Roeper Review

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/uror20

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To cite this article: A. C. Sven Mathijssen, Max J.A. Feltzer, Lianne Hoogeveen, Jaap Denissen & Anouke Bakx (2023) Back to the Drawing Board Again: Potential Indicators of Giftedness in Human Figure Drawings of Children Aged 4 to 6 Years, Roeper Review, 45:2, 128-139, DOI: 10.1080/02783193.2023.2172756

To link to this article: https://doi.org/10.1080/02783193.2023.2172756

Published online: 27 Mar 2023.

ROEPER REVIEW
2023, VOL. 45, NO. 2, 128–139
https://doi.org/10.1080/02783193.2023.2172756

Routledge
Taylor & Francis Group

VISUAL-SPATIAL IDENTIFICATION PROCESSES

Back to the Drawing Board Again: Potential Indicators of Giftedness in Human Figure Drawings of Children Aged 4 to 6 Years

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ABSTRACT

The present study aimed to determine whether exceptional items in human figure drawings (HFDs) can serve the identification process of talents and (educational) needs of children with high intellectual abilities. Participants were 152 children aged 4 to 6 years at the time of drawing. After 2 years, 85 had received regular curriculum (the *typically developing* group) and 67 had received enriched curriculum (the *potentially gifted* group). Analyses of item categories suggested that HFDs can serve as a screener for giftedness for 4- and 5-year-olds, but not for 6-year-olds. For 4- and 5-year-olds, the presence of items that indicated *what* is drawn or indicated deliberate abnormalities in shape and size predicted the likelihood of being in the *potentially gifted* group. No such predictive relation was found for items that indicated *how good* drawings look.

KEYWORDS

giftedness; human figure drawings; identification; screening; young children

Research and practice in the field of giftedness have made shifts from measuring cognitive capacities and describing characteristics to determine who is gifted (and who is not) to identifying talents and needs and how to meet and foster them (Lo & Porath, 2017). However, since (educational) professionals do not receive standard training about giftedness, they are not always able to identify and meet the talents and needs of children with high (intellectual) abilities (Mathijssen et al., 2021). In this paper, we consider children with high abilities as outlined in Ambrose and Machek:

> children who give evidence of high performance capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who require services or activities not ordinarily provided by the school in order to fully develop such capabilities. (2015, p. 121)

Our specific focus is on the intellectual domain.

When the talents and needs of children with high intellectual abilities are not properly assessed, these children might be at risk for not being able to develop their talents optimally. This is because intellectual potential does not always result in academic achievement (Emerick, 1992; Siegle & McCoach, 2018). Many gifted education programs still rely heavily on the outcome of intelligence tests for admission (Borland, 2009; Card & Giuliano, 2016; McBee, 2010). However, researchers state that IQ scores alone are insufficient when it comes to identifying the talents and needs of children with high intellectual abilities (e.g., Davis et al., 2014). Their needs are not limited to the intellectual domain and, according to Ziegler and Stoeger (2012), it has not been sufficiently demonstrated that IQ gives a good estimate of giftedness. Identification processes should therefore not be limited to the intellectual domain, and Dağlıoğlu et al. (2010) strongly suggested to include human figure drawings (HFDs).

Given the reasons mentioned above, we proposed an additional method that might improve the identification process of talents and needs of children with high intellectual abilities (Mathijssen et al., 2018). This new way of early identification concerns the analysis of human figure drawings (HFDs) for *non-exceptional* (i.e., frequently occurring) and *exceptional* (i.e., non-frequently occurring) items. We hypothesized that the latter are possibly including indicators of giftedness because they involve creativity, which is generally seen as a part of giftedness (e.g., Faber et al., 2021).

Exceptional and non-exceptional items in human figure drawings

The analysis of HFDs based on the presence of exceptional items that might indicate giftedness has not thoroughly been studied yet. Traditionally, research in children's drawings focused on aggregated scores and comparing those to norms of age, gender, and intelligence (Harris, 1963; Naglieri, 1988). Since the scores in these traditional HFD tests are based on the *number* of drawn items rather than on the *nature* of the items, this way of analysis provides little insight into *what* is drawn by children and what is not. There are many

CONTACT A. C. Sven Mathijssen sven.mathijssen@ru.nl CBO Talent Development, Toernooiveld 100, Nijmegen 6525 EC, The Netherlands.

publications that emphasize looking beyond IQ scores when identifying talents and needs of children with high abilities (e.g., Davis et al., 2014; Gottfried et al., 1994; Pfeiffer & Blei, 2008), for example, to prevent academic underachievement due to test anxiety (Harris & Coy, 2003). In addition, several empirical studies found no differences between the standardized scores gained from HFD analysis ("drawing IQs") of children with high intellectual abilities and typically developing children (Dağlıoğlu et al., 2010; Mathijssen et al., 2016; Metin & Aral, 2020). We therefore argue that the analysis of HFDs on an item level, instead of comparing drawing IQs, might be more fruitful for gaining insight into the expression of giftedness. In turn, establishing aspects of drawing behavior that covary with giftedness might help identifying the talents and needs of children with high intellectual abilities earlier and easier.

