Psychological Test and Assessment Modeling, Volume 60, 2018 (4), 493-515

Identifying highly gifted children by analyzing human figure drawings: A literature review and a theoretical framework

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Abstract

There are still many problems in identifying highly gifted children, and professionals are in need of alternative identification procedures. Human figure drawings (HFDs) have since long been used in diagnostic assessments, but their use as an alternative identification instrument for highly gifted children has not been examined thoroughly yet. In this article, the possibilities to use HFDs as an instrument with which highly gifted children can be identified are explored. A brief history of giftedness and research on children's drawings is presented. Cognitive functioning, creativity and social-emotional functioning, and the possible expression of these psychological characteristics in drawings are discussed. Based on the literature reviewed, a theoretical framework is presented, in which suggestions for the analysis of HFDs for identification purposes are made. This involves going beyond the traditional method of computing drawing-IQ's when analyzing HFD's. This theoretical framework forms the basis for a research program that should eventually result in a well-founded diagnostic screening instrument to be used in the identification of highly gifted children.

Keywords: highly gifted children; human figure drawings

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In the field of giftedness, psychologists, educationalists, and teachers face a problem concerning the identification of highly gifted children; giftedness is not always reflected in academic achievement (Emerick, 1992). Causes for academic underachievement in highly gifted children are widely discussed in scientific literature (e.g. Baum, Renzulli, & Hébert, 1995; Kesner, 2005; Kroesbergen, Van Hooijdonk, Van Viersen, Middel-Lalleman, & Reijnders, 2015; Obergriesser & Stoeger, 2015), and involve individual as well as environmental factors. As a consequence, many highly gifted children may remain unidentified and may not receive the academic challenge they need. It is known that highly gifted children are often under-challenged in regular education (Jarvin & Subotnik, 2015) and are therefore in need of special (gifted) educational programs (Swiatek & Lupkowski-Shoplik, 2003; Winner, 1997). Highly gifted children whose educational needs are not met, are at risk for social-emotional difficulties and/or not reaching their full potential (e.g. Little, 2012; Reis & Renzulli, 2009; Yoo & Moon, 2006).

Many gifted education programs rely on the outcome of intelligence tests, ergo high IQ (usually > 130) becomes the entry ticket to many of these programs (e.g. Borland, 2009; Card & Giuliano, 2015; Kaufman & Sternberg, 2008; McBee, 2010; Newman, 2008; Pfeiffer, 2002; Stephens, 2008). This suggests that 'highly intelligent' is used as a synonym for 'highly gifted', rather than it is considered a characteristic of giftedness. However, it is known that some children score relatively low on an intelligence test despite their high potential (Silverman & Golon, 2008). Possible causes for poor performances are a low (academic) self-concept (Clark, 1992), dysfunctional interactions among the child's family members (Gallagher, 2005) or unusual scoring patterns (for example, high verbal skills and poor sequencing skills) (Gallagher, 1991) . These children do not meet the criterion of a certain IQ score and therefore are not allowed entrance into a gifted education program. Highly gifted children with disability labels are even less likely to be referred to gifted programs by teachers (Bianco, 2005).

Given the notions mentioned above, it seems advisable to look beyond the score on a standard IQ test alone, in order to identify highly gifted children; according to Pfeiffer and Blei (2008) "there exists no precise cut score or set of characteristics that differentiate gifted from not-gifted" (p. 178). Relying on a precise cut-off score may result in a lot of highly gifted children who will remain unrecognized and consequently underserved in schools. Therefore, professionals are in need of improved identification procedures.

A possibility to improve the identification process might be to add the use of children's drawings to the identification procedure. Children's drawings, in particular human figure drawings (HFDs), have been thought to give information on the cognitive development of children (e.g. Harris, 1963; Koppitz, 1968; Naglieri, 1988; Reisman & Yamokoski, 1973; Reynolds & Hickman, 2004) as well as difficulties in their social-emotional functioning (e.g. Catte & Cox, 1999; Cherney, Seiwert, Dickey & Flichtbeil, 2006; Matto, Naglieri & Clausen, 2005; Lassiter & Bardos, 1995). Social-emotional difficulties can occur in highly gifted children due to certain vulnerabilities in their development (Freeman, 1983, 1994; Reis & Renzulli, 2004), for example when the academic environment does not meet their cognitive and social-emotional needs (e.g. Roedell, 1984; Vialle & Rogers, 2012; Yoo & Moon, 2006). However, the validity of scoring systems for analyz-

ing HFDs as a measure of intelligence has often been a disputed issue (e.g. Abell et al., 1996; Dykens, 1996; Imuta, Scarf, Pharo, & Hayne, 2013; Lilienfeld, Wood, & Garb, 2000), and researchers also do not agree on the value of HFDs with regard to measuring social-emotional difficulties and well-being of children (e.g. Bonoti & Misalidi, 2015; Cox, 1993; Di Leo, 1983; Koppitz, 1966). The HFD validity debate will be discussed in more detail later on.

