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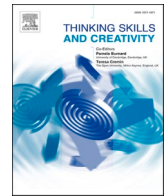
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Development and preliminary validation of a questionnaire to measure parental support for drawing

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ABSTRACT

Drawing is first learned and practised in the home environment, and therefore parental influence should play a significant role in the development of drawing skill. However, both the content and extent of parental support for drawing have been understudied. Since drawing promotes children's cognitive, creative, and academic development, it seems valuable to have a tool to properly measure the impact of parental engagement with the child's drawing behavior. Here, we describe the process of the construction and preliminary validation of the Parental Support for Drawing Questionnaire (PSDQ), which comprised four phases: (1) item generation through a literature review, (2) establishing face validity and content validity using expert panels, (3) pre-testing in a pilot study, and (4) assessing the underlying factor construct, preliminary construct validity and internal consistency. Phase 4 was achieved through exploratory factor analysis using 203 participants. The questionnaire's final version includes four scales defined as Resource support, Joint drawing, Scaffolding, and Praise, and consists of 14 items. The psychometric properties are satisfactory, including factor loadings above 0.5, a Cronbach's Alpha value of $\alpha = 0.77$, and explaining 63.95% of total variance. This study revealed the multidimensional nature of parental support for drawing, and generated the first tool to measure parental support in a drawing context. The PSDQ allows researchers and education professionals to investigate the influence of parental support for drawing (both type and extent) on children's drawing skill, creativity, cognitive development, and academic success. Further research should establish the questionnaire's construct validity and cross-cultural applicability.

1. Introduction

Drawing is not only a popular playtime activity among children, but also an important means of creative expression, and a visual tool for thinking and communication. From the moment children master the ability to draw, they increasingly use it to develop their ideas and to share these with others (Brooks, 2009a; Burkitt et al., 2010; Cohn, 2012). Through drawing, children are able to visualize

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concepts and thoughts, think through them, and thereby deepen their understanding of complex and abstract matter (Brooks, 2009a, 2009b; Fiorella & Zhang, 2018). The value of drawing as a tool for thinking becomes tangible in children's study endeavors. For example, (Leopold & Leutner, 2012) found that students who created drawings of molecular structures performed better on comprehension and transfer tests than students who only wrote verbal summaries. Meta-analyses conducted by Cromley et al. (2019) and Fiorella and Zhang (2018) show that drawing can reinforce learning, and especially higher-order learning. In fact, multiple studies show that drawing skill is positively correlated to academic performance, such as proficiency in reading, writing, and mathematics (Baker & Kellogg, 1967; Krawitz & Schukajlow, 2020; Kulp, 1999; Sortor & Kulp, 2003; Wu & Rau, 2019). Drawing also enhances creative thinking and competence. For example, Chan and Zhao (2010) found that proficiency in drawing enhanced artistic creativity in adolescents, and was positively related to divergent thinking as well. In addition, Ulger (2019) found that visual arts students outperformed music and science students on creative thinking tests. Drawing is thus a valuable skill to master, both during and beyond childhood.

Drawing may be defined as the intentional creation of visible marks on a surface (MacDonald, 2014; Martinet et al., 2020), which in most contemporary societies involves the use of pen/pencil and paper. Studies on the ontogeny of drawing have often focused on the development of dexterity, symbolism, and aesthetics, while less attention has been given to examining which components of drawing skill are influenced by the environment and to what extent (Callaghan, 2020). In part, this may be attributed to the fact that traditional Piagetian models have explained the development of drawing as a natural process related to the maturation of cognitive skills, acquired relatively independent of the social climate (Hardiman & Zernich, 1980). However, we here point to a theoretical framework that recognizes the critical influence of the environment on a child's cognitive development, as found in Bronfenbrenner's ecological theory (1979) and Vygotsky's (1978) theory on learning in social contexts. Vygotsky acknowledged the importance of the child's own agency, but emphasized the importance of interrelatedness and interdependence in learning and development, and the significant role that adult guidance plays in a child's cognitive development (Vygotsky, 1978). Bronfenbrenner also stressed the relevance of the environment in shaping the child's development, as can be found in his work *The Ecology of Human Development* (Bronfenbrenner, 1979). Herein he further mentions that proximal factors such as the immediate family have a greater influence on a child's learning development than more distal influences such as societal institutions.

There is ample evidence demonstrating the impact of the home learning environment (HLE) on children's cognitive and competency development (e.g., Dowdall et al., 2020; Lehl et al., 2020; Melhuish et al., 2008; Mol et al., 2008; Niklas et al., 2018). For example, Melhuish et al. (2008) found that the HLE (e.g., the frequency with which children are read to, visit the library, or play games) assessed before school entry predicted concurrent literacy and numeracy outcomes as well as reading and mathematics two years later. Parents in particular play a significant role in advancing their children's cognitive development (e.g., Sylva et al. 2008), and a large body of empirical research confirms that parental involvement has a significant influence on children's academic achievement (Boonk et al., 2018; Jaiswal & Choudhuri, 2017; Zhang et al., 2020).

The early acquisition and development of *drawing* also largely depends on the resources and learning opportunities given to the child, which are primarily determined by family, peers, and teachers (Anning, 2002; Callaghan et al., 2011; Oğuz, 2010). During the preschool years in particular, adult caregivers (usually, the parents) engage the child in the drawing activity within the home environment (Anning, 2002; Hallam et al., 2008; Kindler, 1995). Therefore, parents are a major influence in the development of their children's drawing skill (Anning, 2002; Ring, 2006).