Drawing human figures is something that children do in a recognizable way from a very early age (Cox, 1993; Feltzer, 1975; Koppitz, 1968). Because they have done it so often before, they might not feel threatened by the task to draw a person (Flanagan & Motta, 2007; Skybo et al., 2007). Drawings are also inexpensive and not time consuming to implement in the classroom or a psychological setting. HFDs could therefore be a valuable part of a larger test battery (Dykens, 1996). In addition, HFDs provide the opportunity to express creativity.

Creativity is generally seen as a part of giftedness (Faber et al., 2021; Gagné, 2010; Kroesbergen et al., 2016; Piirto, 2013; Renzulli, 1976; Ziegler et al., 2013). Creativity involves generating novel ideas and thinking flexibly and out-of-the-box (Sternberg, 2004), and is inherent to drawing in terms of fluency, elaboration, and originality (e.g., Hui et al., 2015). This justifies the investigation of HFDs as a screener in the identification process of giftedness. In previous studies (Mathijssen et al., 2016, 2022), we therefore expected samples of children with high intellectual abilities to produce more novel drawings than typically developing samples. Mathijssen et al. (2016) compared the HFDs of children (aged 7 to 9) enrolled in full-time gifted education and children enrolled in regular education and found that 30 items were exclusively present in the drawings of children who follow gifted education. These items were called *exceptional items* and they were generally not necessary to make the drawn figure human. In a subsequent study, Mathijssen et al. (2022) compared the HFDs of children (aged 4 to 6) who were considered *potentially gifted* (based on teacher nomination) with drawings of typically developing children. Exceptionality was defined as items occurring in less than 15% of the drawings (following Koppitz, 1968). Results showed exceptional items to be most visible in HFDs of children in the potentially gifted group at the age of 4. However, due to the explorative and descriptive nature of our earlier studies, the low number of children with high intellectual abilities, and the resulting lack of power to conduct statistical analyses, we have not yet been able to generalize these preliminary findings and had to draw conclusions with caution. We recommended further research with larger groups of children, particularly a larger subsample of children with high abilities, in order to draw more solid conclusions.

Social and emotional development and human figure drawings

For identification of talents and needs of children with high intellectual abilities, social and emotional development has not been extensively discussed in the literature on HFDs. This is a missed opportunity because assessing social and emotional development might be relevant for two reasons. First, several views on giftedness take into account social and emotional characteristics, such as motivation, locus of control, anxiety, and relations with individuals in the environment (Gagné, 2004, 2009; Heller, 2004, 2009; Piirto, 2000; Ziegler et al., 2013). Second, although the basic social needs of children with high intellectual abilities are the same as the needs of typically developing children (Bakx et al., 2019; Robinson, 2008) and several studies show that children with high abilities on average are not more susceptible to social and emotional problems than typically developing children (Altman, 1983; Vialle et al., 2007), individual children with high intellectual abilities can still experience social-emotional problems (Blaas, 2014). This is especially true when they experience a mismatch between their educational needs and the educational environment (Bakx, 2019; Rinn, 2018). For example, they might feel under-challenged in regular school settings (Jarvin & Subotnik, 2015), or lack like-minded peers (Espelage & King, 2018; Kroesbergen et al., 2016; Peterson & Jen, 2018). If a mismatch occurs, it might lead to experiencing social and emotional difficulties (Lee et al., 2012; Roedell, 1984; Vialle & Rogers, 2012). This deserves attention, since poor social and emotional well-being was found to be positively correlated with underachievement (Blaas, 2014).

According to Thomas and Silk (1990), children's drawings have been researched in the social and emotional domain as possibly containing (a) manifestations of personality traits, (b) validation of emotional indicators, or (c) salient topics for the children at the time of drawing. However, previous studies have often been

limited and produced inconsistent results in terms of validity. This left experts taking polarized views on the use of HFDs in the detection of social-emotional problems in children. The most promising validity evidence comes from a line of research using HFDs to derive emotional indicators (Mathijssen et al., 2018).

Emotional indicators (EIs) in HFDs as introduced by Koppitz (1968, 1984) were described this way because they correlated with emotional problems in children. For example, teeth and big hands occurred more often in the drawings of children who showed aggressive behaviors, and shading of body parts in HFDs was associated with anxiety in children. Although EIs have been found to be drawn more frequently by groups of children with emotional disturbances, misclassifications of individuals based on EIs happened often (Chantler et al., 1993; Flanagan & Motta, 2007; Fuller et al., 1970). To the extent of our knowledge, EIs in HFDs of young children have not yet been studied within research on giftedness. Therefore, it is very interesting and might reveal new insights to investigate whether Koppitz's (1968, 1984) EIs are of added value in a screener for HFDs that can be used as part of the process for identifying the talents and (educational) needs of children with high intellectual abilities.