Despite different views on the validity of HFDs, analyzing HFDs for the purpose of identifying highly gifted children is a different approach that has hardly been studied yet. At first glance, HFDs may seem appealing tools to identify giftedness in children; they are easily embedded and may provide helpful information within a larger test battery (Dykens, 1996), they leave room for creativity, which is considered an important characteristic of giftedness throughout the literature (e.g. Mönks & Mason, 2000; Renzulli, 2003; Ziegler, Vialle, & Wimmer, 2013), and they may give information on possible social-emotional difficulties. In addition, most children are not threatened by the task to draw a person (Flanagan & Motta, 2007; Skybo, Ryan-Wenger, & Su, 2007), which consequently may prevent test anxiety. This may be an important factor, since test anxiety is a possible cause for academic underachievement (Harris & Coy, 2003).

To find support for the use of HFDs as a method to identify highly gifted children in psychological evaluation, a literature review has been undertaken, which is presented in the sections that follow. It starts with past and current views on the subject of giftedness, paying special attention to characteristics and identification. Then, the development of children's drawings, with HFDs in particular, will be given attention, followed by a review of the use of HFDs as a diagnostic instrument. It will be argued that existing literature gives indications for improving the identification process of highly gifted children by analyzing HFDs, which will be further explained in a theoretical framework.

Giftedness

Past and Current Views

The concept of giftedness finds its roots in measuring intelligence (Guignard, Kermarrec, & Tordjman, 2016); it has been a topic of interest for scientific investigation, ever since the 'Intelligence Quotient' (IQ) was introduced to quantify the mental abilities of people in the early twentieth century (Carson, 2001). Someone with a high IQ score was considered 'gifted' (Terman, 1926; Calero, Belen, & Robles, 2011). According to Davis, Rimm, and Siegle (2014), Terman found in his studies that his participants with high IQ (> 135 on the Stanford-Binet test, also called 'Termites') were more successful when they could accelerate according to their intellectual potential, and family values and parents' education were major factors with regard to being successful. Therefore, it is not strange that identification of gifted people was often done by measuring intelligence (Hollingworth, 1942; Winner, 1997). However, studies showed that intelligence consists of multiple domains, rather than one general factor. Thurstone's (1938) theory proposed that general intelligence was the dominant factor, but included seven specific mental

abilities (viz. verbal comprehension, word fluency, number facility, spatial visualization, associative memory, perceptual speed, and reasoning) which were found using factor analysis. Horn and Cattel (1966) found evidence that supported the theory that intelligence consists of both fluid and crystallized intelligence. Gardner (1983) described seven different intelligences (viz. linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, interpersonal, and intrapersonal), to which he later added naturalistic and existential (more spiritual) intelligence (Gardner, 1999, 2011). Finally, Sternberg (1997) proposed the theory of successful intelligence, in which intelligence is divided in three abilities (viz. analytical, practical, and creative) which are needed to be successful in life.

Measuring (general) intelligence turned out to be insufficient with regard to identifying gifted people, since "specific domains of intellectual giftedness are not measured by IQ" (Gottfried, Gottfried, Bathurst, & Wright Guerin, 1994, p. 2). Davis et al. (2014) considered this one of the limitations of the Terman studies. Currently, intelligence is mostly measured using the Wechsler tests (Camara, Nathan, & Puente, 2000) and IQ testing is still often used as a very prominent means of finding children 'suitable' for gifted programs, at least in the U.S.A. (Card & Guiliano, 2015).

