their state of mind. At the best of our knowledge, there are no other published works in the literature with this topic.

Conclusions

The psycho-pedagogical analysis of the drawings produced by groups of children

divided by type of vertiginous pathology, made it possible to identify stereotyped graphic archetypes, in the case of rotational vertigo, migraine-related vertigo and psychogenic vertigo. Identical feedback was obtained in three different healthcare facilities distant one from each other, such as the Audiology Unit of the University of Palermo, the Otorhinolaryngology Clinic of the University of Brescia and the San Bernardino Outpatient Clinic in Salò (Italy).

The considerations that derive from our experience can be summarized as follows:

1. there are innate "distinctive" unconscious elements (archetypes) used by children to represent their sensations/emotions through drawings, which vary according to the type of pathology and age-related graphic skills;
2. despite the inter-individual differences in graphic representation of its own disease, it is evident that children have a remarkably clear perception of their state of suffering regardless of age and an extraordinary non-verbal expressive ability, which can be revealed thanks to drawing;
3. in children a vertigo attack is expressed in drawings as something external to the child, involving not only the subject, but the entire environment and the figures close to him/her;
4. children represent their symptoms as something disruptive that alters quality and rhythms of their daily life, and a situational element is always drowned (home, school, car, bed, etc.);
5. finally, rotational vertigo (as the case of BPPV, AUVL) is represented in details with itself axis deviation and/or coloured arrows; non-rotational migraine-related vertigo (as the case of BPVC, MV) is represented with something occurring in the scene, with closed, spirals, and a sadness/oppressive sensation pervades the scene; psychogenic vertigo (as the case of PPPD) is represented with non-specific matters of the drawing.

The drawing of dizzy children, interpreted in a specialistic field, can therefore be an interesting complementary in paediatric vestibular diagnostics, since the graphic representation of symptoms, is effective in the paediatric age.

Due to numerous interfering variables, our research is mainly exploratory, but still maintains an innovative character. In fact, there is no evidence in the literature regarding the specificity of graphic-pictorial representations of the symptom by children with vertigo. The few reports concern headaches. Ours are preliminary results, but they support the usefulness of nonverbal inquiry techniques, such as those related to drawing, to detect and evaluate significant relationships in developmental age and balance growth.

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Informed Consent Statement: Informed consent was obtained from the parents of all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy.

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References

Akagi H, Yuen K, Maeda Y, Fukushima K, Kariya S, Orita Y, Kataoka Y, Ogawa T, Nishizaki K. Ménière's disease in childhood. *Int J Pediatr Otorhinolaryngol*. 2001;61:259-64.

Anoh-Tanon MJ, Bremond-Gignac D,Wiener-Vacher SR.Vertigo is an underestimated symptom of ocular disorders: dizzy children do not always need MRI. *Pediatr Neurol* 2000;23:49-53.

Aust G, Novotný M. Ménière's disease and various types of vertigo in children. *Int Tinnitus J.* 2005;11:66-8.

Balatsouras DG, Kaberos A, Assimakopoulos D, Katotomichelakis M, Economou NC, Korres SG. Etiology of vertigo in children. *Int J Pediatr Otorhinolaryngol*. 2007;71:487-94.

Balzanelli C, Spataro D, Redaelli de Zinis LO. Prevalence of Pediatric and Adolescent Balance Disorders: Analysis of a Mono-Institutional Series of 472 Patients. *Children (Basel).* 2021 Nov 16;8(11):1056. doi: 10.3390/children8111056. PMID: 34828769; PMCID: PMC8625109.

Batson G. Benign paroxysmal vertigo of childhood: A review of the literature. *Paediatr Child Health.* 2004;9:31-4.

Božanic Urbancic N, Battelino S, Vozel D. Appropriate Vestibular Stimulation in Children and Adolescents—A Prerequisite for Normal Cognitive, Motor Development and Bodily Homeostasis—A Review. *Children* 2024, 11, 2. DOI:10.3390/children11010002.

Crunkhorn R, Dasgupta S, Seal AK, et al. Fifteen-minute consultation: The dizzy child. *Archives of Disease in Childhood - Education and Practice* 2023;108:10-16.

Cumberworth VL, Patel NN, Rogers W, Kenyon GS. The maturation of balance in children*. J Laryngol Otol.* 2007;121:449-54.

D'Agostino R, Tarantino V, Melagrana A, Taborelli G. Otoneurologic evaluation of child vertigo. *Int J Pediatr Otorhinolaryngol.* 1997;40:133-9.