Koppitz's scoring system for HFDs includes a list of 30 EIs, and also a list of 30 *developmental items* (Koppitz, 1968, 1984), which can either be classified as *expected* or *exceptional* at a certain age. EIs are classified as exceptional if they occur in less than 15% of HFDs at a certain age level. So, some of the EIs have been only considered an EI by Koppitz from certain ages on. The omittance of body parts, for example, might not be the result of emotional problems, but of cognitive and motor skills that might seem immature but are age appropriate. Koppitz has not investigated how often EIs occur in HFDs of children younger than 5 years of age or in children with high intellectual abilities. Neglecting EIs purely based on age as indicated in Koppitz's system may result in excluding relevant information beforehand.

Present study

For the present study, we used the drawings collected and dataset created in Mathijssen et al. (2022), along with additional information about the school development we received from the parents 2 years after the drawings were made. This allowed us to distinguish typically developing children from children with high intellectual abilities in accordance with our operationalization of giftedness (i.e., children who give evidence of high intellectual abilities and require services or activities not ordinarily provided in the regular classroom). The present study aimed to investigate if selections of exceptional items covaried with this operationalization, in order to develop a screener for HFDs of children with high intellectual abilities. As a first criterion, the screener should be able to significantly distinguish between children with high intellectual abilities and typically developing children and thus to correctly assign most of the children to the *potentially gifted* or *typically developing* group.

To investigate this, we analyzed exceptional items in four item categories. First, we identified a category of *Initially Found items*, in the sense that they were initially found in the first Mathijssen et al. (2016) publication. These items mainly consisted of content items, such as a head, eyes, and hands and fingers drawn as a whole. Second, *Formal items* (Harris, 1963; Naglieri, 1988) require a certain level of motor and spatial ability and indicated how items were drawn (such as in the correct proportion, firm lines without irregularities, and lines that suggested a sketching technique). Third, *Newly Found items* were found in the newer Mathijssen et al. (2022) publication and consisted of content or formal items that were neither part of the Initially Found item list (Mathijssen et al., 2016) nor of the Formal item list (Harris, 1963; Naglieri, 1988). These items were: backside of paper used, a beard, a mustache, antennae, hair on the legs, and pubic hair. Fourth, we identified an *Emotional Indicators* category based on Koppitz (1968, 1984).

The research question was: "Which item categories of exceptional items drawn in HFDs of children aged 4 to 6 are statistically associated with our operationalization of giftedness?" We expected exceptional items in our three content item categories (i.e., the Initially Found item list, the Newly Found item list, and the EIs) to be drawn more often by children with high abilities than by typically developing children. We expected these items to be potential indicators of giftedness, because content items (i.e., *what* items are drawn) are more likely than formal items (i.e., *how* items are drawn) to be the result of creativity in terms of flexibility, fluency, elaboration, novelty and originality (Hui et al., 2015; Sternberg, 2004).

Differences in drawings of 4-, 5-, and 6-year-olds were taken into account, given that young children's drawings develop rapidly with age in terms of the number of drawn items (Cox, 1993; Feltzer, 1975). Based on the findings of Mathijssen et al. (2022), we expected exceptional items to be observed more frequently in the subsample of 4-year-old children with high abilities, compared to typically developing 4-year-olds (Mathijssen et al., 2022). We therefore expected the biggest predictive value of exceptional items in HFDs of 4-year-olds.

Method

Participants

The participants were 152 children (74 boys, 78 girls) from the Mathijssen et al. (2022) study. They were from three different elementary schools in the south of the Netherlands. The schools were all part of the research project *POINT*, in which researchers, teacher educators and teachers in the field of giftedness collaborate in bridging the gap between science and (educational) practice (Henrichs et al., 2017). The age span of the children was 4 to 6 years (M = 4.81, SD = 0.73). Fifty-seven children were aged 4, 67 children were aged 5, and 28 children were aged 6. The children were divided into two groups based on information we received from their parents about the children's school development, 2 years after the children made the drawings for the present study. Eighty-five children received regular education without structural adaptations to the regular curriculum, the *typically developing* (TD) group. Sixty-seven children received structural adaptations to the regular curriculum aimed at meeting above average academic abilities (e.g., enrichment or a pull-out program), the *potentially gifted* (PG) group. This is aligned with the operationalization of giftedness we adopted from Ambrose and Machek (2015). In other words, these children gave evidence of high intellectual abilities and required services or activities not ordinarily provided in the regular classroom.