Researchers do not agree on a single definition of giftedness and therefore, put briefly, Borland (2005) implies that giftedness has become a vague concept. Matthews and Folsom (2009) concluded that it would make better sense to identify the particular cognitive domains in which a child is talented, rather than saying a child is 'gifted', which may be the reason why in recent publications the dimension 'intellectual' is often added (e.g. Burger-Veltmeijer, Minnaert, & Van den Bosch, 2016; Francis, Hawes, & Abbott, 2015; Jarvin & Subotnik, 2015). However, what is considered to be gifted in recent scientific literature, goes beyond a high score on a standard IQ test. Although, as mentioned before, it is generally accepted that intelligence consists of many different domains, mainly Gardner's (1983, 1999, 2011) linguistic and logical-mathematical intelligences are valued in schools. But according to Hepworth Berger and Pollman (1996), "when the focus is strictly on the logical-mathematical or linguistic portion of education, only a portion of the child's abilities is tapped" (p. 249). As a consequence, creativity may consequently be overlooked. As mentioned earlier, creativity – in the sense of generating novel ideas, thinking flexibly and out-of-the-box (Sternberg, 2004) – is considered an essential part of many recent giftedness models (e.g. Mönks & Mason, 2000; Renzulli, 2003; Ziegler et al., 2013). Nowadays, many factors are taken into account and named differently throughout theories of giftedness, but essentially, they all cover the following: whether or not potential in a certain domain will be developed into excellent performance, is dependent on the influence of environmental factors and personal characteristics (e.g. Gagné, 2004, 2009; Heller, 2004, 2009; Mönks & Plüger, 2005; Piirto, 2005, 2013; Ziegler & Baker, 2013).

Given the notions mentioned above, detecting highly gifted children is not an easy task. Not all children with high abilities achieve a high overall IQ score (Winner, 1996). For example: some children achieve high in school but score average on an IQ test. The opposite is also true. The classic example of a so called 'underachiever' (e.g. Dowdall & Colangelo, 1982; Karwowski, 2008; Majid & Alias, 2010; Mooij, 2013; Preckel, Holling, & Vock, 2006; Reis & McCoach, 2000) is a child achieving high on an intelligence

test, but relatively low in school (Preckel et al., 2006). However, under the definition of "a discrepancy between potential (what a student ought to be able to do) and actual performance (what a student is actually demonstrating)" (Dowdall & Colangelo, 1982, p.179), a gifted child with an uneven intelligence profile – and an IQ score below the usually required minimum of 130 (Card & Giuliano, 2015) – may also be underachieving and will remain unidentified. This may explain why many professionals in the fields of psychology and education still fail to recognize and serve highly gifted children, despite broadened definitions of giftedness, intelligence and creativity (Reis, 2009).

The identification procedure of highly gifted children has made a shift from assessing cognitive capacities, to describing characteristics, behaviors, and traits (e.g. Betts & Neihart, 1988; Johnsen, 2004; Neihart & Betts, 2010). Throughout the literature about giftedness, creativity as a characteristic (e.g. Piirto, 2005, 2013; Renzulli, 2003) and social-emotional difficulties as expressed in behavior (e.g. Freeman, 1983, 1994; Reis & Renzulli, 2004), are mentioned often. Creativity is also considered to be expressed in HFDs (e.g. Hui, He, & Ye, 2015; Lee & Jun, 2015), as are social-emotional difficulties (e.g. Koppitz, 1968, 1984; Naglieri, 1988), as will be discussed later in this manuscript.

Creativity

Although recognized as an important factor in giftedness (Davis et al., 2014), creativity does not immediately make identification of giftedness an easier task. As with giftedness, creativity has no single definition (e.g. Hunsaker & Callahan, 1996; Kaufmann, 2003; Piirto, 2013) and should not be measured by a single instrument (Cropley, 2000; Treffinger, 2009).

Intelligence and creativity are associated with convergent and divergent thinking respectively (Cropley, 2006; Jaarsveld et al., 2015). But they are in fact more closely connected when considering problem solving and cognitive flexibility than initially thought (Silvia, 2015). According to Silvia, not taking creativity into account creates a "sterile view of intelligence that emphasizes how people get right answers (…) And carving out intelligence yields a view of creativity that seems capricious and uncontrolled instead of something that can be directed and nurtured" (p. 604). Most definitions of creativity mention originality in the form of novelty and unconventionality (e.g. Cropley & Urban, 2000; Moran, 2010; Runco & Jaeger, 2012; Sawyer, 2012; Sternberg, 2006). This supports the statement that IQ testing is not sufficient when identifying highly gifted children. For example, suppose that a child answers the question "Where does the sun set?"[4] with "At the horizon". Seen from a divergent-thinking perspective, this answer is in fact correct. However, it cannot be scored, because it is not in the test's manual. Therefore, the IQ score will not be representative for this particular child's ability. History has already shown the possibility of this occurrence: Luis Alvarez and William B. Shockley, who have both won a Nobel Prize in Physics, had been excluded from the Terman studies as children, because of their 'insufficient' IQ scores (Davis et al., 2014).