1.1. Aims

The aims of the current study were twofold. First, we intended to reveal the dimensionality of parental support for drawing and answer the question: what types of support do parents provide children in a drawing context? Second, we set out to construct a questionnaire to provide the field with a tool to investigate the contribution of different types of parental support in the development of drawing. We elaborate on these aims in Section 1.3. *The Parental Support for Drawing Questionnaire*.

1.2. Parental support for drawing

Parental support is an overarching term comprising the attitudes and actions taken by parents to promote certain behaviors or developmental aspects in the child. While traditionally defined as a form of emotional support (Barber et al., 2005), the term is used more broadly to include, for example, parents' encouragement of children's play (Vandermaas-Peeler, 2002), academic performance (Choe, 2020), and health (Beets et al., 2010; Pyper et al., 2016; Rhodes et al., 2020). Here, we define parental support for drawing as the actions undertaken by parents which aim at promoting the acquisition and development of drawing skill in their children. According to Bornstein's (2002) Specificity Principle, the development of children's domain-specific skills requires domain-specific inputs in a developmentally appropriate manner (Bornstein, 2002), meaning that parental support must directly relate to drawing to benefit children's drawing skill. Daucourt et al. (2021) found empirical support for the Specificity Principle in their meta-analysis investigating the effectiveness of the home math environment on children's math proficiency. Therefore, we investigated specifically literature in the context of parental support for drawing. Our literature review yielded a short list of relevant domains that could be used to measure parental support in relation to drawing, including (1) Resource support, (2) Joint attention, (3) Scaffolding, (4) Encouragement, and (5) Praise.

Resource support refers to the provision of the materials, time, and space that a child needs to engage in drawing activities. Learning and developing drawing skill in childhood will partly depend on access to these resources. A greater availability of drawing materials and space to draw, for example, increases drawing frequency in young children (Ring, 2006), and having more opportunities

to draw results in more mature and creative drawings (Huntsinger et al., 2011). However, while resources are fundamental to drawing behavior, merely providing children with materials does not automatically lead to drawing. To engage in drawing activities, it is key that young children be guided through joint attention on drawing (Matthews, 2003). **Joint attention** involves sharing a focus on an object, a person, or an event, with someone else – something that humans are intrinsically motivated to do (Tomasello et al., 2005). The presence and involvement of an adult during drawing leads to increased interest, enjoyment, and experimentation by the child (Anning, 2002; Burkitt et al., 2010; Kindler, 1995).

Scaffolding includes a variety of techniques providing successive levels of support aimed at helping the learner acquire a level of understanding or skill that they would not be able to achieve without guidance and assistance. Scaffolding is fundamental to the development of any skill (Vygotsky, 1978). During drawing activities, it has been noted that children need models to follow in order to learn to configure and understand the meaning of visual signs (Wilson & Wilson, 1977). Scaffolding in relation to children's drawing may involve adult demonstration and/or verbal indications. A study on children's drawing activities in both home and school settings showed that, when drawing at home, children received a good amount of parental demonstration as well as verbal suggestions and instruction (Burkitt et al., 2010). Graphical modeling or demonstration by parents, in turn, has been shown to be positively related to the child's drawing frequency at home (Anning, 2002).

Throughout the literature, scaffolding features as a consistent component of parental support for drawing with several beneficial effects. It stimulates drawing, increases its frequency, and generally improves drawing skill (Kindler, 1995). Modeling by an adult also enhances symbolic understanding and communication intent through drawing in young children (Callaghan, 1999). The effects of scaffolding during the process of acquiring and developing drawing skill became apparent in a cross-cultural study which found that Chinese-American children whose parents offered explicit drawing instruction scored higher on creative drawing tasks than Western-American children whose parents took a more non-directive approach (Huntsinger et al., 2011). Children seem to value receiving feedback on their drawing performance, and actively request demonstration by their parents (Anning, 2002).

Art educators, developmental psychologists, and early childhood teachers all recommend encouraging children to persevere in drawing (Huntsinger et al., 2011). **Encouragement** is reportedly the most common action undertaken by parents to engage children in drawing activities, and is often perceived as a type of support for drawing by both parents and teachers (Burkitt et al., 2010). Alongside encouragement, **praise** is also commonly reported as a form of support for drawing. Parents and other adults often praise a child for their drawing behavior and production, and several studies show its efficiency on building up children's confidence in their drawing skill and increasing drawing frequency and creativity (Burkitt et al., 2010; Oğuz, 2010). Verbal praise and indirect praise by the parents (e.g. expressing interest, and displaying the child's drawings) is also considered as a form of parental support for drawing in the literature (Huntsinger et al., 2011).

1.3. The parental support for drawing questionnaire

There is little doubt that parental involvement is of great importance during the acquisition and development of drawing abilities in children. Yet, the type of parental support for drawing and its effect on children's drawing skill have been understudied (Callaghan, 2020; Fernyhough, 2008). For instance, it remains unclear how the above-described components of parental support for drawing are interrelated and how much each component impacts the development of the child's drawing skill. This is partly due to the lack of an instrument that can measure parental support for drawing.