Procedure and materials

The research project was approved by the institutional ethics committee of Fontys University. Parent(s) or caretaker(s) (for ease of reading, hereafter called *parents*) were informed by a letter about the purpose of the study, and were asked to give active consent for participation of their child and if they would be willing to answer questions about the school development of their child in the future. The drawings were collected at school. The teachers handed out the drawing tasks according to a protocol, in absence of the investigators. The teachers were asked to strictly follow the protocol and instructions provided by the investigators. The teachers gave the following verbal instructions for the HFD: "You will soon receive a blank sheet of paper. You will draw a human figure. Draw a full human figure. You can use the whole sheet. Draw the human figure using only a gray pencil, without an eraser. When you are done drawing, lay down your pencil, so I can see I can collect your drawing." Teachers were instructed not to intervene if children did not abide by the instructions, and to give a general answer if children would ask what to or what not to draw. Children were given approximately 15 minutes to complete their drawing. After the drawings were completed, the teacher collected the drawings. The drawings were anonymized and marked with ID numbers on the backside. A dataset with information about the children and the corresponding ID numbers made it possible to trace back drawings to the children and their parents.

Two years after the drawing task was given, the parents who gave their email addresses were contacted to inform us about the school development of their child. We asked the parents for this information because the schools were under European Union law prohibited from providing this information to us (General Data Protection Regulation, 2016). The parents were asked the following: "Did [first name] receive any educational adaptations in the past few years? If so, which educational adaptations? (for example, think of curriculum compacting, enrichment, counseling, participating in a pull-out program etc.)." These questions aimed to determine whether or not a child received services or activities not ordinarily provided by the school in order to develop their (intellectual) capacities and in turn made it possible to divide the participating children into the TD and the PG group.

Parents who did not respond were reminded once or twice after one and two months respectively. Of the parents of 206 children who contributed drawings, 177 (86%) responded. Of 152 children, parents informed us that their child(ren) either received no educational adaptations or received structural educational adaptations aimed at meeting above average intellectual abilities. The drawings of these children were included in the present study. The drawings of 54 children were excluded from the present study because their parents did not respond, it was not clear what adaptations were made, if structural adaptations were made (e.g., "receives extra tasks" or "extra challenge") but parents were unable to specify further, or if there were also educational adaptations aimed at meeting below average abilities in other domains (e.g., adaptations due to dyslexia or ADHD).

To analyze the drawings, 158 items from the aforementioned four item categories (*Initially Found items, Formal items, Newly Found items* and *Emotional Indicators*) were scored as "present" or "not present" in the drawings.

Data analysis

Two investigators (the first and second author of the present study), who were experienced in analyzing

HFDs, analyzed the drawings without identifying information of the children, and independently from each other. There were some discrepancies in the judgments of the two investigators (i.e., an item was considered present in a drawing by one investigator but considered absent by the other), which were addressed during a meeting. The investigators reached an overall interrater agreement of 96.35%. If the investigators could not agree on whether or not an item was present in a drawing, the item was scored as *no agreement* and treated as a missing value.

Exceptional items were analyzed to determine their predictive value as potential indicators of giftedness in HFDs. Exceptional items were items that occurred in less than 15% of the drawings according to the two investigators (Mathijssen et al., 2022). This cutoff is in line with Koppitz's (1968) ranges. Exceptional items that were drawn only or more frequently by children in the PG group were focus items of the present study. Items that were drawn at least once by children in the TD group had to be included, because otherwise no statistical solutions would result from binary logistic regression analyses. If an item was drawn more than once by TD children, we only considered it a focus item if there were at least two more PG children who drew this exceptional item too.

The presence of focus items was entered in four categorical variables with the following focus item categories: *Initially Found* focus items, *Formal* focus items, *Newly Found* focus items, and *Emotional Indicator* focus items. The focus items in each category varied per age group (see Table 1). Children who drew at least one focus item within an item category scored 1 and children who drew none scored 0. We decided to analyze the focus items in the aggregate instead of single focus items, because analyses of single items would require a large number of statistical tests. A Bonferroni Correction of far below .001 and unrealistic effect sizes would then be necessary to reduce the chance of a Type I error. To determine the predictive value of the focus items in HFDs for the likelihood of being in the PG group, binary logistic regression analyses were performed for the focus items per age group and per item category. The focus items were considered the predictor variables for being in the PG group. A significance threshold of .01 was used for each of the performed logistic regression analyses to reduce the chance of a Type I error due to multiple comparisons.

Results

Determination of focus items

The focus items differed per age group and per item category. In none of the age groups *Newly Found* items were considered focus items. For 4-year-olds, there were 21 *Initially Found* focus items, 7 *Formal* focus items, and 7 *Emotional Indicator* focus items. For 5-year-olds, there were 20 *Initially Found* focus items, 3 *Formal* focus items, and 7 *Emotional Indicator* focus items. For 6-year-olds, there were 4 *Initially Found* focus items, 0 *Formal* focus items, and 3 *Emotional Indicator* focus items. See Table 1 for an overview of all focus items per age group and item category.

Table 1. Overview of focus items per age group and per item category.