[4] Due to copyright, this is a fictitious question.

When creative behavior is being expressed – for instance in the form of challenging teachers, questioning rules and policies and persevering (only) in areas of interest (Neihart & Betts, 2010) – creativity may be seen as a sign of behavioral problems, rather than a characteristic of giftedness (Webb, 2000; Webb et al., 2004), and is therefore often discouraged or even punished (Kim & VanTassel-Baska, 2010). It is important to mention that, according to Davis et al. (2014), "teachers will identify as 'gifted' those children who are pleasant, well behaved, prompt, [and] conforming" (p. 34) and that the conclusions from the Terman studies (Termites being more intelligent, better adjusted on psychological and social level, and physically healthier than average) "would not necessarily apply, for example, to students who are artistically or creatively gifted, who are bright underachievers, or who are intelligent, but rebellious, irritating, or otherwise undesirable" (p. 35). Needless to say, the latter characteristics can have a major negative impact on the social environment of these highly gifted children.

Social-emotional Difficulties

Characteristics like being rebellious, irritating or otherwise undesirable fit perfectly in The Creative profile, as described by Neihart and Betts (2010). Like the other profiles of gifted and talented children, children with these specific characteristics have specific social-emotional needs. This is consistent with what is found in other studies; the gifted and talented do not constitute a single homogenous group, but rather comprise individuals with unique social and emotional needs (e.g. Freeman, 1983; Peterson, 2009; Reis & Renzulli, 2009). This may be why findings across several studies on social-emotional difficulties of highly gifted children are not consistent. On one hand, it is known that gifted and talented children may not match with non-gifted peers on cognitive and social level (Kroesbergen et al., 2015). This is considered one of the "particular vulnerabilities in highly gifted children's growth and development which can cause them emotional and educational problems" (Freeman, 1983, p. 482). On the other hand, Francis, Hawes, and Abott (2015) concluded on the basis of their literature review that "results generally support the view that high ability is a protective factor against both internalizing and externalizing difficulties for children and adolescents" (p. 18).

Findings from other studies also support the notion that gifted students are not prone to behavioral or emotional problems or more socially vulnerable than non-gifted peers (e.g. Altman, 1983; Robinson, 2008; Vialle, Heaven, & Ciarrochi, 2007). According to Robinson (2008), the basic social needs of highly gifted children do not differ from non-gifted children; like every child, highly gifted children need peers and close friends. However, classmates are not always peers (in the sense of like-minded), making highly gifted children seek older children to play with or even seek the companionship of adults (Freeman, 1994). Lack of like-minded peers can cause highly gifted children to experience social difficulties, social stress (Roedell, 1984; Vialle & Rogers, 2012), social-emotional difficulties, even in preschool years (Yoo & Moon, 2006), and to engage in challenging behavior (Corso, 2007).

Supportive environments that provide contact with peers are important. Cross, Coleman, and Stewart (1993) found in their study that gifted students want to have normal social

interactions. Tannenbaum (as cited in Cross et al.) stated earlier that "some would rather underachieve and be popular than achieve honor status and receive social ostracism" (p. 37). This also fits one of the profiles described by Neihart and Betts (2010): the profile of The Underground. Typical feelings and attitudes of individuals who fit this particular profile are insecurity about their capabilities, insecurity about their right to their emotions, conflicted, diminished sense of self, and internalizing and personalizing societal ambiguities and conflicts. By definition, the capabilities of a gifted child who engages in underground behavior (such as denying talent and rejecting challenge) are hard to identify. However, Hoogeveen, Van Hell, and Verhoeven (2012) found that less underground behavior was observed in children who skipped more than one grade.

In short: the studies mentioned above show the importance of creating supportive environments with like-minded peers, in order to reduce as many vulnerabilities in the development of highly gifted children as possible, and consequently prevent social-emotional difficulties (both internalizing and externalizing) and underachievement. These factors are important in order to work holistically and to take as much information as possible into account, when identifying highly gifted children. Also important is the conclusion that not all highly gifted children have social-emotional difficulties, but a substantial proportion does have these problems (because their educational needs are not met), and there might be several subgroups.