An improved description of the role of the environment, in particular of parents, in the development of drawing has potential implications for the ontogeny of drawing, symbolic comprehension and communication, learning, artistic creativity and cognition in general. Competing models of children's development see the unfolding of drawing as either a by-product of growth and the development of motor skill (Simpson et al., 2017), or as a learned behavior that hinges on cultural transmission (Rakoczy et al., 2017). Understanding the effects of parental support on the timing and pace of drawing acquisition and progress could inform these models and help researchers to better understand children's developmental trajectories across different domains. Moreover, having an instrument to examine the relationship between parental involvement and a child's drawing development can shed light on the content and impact of the support. This is of importance considering the relevance of drawing to a child's cognitive development, academic achievements, and creative skills (Chan & Zhao, 2010; Comley et al., 2019; Fiorella & Zhang, 2018; Kulp, 1999; Sortor & Kulp, 2003).

Despite its relevance, we currently lack a tool to measure how parental attitudes influence children's drawing behavior. This paper is a first step towards creating a new questionnaire for assessing, and thus better understanding, parental support for drawing. We report the description of the Parental Support for Drawing Questionnaire (PSDQ), and its initial assessment using exploratory factor analysis (EFA) and internal consistency.

2. Materials and methods

We built our instrument (PSDQ) in four phases, following Mya et al.'s (2021) exploratory sequential mixed method design. The first phase (Phase 1) included the initial construction of the questionnaire, using the literature review as the basis for item generation. Next (Phase 2), we established face validity and content validity. Then (Phase 3), we carried out a pilot study. Finally (Phase 4), we conducted the assessment of the questionnaire's factor construct and preliminary construct validity through an EFA, and evaluated the scale's internal consistency.

2.1. Development of the questionnaire

2.1.1. Phase 1: Literature review for item generation

To create the initial item pool for the drafted Parental Support for Drawing Questionnaire (PSDQ), we conducted a thorough literature review on adult involvement and parental support for children's drawing behavior, using PubMed and Google Scholar. The

Component	Description		Item
Resource support (RS)	The provision of a variety of drawing materials, as well as opportunity, time, and space for drawing.	RS-1	How often is drawing material available in the living space?
		RS-2	Does your child have access to a <u>wide variety</u> of drawing utensils at home (for example, colored pencils, markers, paint, crayons, charcoal, coloring books, etc.)?
		RS-3	How often do you provide your child with books, magazines, (digital) drawing games, or other material as drawing inspiration?
		RS-4	How often does your child have the opportunity to draw at home?
		RS-5	Do you (or would you) allow your child to draw in different places within the house (e.g., at the dining table, on the floor, etc.)?
Encouragement (EN)	Efforts to stimulate the child to start or continue drawing.	EN-6	When your child has time to play, how often do you encourage him/her to start drawing?
		EN-7	How often do you encourage your child to draw by suggesting to draw together?
		EN-8	When your child seems to disengage while drawing, how often do you encourage him/her to continue?
		EN-9	When your child wants to draw, how often do you suggest doing something else, like playing outside, playing with other children, doing sports, reading, etc.?
Joint attention (JA)	Engaging in the child's drawing activity (without the aim to improve their drawing skill).	JA-10	How often do you sit with your child while he/she is drawing?
		JA-11	How often do you pay attention to what your child is drawing?
		JA-12	How often do you draw together with your child <u>if</u> he/she asks you to do so?
		JA-13	How often do you talk with your child about his/her drawings?
Scaffolding (SC)	Activities that aim to enhance the child's drawing skills.	SC-14	(When your child draws,) how often do you help to improve his/her drawing skills?
		SC-15	(When your child draws,) how often do you help to draw certain things by demonstrating it?
		SC-16	(When your child draws,) how often do you make verbal suggestions on how to draw certain things?
Praise (PR)	Praising the child's effort and/or finished drawing, which can be both verbal or visual (e.g. displaying the child's drawing in the house).	PR-17	How often do you praise your child while he/she is drawing?
		PR-18	How often do you praise your child when he/she has completed a drawing?
		PR-19	Do you praise your child also if his/her drawing is not so good?
		PR-20	How often do you display your child's drawings in the house?

Fig. 1. Descriptive information for each component of the initial draft PSDQ and the corresponding item pool.

literature search comprised the following keywords: (“parent**”) AND (“support” OR “involvement” OR “scaffolding” OR “facilitation”) AND (“drawing” OR “drawing development” OR “ontogeny of drawing” OR “Visual motor integration” OR “VMI”). After identifying relevant articles, we reviewed the corresponding reference lists to detect additional relevant readings. We subsequently used the “cited by” function in Google Scholar to identify more recent relevant studies that cited the literature we had found. We observed that the current body of research examining parental involvement during the development of drawing was rather limited. A detailed description of how the literature informed the individual items can be found in the supplementary material. As reported earlier, the literature indicated that parental support for drawing consists of multiple factors, which were summarized as: (1) Resource support: the extent to which the parent provides materials, opportunity, time, and space to draw; (2) Joint attention: the extent to which the drawing activity is shared between the parent and the child; (3) Scaffolding: the extent to which the parent engages in behaviors that aim at enhancing the child’s drawing skill; (4) Encouragement: the extent to which the parent stimulates the child to start or continue drawing; and (5) Praise: the extent to which a parent praises the child’s drawing effort and the finished product, which can be both verbal or behavioral.