	Focus Items		
Item Category	4-year-olds	5-year-olds	6-year-olds
1. Initially Found items (Mathijssen et al., 2016)	Headband; Ears; Eyelashes; Nose (more than dots or single circle); Nasal bridge; Mouth (more than single line); Lips; Neck fully attached to trunk; Shoulders fully attached to trunk; Trunk and arms as a whole; Nipples; Arms (more than single lines); Belt (upper body clothing); Print (upper body clothing); Fingers (more than single lines); Legs (more than single lines); Legs fully attached to trunk; Crotch; Toes; Multiple human figures; Frame around the human figure	Ears (more than a half circle); Iris; Ala (nose); Teeth; Waist; Nipples; Buttons (upper body clothing); Thumb; Fingers fully attached to hands; Hands and fingers as a whole; Knees; Socks; Print on socks; Feet not from the side; Toes (more than single lines); Feet and toes as a whole; Wings; Multiple human figures; Animal(s); Page turned diagonally	Waist; Navel; Genitals; Object (in hand or next to human figure)
2. Formal items (Harris, 1963; Naglieri, 1988)	Arms in proportion; Fingers in proportion; Legs in proportion; Mouth in proportion; Nose in proportion; Trunk and arms as a whole; Lines in legs are well controlled	Fingers in proportion; Nose in proportion; Lines in arms are well controlled	
3. Newly Found items (Mathijssen et al., 2022)			
4. Emotional Indicators (Koppitz, 1968, Koppitz, 1984)	Shading of the body and/or limbs; Shading of the hands and/or neck; Asymmetry in shapes of arms and/or legs; Big figure; Relatively tiny head; Multiple (≥ 3) unrelated figures; Clouds[a]	Tiny figure; Big figure; Teeth; Relatively short arms; Relatively big hands; Multiple (≥ 3) unrelated figures; Omittance of arms	Shading of the hands and/or neck; Relatively big hands; Genitals

[a]Any representation of clouds, rain, snow, or birds in flight are considered in this item.

Analyses of focus items

Initially found focus items

The binary logistic regression analyses showed statistically significant models for *Initially Found* focus items and the likelihood of being in the PG group for 4-year-olds (χ^2 (1, $n = 43$) = 10.51, $p = .001$), 5-year-olds (χ^2 (1, $n = 61$) = 14.84, $p < .001$), and 6-year-olds (χ^2 (1, $n = 27$) = 14.60, $p < .001$). This showed that all models could distinguish between children in the PG group and children in the TD group. The *Initially Found* focus items together significantly contributed to the models: the model for 4-year-olds explained 21.7% (Cox & Snell R square) to 29.0% (Nagelkerke R square) of the variance in the dependent variable and correctly classified 74.4% of the cases, and the model for 5-year-olds explained 21.6% (Cox & Snell R square) to 28.8% (Nagelkerke R square) of the variance and correctly classified 73.8% of the cases. However, for 6-year-olds the final solution could not be found. The Initially Found focus items together appeared to be positive predictors of being in the PG group for 4-year-olds and 5-year-olds, but not for 6-year-olds (see Table 2).

Formal focus items

The binary logistic regression analyses showed no statistically significant model for the *Formal* focus items and the likelihood of being in the PG group for 4-year-olds (χ^2 (1, $n = 46$) = 2.52, $p = .113$) and 5-year-olds (χ^2 (1, $n = 54$) = 3.07, $p = .080$). This showed the models could not distinguish between children in the PG group and children in the TD group for 4- and 5-year-olds. The *Formal* focus items together appeared to be no positive predictors of being in the PG group for 4-year-olds and 5-year-olds (see Table 2). For 6-year-olds, there were no *Formal* focus items that could be analyzed through logistic regression.

Emotional indicator focus items. The binary logistic regression analyses showed statistically significant models for the *Emotional Indicator* focus items and the likelihood of being in the PG group for 4-year-olds (χ^2 (1, $n = 52$) = 6.93, $p = .008$) and 5-year-olds (χ^2 (1, $n = 67$) = 14.83, $p < .001$). This showed that the models could distinguish between children in the PG group and children in the TD group for 4- and 5-year-olds. The *Emotional Indicator* focus items together significantly contributed to the models: the model for 4-year-olds explained 12.5% (Cox & Snell R square) to 16.8% (Nagelkerke R square) of the variance in the dependent variable and correctly classified 69.2% of the cases. The model for 5-year-olds explained 19.9% (Cox & Snell R square) to 26.5% (Nagelkerke R square) of the variance and correctly classified 71.6% of the cases. For 6-year-olds, the model was not statistically significant (χ^2 (1, $n = 28$) = 3.52, $p = .061$), suggesting the model could not distinguish between children in the PG group and children in the TD group. The *Emotional Indicator* focus items together appeared to be positive predictors of being in the PG group for 4-year-olds, and 5-year-olds, but not for 6-year-olds (see Table 2).