An Alternative Identification Method

From the foregoing paragraphs, it appears that correctly identifying and serving highly gifted children is a difficult task, because a certain IQ score does not provide sufficient information, and because some typical (disturbing) behaviors are not associated with giftedness. As mentioned before, professionals in the field of both education and psychology are in need of improved identification procedures.

Sanborn (as cited in Brown et al., 2005) recommends to "apply multiple techniques over a long period of time [and to] understand the individual, the cultural-experiential context, and the fields of activity in which the student performs" (p. 71). In our view, children's drawings could be considered one of multiple techniques in this matter. Although the analysis of children's drawings, with HFDs in particular, has been used to measure cognitive abilities, it has hardly been used as a technique to identify highly gifted children. In fact, only two studies seem to have aimed at identifying highly gifted children with drawings. Dağlioğlu, Çalışandemir, Alemdar, and Bencik-Kangal (2010) found that 4-5 year old highly gifted children produced more detailed HFDs than typically developing preschoolers, and strongly suggested that HFDs should be part of the identification process of highly gifted children. Clark (1989) reported success in identifying highly gifted children with a new drawing abilities test, but this study was limited to the identification of artistically gifted students in the age range of 11 to 16.

In this paper, it is contended that analyzing HFDs may be a technique that gives insight in creative abilities that might otherwise go undetected, and helps understand the child's individual context.

Children's Drawings

General Development

Initially, the scientific interest in drawings emerged when art of mentally ill patients was examined in combination with the development of child psychology at the beginning of the twentieth century (Malchiodi, 1998). Since then, the scientific interest for children's drawings grew (Feltzer, 1975). According to Van de Vijfeijken (2001), analysis of children's drawings began by examining the development of drawing itself. Many studies showed that almost all 2-year-old children draw nothing more than scribbles and that between the second and fourth year of age, these evolve to distinctive single lines (Feltzer, 1975; Toomela, 1999).

The examination of the development of drawings eventually resulted in the sequence of four stages (preschematic, schematic, prerealistic and realistic), named by Lowenfeld and Brittain (1966) and supported by most other investigators (Mitchelmore, 1978). It is significant that, according to Mitchelmore (1978), some authors refer to 'intellectual realism' instead of 'schematic'. This implies the attempt to say something about intelligence through drawings. Along with the development of intelligence tests, investigators tried to use HFDs as a measure of intelligence (Van de Vijfeijken, 2001). One of the first structured scoring systems with which children's HFDs could be analyzed was developed by Goodenough (1926) and later revised by Harris (1963). However, intelligence was not the only topic of interest. According to Van de Vijfeijken (2001), during the 1940's, it was assumed that children could also express their emotions, motives, and attitudes through drawings. Since then, HFDs have not only been used to assess cognitive abilities, but also to evaluate social-emotional functioning and to measure possible emotional difficulties (Bodwin & Bruck, 1960; Flanagan & Motta, 2007; Koppitz, 1966, 1968, 1984; Machover, 1949; Naglieri, McNeish, & Bardos, 1991). In the following paragraphs, the use of HFD's for measuring intelligence and social-emotional difficulties will be discussed in more detail, after looking at the development of human figure drawing.

Development of Human Figure Drawing

The use of HFDs for measuring intelligence was based on the normal development of human figure drawing, by analogy with the classic IQ tests, which used the ratio between Mental Age and Chronological Age (see Goodenough, 1926). There are fairly exact data on how children of various ages represent human figures in their drawings (Cox, 1993; Feltzer, 1975; Koppitz, 1968). The earliest recognizable human figure is usually the tadpole figure, appearing at about 3 to 4 years of age. The tadpole consists of head, eyes, mouth, and two legs. As children get older, the drawing of a human figure becomes more detailed. At the age of 5 or 6, the average child draws at least the following features: head, eyes, nose, mouth, trunk, and legs; most children also draw arms. At 7, arms and feet are seldomly missing, and arms and legs are mostly drawn in two dimensions. At 8, body proportions are slightly better, but are still far from realistic. When children are 9 or

10, they often draw hair, neck, and – unless a woman is represented in the drawing – ears. At the age of 11 or 12, body proportions are clearly more realistic, at least two articles of clothing are drawn, and often hands, eye brows, pupils, and two-dimensional feet. After the age of 12, there is no further differentiation of the human figure in drawings.