Davitt M, Delvecchio MT, Aronoff SC. The Differential Diagnosis of Vertigo in Children: A Systematic Review of 2726 Cases. *Pediatr Emerg Care.* 2017 Oct 31. doi: 10.1097/PEC.0000000000001281.

Düwel P, Westhofen M. Vestibular diagnostics in childhood - methods and assessment. Laryngorhinootologie. 2002;81:263-7.

Erbek SH, Erbek SS, Yilmaz I, Topal O, Ozgirgin N, Ozluoglu LN, Alehan F. Vertigo in childhood: a clinical experience. *Int J Pediatr Otorhinolaryngol.* 2006;70:1547-54.

Fernandes R, Hariprasad S, Kumar VK. Physical therapy menagement for balance deficits in children with hearing impairments: A systematic review. *J Ped Child Health* 2015:1-6. doi:10.1111/jpc.12867.

Ferro, F.; Gaspari, C.; Manfrè, G.; Cernigliaro, F.; D'Agnano, D.; Panzica, R.; Correnti, E.; Ruta, M.R.; Marchese, F.; Pitino, R.; et al. Children's Headache Through Drawings: A Narrative Review and a Portrait Gallery. *Life* 2025, *15*, 996.

Gioacchini FM, Alicandri-Ciuffeli M, kaleci S, Magliulo G. Prevalence and diagnosis of vestibular disorders in children: A review. *International Journal of Pediatric Otorhinolaryngology.* 2014;78:718-724.

Gruber M, Cohen-Kerem R, Kaminer M, Shupak A. Vertigo in children and adolescents: characteristics and outcome. *Scientific World Journal*. 2012;2012:109624. doi:10.1100/2012/109624.19.

Heidegger M (1957) Il principio di ragione, tr. It F. Volpi, *Adelphi,* Milano 1991, p.90

Humphriss RL, Hall AJ. Dizziness in 10 year old children: an epidemiological study. *Int J Pediatr Otorhinolaryngol.* 2011;75:395-400.

Jahn K, Langhagen T, Heinen F. Vertigo and dizziness in children. *Curr Opin Neurol*. 2015;28:78-82.

Jahn K. Vertigo in children. Clinical presentation, course and treatment. *Nervenarzt.* 2009;80:900-8.

Jung CG. Archetypes and the Collective Unconscious. 1981. *Bollingen Foundation Editor*. ISBN-13 978-0415058445.

Langhagen T, Schroeder AS, Rettinger N, Borggraefe I, Jahn K. Migraine-related vertigo and somatoform vertigo frequently occur in children and are often associated. *Neuropediatrics*. 2013;44:55-8.

Lempert T, Olesen J, Waterston J, Seemungal B, Carey J, Bisdorff A, Versino M, Evers S, Newman-Toker D. Vestibular migraine: diagnostic criteria. J Vestib Res. 2012;22:167-72.

Marcelli V, Piazza F, Pisani F, Marciano E. Neuro-otological features of benign paroxysmal vertigo and benign paroxysmal positioning vertigo in children: a follow-up study. *Brain Dev.* 2006;28:80-4.

McCaslin DL, Jacobson GP, Gruenwald JM. The predominant forms of vertigo in children and their associated findings on balance function testing. *Otolaryngol Clin North Am*. 2011;44:291-307.

Medeiros IRT, Bittar RSN, Pedalini MEB, Lorenzi MC, Formigoni LG, Bento RF. Vestibular Rehabilitation Therapy in Children. *Otol Neurotol*. 2005;26:699-703.

Naber CM, Water-Schmeder O, Bohrer PM, Matonak K, Bernstein AL, Merchant MA. Interdisciplinary treatment for vestibular dysfunction: the effectiveness of mindfulness, cognitive-behavioral techniques and vestibular rehabilitation. *Otolayngol Head Neck Surg.* 2011;145:117-24.

Niemensivu R, Kentala E, Wiener-Vacher S, Pyykkö I. Evaluation of vertiginous children. *Eur Arch Otorhinolaryngol.* 2007;264:1129-35.

O'Reilly R, Grindle C, Zwicky EF, Morlet T. Development of the vestibular system and balance function: differential diagnosis in the pediatric population. *Otolaryngol Clin North Am.* 2011;44:251-71.

Pagnini P, Verrecchia L, Giannini B, Vannucchi P. Migraine-related Vertigo (MV). *Acta Otorhinolaryngol Ital.* 2003;23(5 Suppl 75):19-27.

Redfern MS, Yardley L, Bronstein AM. Visual influences on balance. *J Anxiety Disorders* 2001;15:81-94.