Table 2. Logistic regressions of the focus items predicting the likelihood of being in the PG group per age group.

Age	Item Category	*B*	*SE*	Wald	*df*	*p*	*OR*
4	Initially Found focus items	2.13	0.70	9.18	1	.002	8.40
	Constant	−1.28	0.51	6.42	1	.011	0.28
	Formal focus items	1.42	0.93	2.35	1	.126	4.15
	Constant	−0.73	0.34	4.69	1	.030	0.48
	Newly Found focus items	N/A	N/A	N/A	N/A	N/A	N/A
	Constant	N/A	N/A	N/A	N/A	N/A	N/A
	Emotional indicator focus items	1.56	0.61	6.48	1	.011	4.75
	Constant	−0.94	0.39	5.70	1	.017	0.39
5	Initially Found focus items	2.13	0.60	12.79	1	<.001	8.43
	Constant	−1.34	0.46	8.59	1	.003	0.26
	Formal focus items	1.39	0.86	2.63	1	.105	4.00
	Constant	−0.13	0.30	0.20	1	.655	0.88
	Newly Found focus items	N/A	N/A	N/A	N/A	N/A	N/A
	Constant	N/A	N/A	N/A	N/A	N/A	N/A
	Emotional indicator focus items	2.10	0.60	12.42	1	<.001	8.17
	Constant	−1.48	0.50	8.94	1	.003	0.23
6	Initially Found focus items	–	–	–	–	–	–
	Constant	–	–	–	–	–	–
	Formal focus items	N/A	N/A	N/A	N/A	N/A	N/A
	Constant	N/A	N/A	N/A	N/A	N/A	N/A
	Newly Found focus items	N/A	N/A	N/A	N/A	N/A	N/A
	Constant	N/A	N/A	N/A	N/A	N/A	N/A
	Emotional indicator focus items	2.02	1.20	2.81	1	.093	7.50
	Constant	−0.63	0.44	2.06	1	.151	0.53
	All focus items for 6-year-olds	*3.05*	*1.19*	*6.58*	*1*	*.010*	*21.0*
	Constant	*−1.10*	*0.52*	*4.53*	*1*	*.033*	*0.33*

Note. For 6-year-olds, the final solution could not be found for the Initially Found focus items.

All focus items for 6-year-olds clustered together. Given the small sample size in combination with the low number of focus items for 6-year-olds (which involved only content items: 4 Initially Found and 3 Emotional Indicator focus items) and the ambiguous results from the analyses described above, we decided to perform binary logistic regression analyses on the combined focus items for this age group. The binary logistic regression analyses showed a statistically significant model for the combined focus items and the likelihood of being in the PG group for 6-year-olds (χ^2 (1, n = 28) = 9.72, p = .002). This showed that the model could distinguish between children in the PG group and children in the TD group. All focus items clustered together significantly contributed to the model: it explained 29.3% (Cox & Snell R square) to 39.4% (Nagelkerke R square) of the variance and correctly classified 78.6% of the cases. All focus items clustered together appeared to be positive predictors of being in the PG group for 6-year-olds (see Table 2).

Discussion

Exceptional items as potential indicators of giftedness

The answer to the research question, which item categories of exceptional items drawn in HFDs of children aged 4 to 6 are statistically associated with our operationalization of giftedness, is that *Initially Found* and *Emotional Indicator* focus items as categories appear to be positive predictors of being in the PG group for 4- and 5-year-olds, but not for 6-year-olds. For 6-year-olds in this study, this only seemed the case when the *Initially Found* and *Emotional Indicator* focus items were combined. This could suggest that the combination of a small sample size and a low number of focus items provides insufficient support for conclusions about potential indicators of giftedness in HFDs for this age group.

Formal focus items together as a category do not appear to be a predictor of being in the PG group for any of the age groups. Our expectation that exceptional items in content item categories are drawn more frequently by children in the PG group than by children in the TD group was therefore supported. However, this does not apply to the Newly Found item category, because there were no focus items in this category. Our expectation that exceptional items would be observed more in the drawings of 4-year-old children in the PG group than in the drawings of children in the TD group is partially supported, since the findings suggest that drawing at least one *Initially Found* or *Emotional Indicator* focus item may serve as a potential indicator of giftedness for 4- and 5-year-olds, but for 6-year-olds this only seemed the case when all focus items were clustered together.