Measuring Intelligence using HFDs

Although HFDs have in the past been used and accepted by both clinicians and educators as psychological instruments for measuring cognitive capacities (Reisman & Yamokoski, 1973), their value in terms of validity and reliability has been disputed widely, as mentioned earlier. Experts nowadays take different, rather polarized positions concerning the use of HFDs (Slee & Skrzypiec, 2015). This is an important issue, since the method of analyzing HFDs is still used in diagnostic assessment in many countries worldwide (e.g. Camara et al., 2000; Imuta et al., 2013; Lange-Küttner, 2011; Piotrowski, 2015).

On one hand there are experts with positive views on the use of HFDs. Chappell and Steitz (1993) have found a clear relationship between drawing level and Piaget's stages of cognitive development (Piaget & Inhelder, 1956). The Goodenough-Harris Drawing Test (GHDT) (Harris, 1963), an instrument for analyzing HFDs that is widely used, has been investigated in many studies. Reliability coefficients, including inter-rater reliability, were commonly above .90 (Abell et al., 2001). Validity coefficients ranged from .26 to .92, depending on which intelligence test the GHDT was correlated with (Abell et al., 1996; Harris, 1963). The reliability of the Draw a Person: A Quantitative Scoring System (DAP:QSS) (Naglieri, 1988) has also been investigated in many studies and can also be judged as good to excellent, with coefficients for inter-rater reliability ranging from .86 to .99 (Abell et al., 2001; Willcock, Imuta, & Hayne, 2011). Coefficients of internal consistency of the DAP:QSS Total Score range from .83 to .89, which denotes acceptable to good internal consistency over 14 scoring criteria. With regard to the concurrent validity, significant correlations, ranging from .36 to .53, between DAP Total Score and WISC-IQ were revealed (Abell et al., 2001).

Schepers, Deković, Feltzer, De Kleine, and Van Baar (2012) found the DAP:QSS to be a useful parameter for evaluating cognitive functioning. Furthermore, HFDs seem to be helpful when using them within a larger test battery (Dykens, 1996); they can complement data from other tools that measure cognitive abilities. A study by Arden, Trzaskowski, Garfield, and Plomin (2014), in which the HFDs of 7,752 pairs of twins at the ages of 4 and 14 have been analyzed, showed that greater accuracy in children's drawings is significantly associated with higher intelligence, although the correlation is not strong. HFDs may also prove to be useful in the case of test anxiety, which is a possible cause for academic underachievement, according to Harris and Coy (2003). According to Flanagan and Motta (2007), "When a child is asked to 'draw a person,' that child is likely engaging in an activity that he or she has done many times and is therefore often not threatened by this task" (p. 267).

On the other hand, there are reasons for not using HFDs to measure intelligence. Lilienfeld et al. (2000) stated that "the scientific status of scores derived from HFDs can best be described as weak" (p. 51). Correlations with intelligence tests are often actually quite modest (Abell et al., 1996; Abell et al., 2001). Scoring systems for HFDs may be stronger related to visual-motor development than to intelligence (Dykens, 1996), and HFDs may yield a high number of false positives and false negatives for low intellectual functioning, rendering them not useful as a tool to measure intellectual ability (Willcock et al., 2011). Most studies have used the GHDT or the DAP:QSS. These instruments are relatively old, but according to Imuta et al. (2013), the more recent Draw a Person Intellectual Ability Test for Children, Adolescents, and Adults (DAP:IQ) (Reynolds & Hickman, 2004) also yields high numbers of false positives and false negatives for borderline and superior intellectual functioning. They concluded that this more recent scoring system, too, should not be used to measure intelligence. In fact, they ended their argumentation with the advice to "draw an end to [practitioners'] use of children's HFD tests as a surrogate measure of children's intelligence" (p. 7). It is noteworthy, however, that despite the downsides on the use of HFDs as mentioned above, Lilienfeld et al. (2000) encouraged further research on global scoring approaches. However, one should be aware of the at least controversial views on the validity of measuring intelligence with HFDs, which may possibly be caused by factors such as high artistic skills or high creative talent expressed in drawings (Lubart, Georgsdottir, & Besançon, 2009). In our view, the absence of a clear and widely held view on measuring intelligence with HFDs (i.e. computing drawing-IQs), does not necessarily imply that it is not advisable to conduct further research on HFDs.