2.1.2. Phase 2: Questionnaire modification to obtain satisfactory face validity and content validity

We refined the initial item pool by establishing face validity and content validity. Face validity is defined as the subjective assessment of the questionnaire’s presentation and relevance in regard to whether the questions are relevant, reasonable, unambiguous and clear (DeVon et al., 2007; Oluwatayo, 2012). Seeking face validity is important, as it provides an insight into how later respondents will interpret the items (DeVon et al., 2007). We requested a group of non-experts to provide feedback on the clarity of the proposed questionnaire, including the instructions, items and response scale, or any other difficulties (Oluwatayo, 2012; DeVon et al., 2007). Based on the obtained feedback, we improved the items and decided on the format of the response scale. Several items were rephrased to enhance the clarity and comprehension. For the response scale, a seven-point Likert scale was implemented (‘0 = Never’ to ‘6 = All the time’) rather than an 11-point Likert scale or a slider scale, as the latter two were considered confusing by the majority of the non-experts.

Next, we sought to establish content validity, to ensure that the questionnaire adequately covered the entirety of the intended content area (DeVon et al., 2007; Pallant, 2010). We consulted a panel of eight experts in the field of (developmental) psychology to assess whether the proposed questionnaire adequately covered the different types of parental support in the context of drawing. The experts were asked to rate the relevance of each potential item for the intended construct (i.e., “not necessary”, “useful but not essential”, or “essential”) and were also given the opportunity to provide feedback (DeVon et al., 2007; Lynn, 1986). The items were retained, adapted, or removed after considering the item ratings, the feedback from the expert panel, and the theoretical support from the literature (DeVon, 2007). In the end, we improved the wording of several items, and also changed the formulation of the items to a question format to further decrease the chance of an acquiescence bias, which was supported by the expert panel.

2.1.3. Phase 3: Pilot study

After revising the item pool, we conducted a pilot study to assess the intelligibility of the questions and response options. We recruited a subset of the intended research population ($n = 23$) and requested them to fill out the questionnaire and provide feedback. The answers of the pilot respondents were used to further enhance the clarity of all the items.

The initial draft of the PSDQ consisted of 20 items assessing 5 different types of parental support: Resource support (items 1–5), Encouragement (6–9), Joint attention (10–13), Scaffolding (14–16), and Praise (17–20) (see Fig. 1 for an overview of the initial version of the PSDQ).

2.1.4. Phase 4. Questionnaire validation

Once the initial item pool of the PSDQ was established through the pilot study, we conducted an exploratory factor analysis (EFA) with a larger sample, to seek preliminary construct validity. We also calculated the internal consistency of the full scale and the individual scales within the questionnaire.

Table 1
Demographic information of the participants.

Variable	Mean (SD)	Frequency	Percentage
Age	41.29 (6.4)		
Gender			
Female		172	84.7%
Male		30	14.8%
Prefer not to say		1	0.5%
Target child			
Age	7.14 (3.1)		
Gender			
Female		112	55.2%
Male		90	44.3%
Prefer not to say		1	0.5%

Note. Demographic characteristics of the participants ($n = 203$). Participants’ age was based on $n = 192$, since 11 cases had missing data.

2.2. Participants

We recruited 203 parents or primary caretakers of children aged 2 to 12 years to participate in the study (30 male, 172 female). Their age ranged from 21 to 56 years ($M = 41.29$, $SD = 6.41$) (see Table 1 for the descriptive statistics). Participants were recruited via social media and through the researchers' social networks. From the total pool of 229 participants, 26 were excluded from analysis due to (a) not meeting the inclusion criteria (i.e., being the primary caretaker, having a child aged 2 to 12, and being 18 years or older) ($n = 9$); (b) not finishing the questionnaire ($n = 6$); (iii) missing demographic data ($n = 3$) or (iv) providing multiple ages when asked to indicate their child's age ($n = 6$). The latter group was excluded based on the notion that parental support can vary for children of different ages during the preschool years (Burkitt et al., 2010). Eleven participants entered their child's age as their own while also indicating being 18 or older. We decided to include these participants since the variable of parental age was not of interest in this study. Ethical approval was granted by the ethics committee of Leiden university. All participants signed informed-consent forms and were fully debriefed about the purpose of the study.

2.3. Procedure

Data collection was done online through the online platform Qualtrics. After clicking the provided link, the participants arrived at the survey. First, they were informed about the study and asked to provide their informed consent. The language of the survey (English or Dutch) was automatically determined through the participants' web browser settings; however, the participants had the option to switch the language. The initial three questions assessed whether the participants met the inclusion criteria. If the participant gave a negative response to one of these questions, the survey was automatically ended. Participants who indicated they met the inclusion criteria were asked to complete the 20 items of the PSDQ. Afterwards, they were asked to answer demographic questions assessing their age and gender, as well as their child's. The survey took approximately ten minutes to complete. At the end of the survey, the participants had the opportunity to provide feedback, received a debriefing, and were thanked for their participation.

2.4. Measures

The initial version of the PSDQ consisted of 20 items (see Fig. 1). In the initial instructions, the parent was asked to answer according to the general home situation over the past half year and to reply with one target child in mind.

2.5. Statistical analysis

To assess the preliminary construct validity of the PSDQ, we conducted an exploratory factor analysis (EFA) to investigate the factor structure (Costello & Osborne, 2005), using SPSS version 27. An EFA was chosen over a confirmatory factor analysis (CFA) (e.g., see Hurley et al., 1997) because the former is typically used at the early stages of instrument development (Knekta et al., 2019) and is considered the most appropriate method for examining construct validity when the relationships among variables are ambiguous or yet unknown (Brown, 2015). Additionally, an EFA would elucidate the dimensionality of our instrument and disclose which items did not belong to the intended construct, supporting their exclusion (Costello & Osborne, 2005; Knekta et al., 2019). While we had preliminary ideas about the underlying construct of parental support for drawing based on the literature, it was possible that some of the proposed factors needed to be merged, split, or discarded. A CFA would not show how well the items loaded on unexpected factors; something that an EFA would do (Kelloway, 1995). Taken together, we considered an EFA to be most suitable at this stage.