What makes the findings of the present study interesting and important is the different nature of these item categories. The *Initially Found* focus item category mainly comprises exceptional *content* (i.e., items that indicate *what* is drawn). The *Emotional Indicator* focus item category also comprises content items and items that indicate *deliberate* abnormalities in shape or size (e.g., abnormally large or tiny body parts that do not result from immature motor skills). In contrast, the *Formal* focus item category comprises items that indicate how "good" the drawing *looks* (i.e., indications of *how* the items are drawn, such as correct proportions or firm and deliberate lines), which require a certain level of fine motor and spatial ability. Although some *Initially Found* focus items also have a formal nature (e.g., items that indicate whether or not body parts are fully attached to each other), this finding suggests that it is more informative to analyze *what* is drawn than to analyze *how good* the drawing looks. So, although drawing is found to be related to fine motor (Rehrig & Stromswold, 2018) and visuospatial ability in young children (Toomela, 2002), findings from the present study suggest that the exceptional items that appear to be positive predictors of giftedness in 4- and 5-year-olds may not be dependent on fine motor and spatial skills as much as initially thought (Mathijssen et al., 2022). This topic requires further investigation.

Limitations and future research

A number of limitations should be addressed for the present study. Per age group, the subsamples were relatively small. Future research with more participants per age group, especially 6-year-olds, is necessary to be more conclusive about whether the present findings are generalizable to the population of children in the ages of 4 to 6.

A larger sample size would also make it possible to take into account social and cultural aspects like ethnicity and SES. Drawings tend to be influenced by surroundings, including society and culture (Coates & Coates, 2006; Gentle, 1985). Therefore, it varies across cultures what items in drawing development are considered "early" or "late" and what items are sufficient to represent a whole person (Cox et al., 2001). However, less is known about differences and similarities in drawings of children with diverse sociocultural backgrounds in the same classroom.

The available information about the participants was limited. Information about the school development was collected, but information about emotional development

was not available. Children tend to draw what is personally or emotionally important to them (Thomas & Silk, 1990). It is therefore advisable for future research to also collect information about the emotional development and the home environment. Although the validity of drawings for assessing emotional development has been disputed (Piotrowski, 2015), this information may provide more insight into what the presence of *Emotional Indicators* in drawings of children with high abilities means. Lack of this information and the knowledge that misclassifications of individuals based on EIs happen often (Chantler et al., 1993; Flanagan & Motta, 2007; Fuller et al., 1970) prohibit conclusions about the emotional development of the participants in the present study. Future research is required to investigate whether the presence of EIs in HFDs of children with high abilities actually covaries with emotional difficulties, for example, due to a mismatch between the children's educational needs and the educational environment (Bakx, 2019; Rinn, 2018).

The drawing tasks were given by the teachers at times that fit their agendas and were convenient for them. The tasks were sometimes given at the same time in different classrooms and different schools. It was therefore not possible for the investigators to be present at the time of the drawings, and no checks were done to make sure teachers abided by the instructions sent by the investigators. We therefore cannot guarantee that all drawings were made with the same instructions. We did not find drawings containing indications that the instructions were not followed, but to be fully certain, it is recommended for future research to use a method that ensures that all drawing tasks are performed in accordance with the instructions. This may for example, be possible by a video or audio recording of an investigator who gives the instructions for the drawing task.

We recommend future research to be aimed at cross-validation of the current findings. The drawings in the present study have been collected in class, without the possibility of discussing the drawings with the children. However, drawing also is a process that is done naturally from an early age on, often without instructions. Future research into the outcomes of drawings that are made individually is recommended, because it provides the opportunity to have a conversation with the child about what is present in the drawing. This is advisable, given that the two experienced investigators of the present study did not reach 100% interrater agreement, even after a meeting in which they solved most of the discrepancies in their observations. Conversations with the child could give more conclusive information about the items drawn in the HFD.

Conversations about the drawing also may provide additional information about the child's cognitive and emotional functioning (Flanagan & Motta, 2007). This may be especially important and relevant to take into account for future research. In the present study, we assigned children who received structural adaptations to the regular curriculum aimed at meeting above average academic abilities to the *potentially gifted* subsample. We were not always informed about why the children received the adaptations, but since almost no parents provided information from intelligence, ability or achievement tests, we must assume that a substantial number of the curricular adaptations involved or were based on teacher nomination. Although teacher nomination is an often used method for identifying children with high intellectual abilities (Hoogeveen et al., 2004; Siegle et al., 2010), it has disadvantages of teacher nomination, such as only identifying well-adjusted (Davis et al., 2014) or well-performing children (Siegle et al., 2010), or children with a higher than average working memory (Kornmann et al., 2015). This means it is possible that the potential indicators of giftedness in HFDs found in the present study largely indicate those children who would (eventually) be nominated by teachers. Although it is promising to find that HFDs might help to identify the talents and needs of these children earlier and easier, it would be unfortunate if less adjusted and performing children would still be missed. Whether this is the case deserves further investigation.