Reuter I, Mehnert S, Leone P, Kaps M, Oechsner M, Engelhardt M. Effects of a flexibility and relaxation program, walking and nordic walking. *J Aging Res. J Aging Res.* 2011;2011:232473. doi: 10.4061/2011/232473.

Riedel I L'anima dell'immagine. 1998 *Edizione Magi*, Roma, p.25.

Riina N, Ilmari P, Kentala E. Vertigo and imbalance in children: a retrospective study in a Helsinki University otorhinolaryngology clinic. *Arch Otolaryngol Head Neck Surg*. 2005;131:996-1000.

Rine RM, Braswell J, Fisher D, Joyce K, Kalar K, Shaffer M. Improvement of motor development and postural control following intervention in children with sensorineural hearing loss and vestibular impairment*. Int J Ped Otarhinolaryngol* 2004;68:1141-48.

Rine RM, Wiener-Vacher S. Evaluation and treatment of vestibular disfunction in children. *NeuroRehabilitation* 2013;32:507-18.

Rodgers GK, Telischi FF. Meniere's disease in children. *Otolaryngol Clin North Am*. 1997;30:1101-4.

Saka N, Imai T, Seo T, Ohta S, Fujimori K, Masumura C, Inohara H, Sakagami M. Analysis of benign paroxysmal positional nystagmus in children*. Int J Pediatr Otorhinolaryngol*. 2013;77:233-6.

Srivastava M, Gupta A, Talukdar U, Kalra BP, Lahan V. Effect of parental training in managing the behavioral problems of early childhood. *Indian J Pediatr*. 2011;78:973-8.

Strafstrom CE, Rostasy K, Minster A. The usefulness of Children's Drawings in the Diagnosis of Headache. *Pediatrics*. 2002;109:460-472.

Strupp M, Versino M, Brandt T. Vestibular Migraine. *Handb Clin Neurol*. 2010;97:755-71.

Suarez H, Angeli S, Suarez A, Rosales B, Carrera X, Alonso R. Balance sensory organization in children with profound hearing loss and cochlear implants. *Int J Ped Otorhinolarnygol* 2007;71:629-37.

Szirmai A. Vestibular disorders in childhood and adolescents. *Eur Arch Otorhinolaryngol.* 2010;267:1801-4.

Tusa RJ, Saada AA Jr, Niparko JK. Dizziness in childhood. *J Child Neurol*. 1994;9:261-74.

Uzunboylu H, Evram G. Understanding Children's Paintings in Psychological Counselling with Children. *New Trends and Issues Proceedings on Humanities and Social Sciences.* 2017.3(3):449-463. DOI: 10.18844/gjhss.v3i3.1621.

Van Hecke R, Danneels M, Dhooge I, Van Waelvelde H, Wiersema JR, Deconinck FJA, et al. Vestibular function in children with neurodevelopmental disorders: a systematic review. *J Autism Dev Disord*. 2019;49:3328–50. DOI:10.1007/s10803-019-04059-0.

Weisleder P, Fife TD. Dizziness and headache: a common association in children and adolescents. *J Child Neurol.* 2001;16:727-30.

Wiener-Vacher SR, Hamilton DA, Wiener SI. Vestibular activity and cognitive development in children: perspectives. *Front Integr Neurosci.* 2013 Dec 11;7:92. DOI:10.3389/fnint.2013.00092. PMID: 24376403; PMCID: PMC3858645.

Wiener-Vacher SR, Quarez J, Priol AL. Epidemiology of Vestibular Impairments in a Pediatric Population. *Semin Hear.* 2018 Aug Semin Hear. 2018 Aug;39(3):229-242. doi: 10.1055/s-0038-1666815.

Wiener-Vacher SR, Toupet F, François M, Van Den Abbeele T, Viala P, et al. Conséquences des déficits vestibulaires sur le développement du contrôle postural chez l'enfant. In: *Journées parisiennes de pédiatrie*. Paris: Flammarion; 1998. p. 283-7.

Wiener-Vacher SR, Toupet F. Quelle est la place de l'appareil vestibulaire dans les troubles de l'équilibre de l'enfant? *Évol Psychomotrices* 1997;9:212-5.

Wiener-Vacher SR, Vestibular disorders in children. *International Journal of Audiology*. 2008;47:578-83.

Wiener-Vacher SR. Conséquences posturo-locomotrices de deficits vestibulaires chez l'enfant. *Posture et équilibre*. Marseille: Solal; 2001.

Wiener-Vacher SR. What is useful in vestibular testing. *Otorhinolaryngol Nova* 2001;11:95-8.