The suitability of the dataset for an EFA was assessed by considering the intercorrelations among the items and the sample size. The intercorrelations were evaluated by firstly inspecting the correlation matrix, which should show the presence of correlations greater than $r = 0.3$ (Tabachnick & Fidell, 2013). Secondly, the Kaiser-Meyer-Olkin (KMO) value of sampling adequacy had to be above 0.5 (Tabachnick & Fidell, 2013). Lastly, the Bartlett's test of Sphericity needed to be statistically significant with $p < .05$ (Bartlett, 1954). For determining a sufficient sample size, we followed the recommendations by Pallant (2010) and Nunnally (1978), who advocate for a minimum sample size of 150 and a 10/1 ratio per item, respectively. To determine the number of factors to retain, we followed Horn (1965) and conducted a parallel analysis using an engine developed by Patil et al. (2017). Parallel analysis is a technique that is applied to ensure that a factor explains more variance than is expected by chance. Only the factors that exceeded the criterion value provided by the parallel analysis were retained. To establish whether an item should be retained, we required it to show a factor loading of at least 0.4 on the key factor (Floyd & Widaman, 1995, p. 294). We selected principal axis factoring (PAF, following Fabrigar et al., 1999) and adopted an oblique rotation approach (direct oblimin, following Kim & Mueller, 1978, p. 50) as factors were assumed to be correlated (Costello & Osborne, 2005). Lastly, we calculated the internal consistency of the full scale and the individual scales using Cronbach's alpha (α), to examine the extent to which the items within one (sub)scale were interrelated (DeVon et al., 2007).

3. Results

3.1. Preliminary construct validity

The data was found to be suitable for conducting the EFA. The inspection of the correlation matrix displayed 29 (out of 190) correlations greater than $r = 0.3$, ranging between $r = 0.31$ and $r = 0.72$; Bartlett's Test of Sphericity was significant ($\chi^2(190) = 1270.11$, $p < .001$); the Kaiser-Meyer-Olkin value of 0.76 exceeded the minimum value of 0.5; and the sample size of 203 met the

recommendations of Pallant (2010) and Nunnally (1978).

To extract the suitable number of factors, we conducted an initial factor analysis. According to the parallel analysis, only the first four factors exceeded the provided criterion value, thereby suggesting the retention of the first four factors (see Table 2). The four factors together explained 51.64% of the total variance.

Following the subsequent four-factor EFA, we excluded four items as they failed to load sufficiently high (>0.4) on any factor (i.e. “When your child has time to play, how often do you encourage him/her to start drawing?”, “How often do you encourage your child to draw by suggesting to draw together?”, “When your child wants to draw, how often do you suggest doing something else, like playing outside, playing with other children, doing sports, reading, etc.?” and “How often do you talk with your child about his/her drawings?”). The first three excluded items were all intended to measure Encouragement, while the latter was intended to measure Joint attention.

When we explored the content of the retained items within the factors on which they loaded, we observed that the factors represented four of the five expected theoretical constructs: (1) Resource support (six items), (2) Joint attention (four items), (3) Scaffolding (three items), and (4) Praise (three items). However, upon close inspection of the Joint attention scale, we noted that the items assessed joint drawing activities specifically, rather than joint attention. We therefore changed the name of this scale to Joint drawing. We did not find support for Encouragement as an independent factor in this model.

We conducted a third EFA on the remaining 16 items. While all items exhibited factor loadings greater than 0.4 on one of the four factors, the Communalities table revealed four items with low proportions of shared variances (<0.3; Pallant, 2010), indicating that those items had little in common with the other items. We followed a step-wise approach and excluded the item with the lowest amount of shared variance (i.e., “How often does your child have the opportunity to draw at home?”; 22.4%). After removing this item, the factor matrix continued to show factor loadings above 0.4 and shared variance exceeding 30% for all items, except for one (i.e., “How often is drawing material available in the living space?”; 16,1%), whose factor loading dropped below 0.4. Upon removal of this item, the pattern matrix showed a clean four-factor solution, with loadings greater than 0.5 for all items (see Table 3 for the factor loadings). This four-factor solution explained a total 63.95% of variance, with factor 1 (Resource support) contributing 11.55%, factor 2 (Joint drawing) contributing 10.22%, factor 3 (Scaffolding) contributing 26.92%, and factor 4 (Praise) contributing 15.27%. Furthermore, the factor correlation matrix revealed that factors 1, 3 and 4 negatively correlated with factor 2, exhibiting Pearson values of $r = -0.18$, $r = -0.38$, and $r = -0.33$, respectively.

3.2. Internal consistency

Cronbach’s Alpha values showed adequate internal consistencies: $\alpha = 0.77$ for the total scale; $\alpha = 0.62$ for the scale Resource Support; $\alpha = 0.73$ for the scale Joint drawing; $\alpha = 0.86$ for the scale Scaffolding; and $\alpha = 0.72$ for the scale Praise. The value for factor 1 (Resource Support) was relatively low (albeit generally considered acceptable; Nunnally, 1978), most likely because it comprises different types of resource support such as materials and space. However, an alternative explanation is that fewer items per subscale could also lead to lower Alpha values (Nunnally & Bernstein, 1994; Streiner, 2003). Given that the number of items per subscale was relatively low (with 3 or 4 items per subscale), these Alpha values may be considered moderate to good (Garnefski et al., 2007). See Table 3.