Measuring Social-emotional Difficulties using HFDs

According to Thomas and Silk (1990), three types of research can be identified with regard to measuring social-emotional functioning by means of children's drawings, namely 1) manifestation of personality traits, 2) validation of emotional indicators, such as described by Koppitz (1968), and 3) what is personally or emotionally important to children. As with other projective techniques, the main criticism is targeted at lack of validity (Piotrowski, 2015). Evaluating the validity in terms of personality functioning has been done to a very limited extent (Slee & Skrzypiec, 2015), and what can be found is dubious at best and not very recent (e.g. Catte & Cox, 1999; Chantler, Pelco, & Mertin, 1993; Eno, Elliott, & Woehlke, 1981; Fuller, Preuss, & Hawkins, 1970; Glutting & Nestler, 1986; Koppitz, 1966). The second line of research, however, seems to be more promising, and will be discussed in more detail here.

Koppitz (1968) developed, on the base of her own research data, a list of 30 emotional indicators, i.e. items that occurred more often in HFDs of children with emotional problems. For example, aggressive children drew more often teeth, long arms, and big hands, and shy and anxious children more often a tiny figure or no nose or no mouth. Some later studies found that between groups, significant differences in emotional disturbance can be found using Koppitz's emotional indicators, but misclassifications of individual children are no exception (Chantler et al., 1993; Fuller et al., 1970).

Later on, Koppitz (1984) grouped the emotional indicators into five categories: Impulsivity, Insecurity/Feelings of Inadequacy, Anxiety, Shyness/Timidity, and Anger/Aggressiveness. This is in line with the view of Riethmiller and Handler (1997), who stated that aggregation of items is necessary to reach sufficient discriminative power. However, Thomas and Silk (1990) argued that Koppitz's 1984 classification is less strongly underpinned by empirical data than her 1968 scoring system.

Naglieri et al. (1991) developed the Draw A Person: Screening Procedure for Emotional Disturbance (DAP:SPED). In this screening instrument, 55 items have to be scored, yielding a *T* score on the base of normative data collected with age groups of 6-8, 9-12, and 13-17 years. Notwithstanding the thoroughness of this scoring system, Flanagan and Motta (2007) concluded from the results of several empirical studies that, again, there is considerable chance of misclassification.

Despite of the critical views mentioned above, Di Leo (1983) advocated a holistic approach concerning the interpretation of HFDs, and stated that they are "but a part of a comprehensive assessment. They are aids in diagnosis and therapy" (p. 82). Essentially the same view is held by Koppitz (1984), and by Riethmiller and Handler (1997). In addition, the use of HFDs in the field of diagnosis and therapy is still being explored, because the expression of emotion through art is considered a way of communication, and part of a therapeutic process (Driessnack, 2005; Malchiodi, 1998).

Scientific Value of HFDs

To summarize: at first sight, there are some strong arguments not to use HFDs as a tool to measure particular psychological characteristics of a child, such as intelligence or social-emotional functioning. Although the reliability of existing scoring systems can be judged as good or excellent, HFDs appear to be less valid than desired when using them as a standardized tool to measure intelligence, and social-emotional aspects. Nevertheless, Piotrowski (2015) states in his review of projective techniques in applied settings in the period of 1995-2015 that, although there has been a small decrease in their use, projective techniques (such as HFDs) are prized by both clinicians and academics. Motta et al. (1993) also state that: "Ease of administration and anecdotal reports of predictive accuracy are presented as explanations for the continued usage of HFDs." (p. 162). This suggests that in consulting practices – which have the aim to advise and help people, rather than to find statistically significant results – clinicians see benefit in the use of HFDs, especially when used holistically (Di Leo, 1983) within a larger test battery (Dykens, 1996). Apparently, they see a certain benefit of HFDs that is not visible with traditional investigation methods.

With regard to the above, in combination with the knowledge that identifying giftedness goes beyond measuring intelligence (Pfeiffer & Blei, 2008), and the fact that analyzing HFDs for this particular purpose is a different approach that has hardly been used yet, it may be wise to investigate what analyzing HFDs can contribute to the identification of highly gifted children. It is advisable to go beyond the traditional approach of merely computing IQ scores when analyzing HFDs (e.g. Harris, 1963; Koppitz, 1966, 1968;

Naglieri, 1988), because this approach has led to controversial views on the use of HFDs. This will be further elaborated upon in the final paragraph.