Practical implications

The findings from the present study indicate that HFDs can be used as an early screener in the identification process of talents and (educational) needs of children with high intellectual abilities at the age of 4 and 5 years, but for 6-year-olds, further research is required before practical implications can be made. Drawing at least one of the *Initially Found* or *Emotional Indicator* focus items in a HFD seems to predict potential giftedness quite well, given that about 70% of the 4- and 5-year-olds were correctly assigned to the potentially gifted group or the typically developing group. This is a promising finding, since this implies possibilities for HFDs as a form of universal screening. Recent literature suggests that universal screening tools should be able to screen as many students as possible through assessment that is already given for other purposes and to use that assignment as an accessible screener that is quick to administer and requires no additional time and costs (Lee & Peters, 2022; Peters et al., 2019; Plucker & Peters, 2018). Children are often asked to draw a human figure upon school entry in the Netherlands, as is shown in the school policy plans found through an internet search of "menstekening school" (translation: "human figure drawing school"). Therefore, HFDs may serve as

a quick and inexpensive screener that is accessible for many, if not all, children upon school entry, by investing a pencil and a sheet of paper worth of money, approximately one min to two min in time for the drawing task, and approximately one min to two min per drawing for the analysis, depending on the experience of the investigator.

However, potential indicators found in HFDs should be seen as only a first indication and as only one part of multiple sources of information about the particular child. We therefore advise paying extra attention to children aged 4 to 5 whose HFDs stand out in terms of *Initially Found* and *Emotional Indicator* focus items, and at the same time to collect additional information about the cognitive, social, and emotional development to determine how to meet their educational needs. Additional observation, monitoring, or assessment using a more extensive test battery is always required to get a full view on the talents and needs of children with high intellectual abilities. At the same time, the presence of at least one *Initially Found* or *Emotional Indicator* focus item in HFDs seems to predict potential giftedness in almost 3/4 of the cases, at least in the current study. This could suggest that human figure drawings can serve as a valuable and fairly time and cost efficient screening tool in the identification process of talents and needs of children with high intellectual abilities at the ages of 4 and 5.

Acknowledgment

We would like to thank the children who participated, and their parents who gave permission for their child(ren) to participate. Thanks also to the schools and the teachers for their willingness to schedule the drawing task into the school program.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This research was funded by the Netherlands Initiative for Education Research [NRO 405-16-627/710].

ORCID

A. C. Sven Mathijssen http://orcid.org/0000-0002-5326-9340
Lianne Hoogeveen http://orcid.org/0000-0002-3362-240X
Jaap Denissen http://orcid.org/0000-0002-6282-4107
Anouke Bakx http://orcid.org/0000-0003-2983-2962

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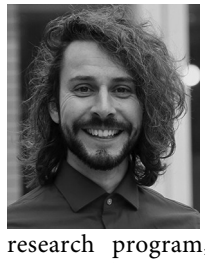
Notes on contributors



A. C. Sven Mathijssen is the vice program director of the Radboud International Training on High Ability (RITHA) and the ECHA Training. He is also the Editor-in-Chief of *Talent*, a Dutch popular-scientific journal about giftedness for teachers, and an external PhD candidate at Tilburg University. In his doctoral research program, he analyzes human figure drawings (HFDs) of children with high intellectual abilities. His goal is

to develop a screening instrument for analyzing HFDs that can be used as part of the identification process for talents and (educational) needs of young children with high intellectual abilities. sven.mathijssen@ru.nl

Max J.A. Feltzer is a developmental psychologist, researcher and teacher at Tilburg University, Tilburg, The Netherlands (Department of Developmental Psychology). His research interests involve children's drawings, cognitive and social-emotional development. Dr. Feltzer has more than 40 years' experience in these areas, and is currently working on several large-scale research projects involving construction of new psychological screening instruments to assess rate of development in children aged 0 to 12. m.j.a.feltzer@tilburguniversity.edu

Lianne Hoogeveen is endowed professor of "Identification, Support and Counseling of Talent," healthcare psychologist and the program director of the Radboud Inter-national Training on High Ability and the ECHA Training. She is president of the European Council for High Ability (ECHA). Lianne is a lecturer of Pedagogical and Educational Sciences at Radboud University and guest lecturer in several other European universities. She is involved in scientific research on giftedness and education in cooperation with colleagues of other universities, in and outside the Netherlands. lianne.hoogeveen@ru.nl

Jaap Denissen currently is professor of Psychological Growth and Maladjustment at Utrecht University after an 8-year period as full professor in Tilburg. He served as associate editor of the *International Journal of Behavioral Development* and the *European Journal of Personality*. He was elected early career representative of the International Society for the Study of Behavioral Development and served as president of the European Association of Personality Psychology. Jaap conducts research on the interface between the fields of personality, social relationships, and development. His work aims to integrate methodological and theoretical perspectives, for example, by incorporating motivational tendencies into models of personality. j.j.a.denissen@uu.nl

Anouke Bakx is a professor in giftedness at Radboud University and a lector "Learning and Innovating" at Fontys University for Applied Sciences. Her research is mainly aimed at the quality of teachers, especially those in gifted education. Building the bridge between science and practice is the focal point in all of her work. Anouke also is the chair of the scientific staff for PPF Center for High Potential. anouke.bakx@ru.nl