The final version of the PSDQ consists of 14 items (see Appendix for the English version) which in accordance with the exploratory analyses can be clustered into four different subscales of parental support (see Fig. 2): Resource support (items 1–4), Joint drawing (items 5–8), Scaffolding (items 9–11), and Praise (items 12–14).

4. Discussion

Although drawing is primarily learned in the home environment, little remains known about the influence of parental support on children’s drawing development. A proper research instrument to measure parental support for drawing was lacking. Hence, the aim of the present study was to construct and preliminarily validate the Parental Support for Drawing Questionnaire (PSDQ), an instrument to specifically measure parental support for drawing. The development of the questionnaire comprised a sequential mixed-method methodology (Mya et al., 2021) including four phases. The EFA revealed a four-factor solution with acceptable psychometric properties. The emergence of the subscales, i.e., Scaffolding, Praise, Resource support, and Joint drawing, is consistent with the literature. The overall model explains a total of 63.95% of the variance, thereby exceeding the recommended 50% (Streiner, 1994). The rotated

Table 2
Factor extraction following horn’s parallel analysis.

Factor number	Actual Eigenvalue	Criterion value	Decision
1	4.540	1.613649	Accept
2	2.474	1.484827	Accept
3	1.826	1.400023	Accept
4	1.487	1.330970	Accept
5	1.147	1.260642	Reject
6	1.015	1.203721	Reject

Note. Comparison of the obtained eigenvalues from the EFA and the criterion values from the Parallel Analysis which led to a four-factor solution.

Table 3
Factor loadings and internal consistency (Cronbach's Alpha, α) of the four factor model of the Parental Support for Drawing Questionnaire (PSDQ).

Item	Factor Loadings			
	Resource support	Joint drawing	Scaffolding	Praise
RS-2	.57	.00	.01	-0.01
RS-3	.56	-0.10	.13	.01
PR-20	.55	-0.05	.04	.22
RS-5	.52	.05	-0.10	-0.07
JA-10	-0.22	-0.82	.09	-0.08
EN-7	.06	-0.62	.10	.03
JA-11	.22	-0.57	-0.06	.01
JA-12	.00	-0.53	-0.05	.06
SC-14	.05	.06	.91	-0.08
SC-15	.02	-0.10	.78	.04
SC-16	-0.04	.01	.76	.05
PR-17	.14	.03	-0.01	.84
PR-18	-0.01	.00	.10	.80
PR-19	-0.09	-0.03	-0.05	.64
Cronbach's Alpha (α)				
Total scale	Resource support	Joint drawing	Scaffolding	Praise
.77	.62	.73	.86	.72

Note. Final factor loadings of the four-factor solution. Item names represent the initially hypothesized component they would measure, and the initial item number: SC = Scaffolding; PR = Praise; RS = Resource support; JA = Joint attention; EN = Encouragement. Major loading of each item is bolded.

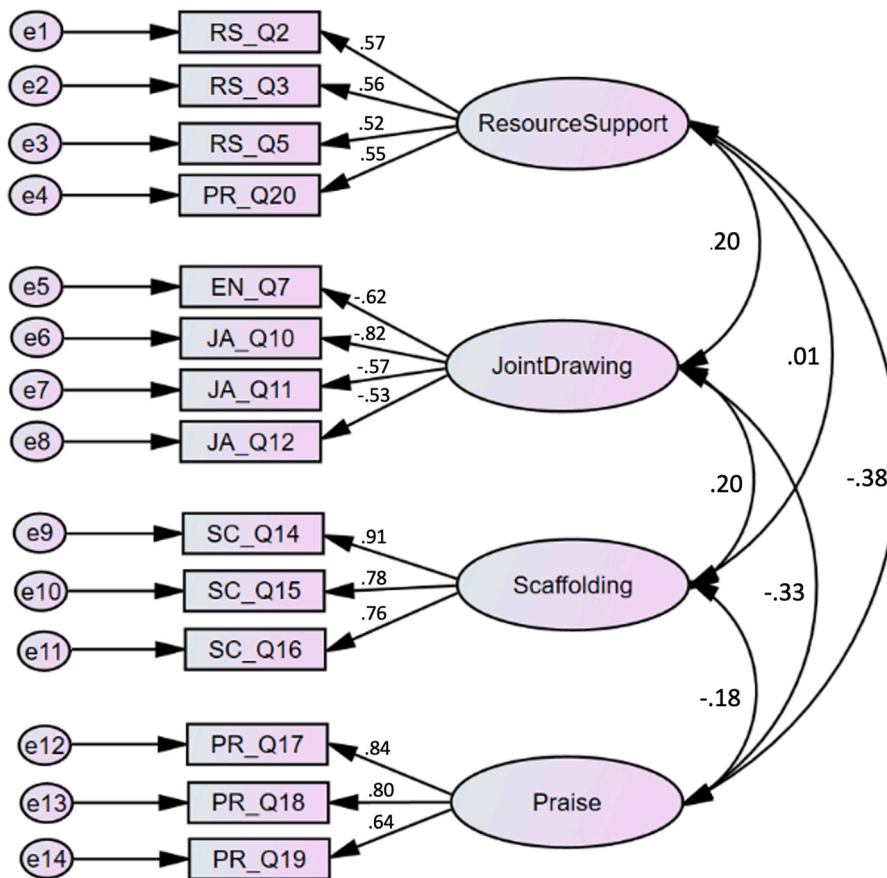


Fig. 2. Four-factor solution of the PSDQ. Note. This diagram depicts the underlying four-factor construct of the PSDQ, including from left to right, the error terms, item names, item loadings, factors and factor correlations. Item names represent the initially hypothesized component they would measure, and the initial item number: SC = Scaffolding; PR = Praise; RS = Resource support; JA = Joint attention; EN = Encouragement.