Giftedness and Drawings

From the literature discussed, it is recommended not to rely on drawing-IQs alone if one considers using HFDs as a tool to identify highly gifted children. This is in line with recent views on the identification of gifted students, in which it is also not advisable to rely solely on the outcome of intelligence tests when it comes to identify giftedness in children (e.g. Gagné, 2004, 2009; Heller, 2004, 2009; Mönks & Mason, 2000; Mönks & Pflueger, 2005; Pfeiffer, 2002; Pfeiffer & Blei, 2008; Renzulli 2003; Sternberg, 2004). Instead, as is preferred in all diagnostic assessment, one should work holistically, and make sure to collect as much information as possible with a large test battery, instead of using a single test (e.g. Carr, 2016; Di Leo, 1983; Dykens, 1996; Schaffer & Kipp, 2014).

When one aims to identify highly gifted children by analyzing their HFDs, it is recommended to look beyond drawing-IQs because of two reasons. First, giftedness involves more than a high score on a standard intelligence test, as described in many theories (e.g. Mönks & Mason, 2000; Piirto, 2005; Renzulli, 2003; Ziegler et al., 2013). Second, creativity – a major asset of giftedness (e.g. Piirto, 2013; Sternberg, 2004) as well as drawing (e.g. Hui, He, & Ye, 2015; Lee & Jun, 2015) – is nearly completely neglected in the scientific literature about the psychological meaning of HFDs. It is important to take these two reasons into account. To do this, it is required to analyze HFDs in a way that has not been done in previous studies.

When considering the cognitive abilities of (yet unidentified) highly gifted children, and the relation between HFDs and stages of cognitive development (Chappell & Steitz, 1993), it may be wise to investigate whether highly gifted children draw more specific details (including correct proportions) than their non-gifted chronological age mates. This has already been found for 4 and 5 year old children (and for girls in particular) in the study by Dağlioğlu et al. (2010), who used Koppitz's (1968) developmental criteria for analyzing HFDs. Although existing scoring systems can help with the analysis of details in drawings, at the same time they hold a limitation. Relying on existing scoring systems means that additional details that are not incorporated in the scoring manual will not be taken into account. These additional details, possibly indicators of giftedness, will then be overlooked. It is advisable to also take into account unusual details in, and additional details apart from the human figure. This is not a totally new perspective in the field of analyzing drawings; the Test for Creative Thinking-Drawing Production (TCT-DP) is fully based on expressing novelty in drawings (Jellen & Urban, 1989), and is still considered highly valuable in terms of this specific domain of creativity (Theurer, Berner, & Lipowsky, 2016; Urban, 2005). Because highly gifted children can think divergently (Batey, Chamorro-Premuzic, & Furnham, 2009), and be (highly) creative (i.e. Piirto, 2005), it may be wise to investigate whether or not highly gifted children produce more novel drawings, and add or draw unusual details when compared to non-gifted

children. Therefore, it is more valuable to collect and analyze HFDs 'from scratch' and create a completely new 'list', based on all items observed. To determine which items could be considered 'novel' or 'exceptional' (Koppitz, 1968) it can be examined which items are only drawn by highly gifted children, which are not and vice-versa.

To be as complete as possible, one should take into account that there are some specific vulnerabilities in the development of highly gifted children, which may result in social-emotional difficulties (e.g. Freeman, 1983, 1994; Reis & Renzulli, 2004). To this day, the emotional indicators as described by Koppitz (1968) have been of rather limited value in identifying individuals with emotional disturbances (Chantler et al., 1993; Fuller et al., 1970), but it has not been investigated yet whether or not (some of) these indicators occur more often in highly gifted children than in non-gifted children, or if the co-occurrence of certain indicators is higher in drawings of highly gifted children.

This way of analyzing HFDs is a new approach that has not thoroughly been studied yet. It may, however, prove to be valuable in the identification process of highly gifted children, without relying (too much) on the outcome of intelligence tests, and by taking into account creativity and social-emotional difficulties.

This theoretical framework forms the basis for a research program, which has already started with the analysis of HFDs of 120 children in the age range of 7 to 9 (Mathijssen, Feltzer, & Hoogeveen, 2016), and with the collection of HFDs of hundreds of children in the age range of 3 to 6 (Mathijssen, Feltzer, & Hoogeveen, 2018a, 2018b). This research program should eventually result in a well-founded diagnostic screening instrument, with which highly gifted children can be more easily detected in diagnostic assessment at an early age.

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