solution uncovers a simple structure entailing a clean separation between the factors which exhibit several high loadings (Thurstone, 1947). All loadings exceed a value of 0.5. The reliability analysis reveals a Cronbach's Alpha value of $\alpha = 0.77$ for the total scale, and ranged from $\alpha = 0.62$ to $\alpha = 0.86$ for each subscale. Taken together, these results indicate an overall acceptable to good preliminary validity and reliability of the PSDQ.

The four-factor model featuring 14 items was found to be an appropriate representation of the PSDQ. Whereas the literature seemed to suggest a five-factor solution, the anticipated component Encouragement was not supported by the obtained model. Common definitions of the term *encouragement* are "persuasion to do or to continue something", "the act of trying to stimulate the development of an activity, state, or belief" and "the action of giving someone support, confidence, or hope" (Oxford University Press, 2020). In other words, encouragement can be considered either a type of stimulation, or a broader type of support. We specifically adopted the former definition of encouragement as stimulation, whereas other researchers may use the term in a broader sense. For example, Burkitt et al. (2010) did not specify what kind of encouragement was meant in their survey, while Huntsinger et al. (2011) adopted the broader definition of encouragement, describing it as a form of praise. In these studies, encouragement might function as an umbrella term for other types of support, rather than a factor in itself. This might explain why we did not find evidence for encouragement-as-stimulation as a type of parental support for drawing.

The obtained model supports the hypothesized Joint attention subscale, which was based on Anning (2002), Burkitt et al. (2010), Kindler (1995), and Matthews (2003). Besides the original JA-items, item EN-7 ("How often do you encourage your child to draw by suggesting to draw together") also loaded on the Joint attention subscale (factor 2). Although the mere suggestion to draw together does not equal the actual action, we can assume that parents who report inviting their child to draw do in fact end up drawing together on most occasions. Consequently, we included it in the Joint attention subscale. Upon closer inspection, all the items in the subscale referred specifically to drawing together, so we changed the name of the subscale to *Joint drawing*. Furthermore, the items comprising Joint drawing involve both active and passive activities: items EN-7 and JA-12 assess active parent-child joint drawing, and items JA-10 and JA-11 focus on the passive presence of the parent exclusively. Future research should investigate whether this potential distinction has any influence on the child's drawing behavior. We could expect passive parental presence to increase drawing frequency (Kindler, 1995), while active engagement in joint drawing may enhance the child's drawing skill through imitation (Cohn, 2014).

All three items comprising factor 3 assessed scaffolding behavior, supporting the retention of the Scaffolding subscale, which was based on Anning (2002); Burkitt et al. (2010); Callaghan (1999); Huntsinger et al. (2011) and Wilson & Wilson (1977). Nevertheless, the Structure matrix showed an additional cross-loading on factor 2 (Joint drawing), for item SC-15 ("When your child draws, how often do you help to draw certain things by demonstrating it?"). Given that demonstration requires sitting together with the child and draw, it is not surprising that item SC-15 partially loaded onto Joint drawing ($r = -0.41$) in the Structure matrix.

The model also supports the suggested Praise subscale (Burkitt et al., 2010; Huntsinger et al., 2011; Oğuz, 2010), with all items in factor 4 assessing praising behavior. Yet, PR-20 (reads "How often do you display your child's drawings in the house?"), initially introduced as a Praise item, ended up loading onto Resource support (factor 1). Although displaying a child's drawings could be considered a form of praise, it is possible to perceive it as a type of resource support, related to the provision of space.

Lastly, factor 1 included items constructed to assess resource support (Burkitt et al., 2010; Huntsinger et al., 2011; Ring, 2006). Two of the items that were constructed to measure resource support, RS-1 and RS-4, were dropped due to (1) their lack of sufficient shared variance with the other items of the full scale, and (2) the observation that the full model improved upon their removal. Inspecting the subscale revealed items RS-2 and RS-3 measured material support, and items RS-5 and PR-20 measured providing space.

4.1. Implications

Drawing plays a significant role in children's cognitive, creative, and academic development. Through drawing, children learn to express and communicate their thoughts and understand the world around them. Parental support undoubtedly has a large influence on the acquisition and improvement of the child's drawing skill. To understand and support children's drawing development, we need to gain a clearer picture of the role and scale of parents' involvement with children's early drawing behavior. The PSDQ answers the need for an instrument to measure parental support for drawing, providing the academic community with a valuable tool to assess the influence of parents on the development of drawing. Moreover, by zooming in on the different types of parental support, researchers can thoroughly analyze which aspects contribute most to their area of interest.

The PSDQ may also aid education professionals to generate strategies for art education both at home and in school. Through a better understanding of the attitudes and resources that encourage drawing behavior in the home environment, parents and teachers should be able to create or revise programs for art education, which are often underdeveloped in current school curricula (Anning, 2002; Burkitt et al., 2010; Rose et al., 2006). Since drawing is positively related to academic, creative, and cognitive skills, fostering and improving drawing can have potential benefits for children's general development.

Future research will need to explore further the multidimensional aspects of parental support for other cognitive and behavioral skills in children, and to investigate how these compare to or differ from one another.

4.2. Limitations

We identify two main limitations to the present study. First, due to its exploratory nature, it has not been possible to establish full construct validity at this point. While the initial step in the construction of a new questionnaire is precisely to conduct exploratory analyses, these should be followed up by confirmatory analyses (CFA) with another sample to investigate the scale's model fit, and thus

its construct validity. In addition, it is important to obtain convergent and discriminant validity, which requires measures of closely related and different constructs, respectively. Future studies should (1) examine convergent validity, by applying observational methods that assess parental support for drawing, and investigate if the scale correlates with these findings; and (2) assess divergent validity, by measuring parental support for literacy and numeracy, and inspect their correlation with parental support for drawing.

A second limitation concerns the skewed representation of gender and nationalities in the reviewed literature and current study. With regards to gender, our parent sample consisted mostly of women (84.7%). Since parent-child interactions during joint activities occasionally differ as a function of parent gender (Huang et al., 2021), we cannot say whether the identified support and four-factor model sufficiently reflects parental support for drawing provided by fathers. In addition, our background literature and literature review for the item development process for the PSDQ were based on a predominantly Western sample, limiting its applicability across cultures. It is known that parenting style significantly differs between cultures (Huntsinger et al., 2011; Lim et al., 2014). Moreover, parental engagement with learning activities also shows intercultural differences (e.g., numeracy: LeFevre et al., 2010; symbolic development: Callaghan, 2011). Therefore, we could expect cross-cultural differences in the underlying structure of parental support for drawing. More research is needed to evaluate the validity of the PSDQ in more diverse populations.

5. Conclusions

This study described the process of building and validating the PSDQ as a novel tool to measure parental support for drawing. The final version consists of 14 items and four subscales assessing different types of parental support: the provision of space and drawing material (Resource support), joint drawing activities (Joint drawing), enhancing the child's drawing skill (Scaffolding), and praising the child during and after the drawing activity (Praise). Overall, the PSDQ has adequate psychometric properties and internal consistency, and thereby provides a sound instrument for assessing the influence of parental support in the context of drawing. The existence of the four subscales allows researchers to analyze the contribution of each *type* of parental support. Given the prominence of drawing behavior in early childhood and its relation to the cognitive and creative development of children, the application of the PSDQ can yield a better understanding of the influence of caregivers on the early ontogeny of cognition and creativity. We encourage researchers to build upon this knowledge to further refine the construction and validation of the PSDQ. The next steps in the validation process include the investigation of the scale's construct validity, as well as improving the generalizability of the scale by using a more diverse sample.

Data availability statement

The data associated with this research will be made available at Dataverse.nl.

CRedit authorship contribution statement

Brenda de Groot: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Project administration. **Naïke D. Gorr:** Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **Mariska E. Kret:** Supervision, Writing – review & editing. **Carolien Rieffe:** Writing – review & editing. **Yung-Ting Tsou:** Writing – review & editing, Formal analysis. **Larissa Mendoza Straffon:** Conceptualization, Supervision, Writing – review & editing, Funding acquisition, Resources.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Supplementary materials

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Appendix

Parental Support for Drawing Questionnaire (PSDQ)

Below you find 14 questions. The questions generally inquire how often a situation applies or takes place. The answer options range from “Never” to “All the time”. When filling in the survey, you can think of the general situation over the past half year. The statements apply to the home situation.

There are no right or wrong, or better or worse answers. We assure you that your responses to this survey will be kept confidential, and that neither you nor your child can be identified from the collected data.

Please answer the questions below.

1. Does your child have access to a <u>wide variety</u> of drawing utensils at home (for example, colored pencils, markers, paint, crayons, charcoal, coloring books, etc.)?						
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1	2	3	4	5	6

2. How often do you provide your child with books, magazines, (digital) drawing games, or other material as drawing inspiration?						
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1	2	3	4	5	6

3. Do you (or would you) allow your child to draw in different places within the house (e.g., at the dining table, on the floor, etc.)?						
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1	2	3	4	5	6

4. How often do you display your child's drawings in the house?						
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1	2	3	4	5	6

5. How often do you encourage your child to draw by suggesting to draw together?						
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1	2	3	4	5	6

6. How often do you sit with your child while he/she is drawing?						
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(continued on next page)

(continued)

6. How often do you sit with your child while he/she is drawing?							
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time	
0	1	2	3	4	5	6	

7. How often do you pay attention to what your child is drawing?							
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time	
<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	

8. How often do you draw together with your child if he/she asks you to do so?							
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time	
<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	

9. (When your child draws,) how often do you help to improve his/her drawing skills?							
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time	
<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	

10. (When your child draws,) how often do you help to draw certain things by demonstrating it?							
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time	
<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	

11. (When your child draws,) how often do you make verbal suggestions on how to draw certain things?							
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time	
<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	

12. How often do you praise your child while he/she is drawing?							
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time	
<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	

13. How often do you praise your child when he/she has completed a drawing?							
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time	
<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	

14. Do you praise your child also if his/her drawing is not so good?							
Never	Almost never	Occasionally	Half of the time	Often	Almost all the time	All the time	
<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	

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