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# The KiddyCAT: A Test-Retest Reliability Investigation

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## Abstract

Research with the Communication Attitude Test for Preschool and Kindergarten Children who Stutter (KiddyCAT) in the United States, Italy and Poland has shown that, as a group, preschool and kindergarten children who stutter report, as of the age of three, already significantly more in the way of a negative attitude toward speech compared to their nonstuttering peers. In addition to its discriminative usefulness, the test's validity has been established. What still needed to be determined was the KiddyCAT's test-retest reliability, which was the aim of this investigation. In order to do so, a Dutch form of the KiddyCAT was administered to a sample of 34 stuttering and 42 nonstuttering children between the age of three and six on two separate occasions. After the initial testing, the children were retested a week to 12 days later. For both groups of participants, the scores of the first and second test administration correlated significantly, and the average scores did not differ from each other to a statistically significant extent. Thus, the repeated administration of the test revealed that the obtained first and second test scores were highly dependent and predictable from each other, and stable over time. As a side issue, it was, once again, confirmed that the scores of the children who do and do not stutter differed to a statistically significant extent.

**Key words:** KiddyCAT; Speech-associated attitude; Communication attitude; Preschoolers; Kindergartners

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## INTRODUCTION

The fact that there is more to the individual who stutters than just disfluencies, and that stutterER and stutterING are not synonymous, has been abundantly documented in the field of fluency disorders. Indeed, research, clinical observation and retrospective information have provided evidence that the person who stutters (PWS) exhibits more than fluency failures. Aside from the stuttering, the PWS might use one or more voluntary behaviors to cope with the anticipation or occurrence of speech breakdown (Barr, 1940; Brutten & Shoemaker, 1967, 1971; Prins & Lohr, 1968, 1972; Vanryckeghem, Brutten, Uddin & Van Borsel, 2004). In addition, there is often evidence of the presence of negative emotion related to speech (Brutten & Shoemaker, 1967, 1971; Brutten & Vanryckeghem, 2003a,b, 2007; Craig, 1990; Craig & Tran, 2014; Iverach & Rapee, 2014; Mahr & Torosian, 1999; Smith et al., 2014; Van Riper, 1982; Vanryckeghem, Hylebos, Peleman & Brutten, 2001). Particular sounds, words and/or situations might take on a negative connotation, become feared and create even more stuttering. Also the cognitive component within the stuttering syndrome has been documented, and many theoreticians and researchers have pointed to the existence of a relationship between stuttering and negative speech-associated attitude (Ammons & Johnson, 1944; Brown & Hull, 1942; Brutten & Shoemaker, 1967; Brutten & Vanryckeghem, 2003a,b, 2007; Cooper, 1977, 1999; Johnson, Brown, Curtis, Edney & Keaster, 1956; Guitar, 2014; Liebert & Liebert, 1995; Perkins, 1986; Sheehan, 1970; Shumak, 1955, Vanryckeghem & Brutten, 1997; Wingate, 1964; Yaruss & Quesal, 2006). These affective, behavioral and cognitive variables have been shown to play a part in what constitutes a PWS.

Research geared toward the investigation of speech-related attitude among PWS was originally limited to adults. It has been repeatedly shown that the speech-associated belief of adults who stutter is significantly more negative than that of those who do not stutter (Andrews &

Cutler, 1974; Erickson, 1969; Brutten & Vanryckeghem, 2003b; Vanryckeghem & Brutten, 2011, 2012). Research on this topic involving children who stutter (CWS) lagged several years behind, and the first research studies were often vague or indirect in nature (Culatta, Bader, McCaslin, & Thomason, 1985; Silverman, 1970; Woods, 1974). Studies focused on *directly* investigating the presence of speech-related attitude among school-age children were not conducted until the late seventies, and eighties (Brutten, 1984; Guitar & Grims, 1977).

The initial design of the Communication Attitude Test (Brutten, 1984; Brutten & Dunham, 1989) led to a series of investigations on a global scale that spans many decades. The Communication Attitude Test (CAT) is a self-report test, composed of 33 items to which a school-age child responds by indicating if a statement is true or false for him or her. Based on the test score, the presence and extent of mal-attitude towards speech can be documented. Numerous investigations have provided psychometric and normative data for stuttering and nonstuttering children. The CAT has shown to have internal consistency (Brutten & Dunham, 1989; Brutten & Vanryckeghem, 2003a, 2007), item to total score reliability (Brutten & Dunham, 1989; Brutten & Vanryckeghem, 2003a, 2007; De Nil & Brutten, 1991; Johannisson et al., 2009), good test-retest reliability (Vanryckeghem & Brutten, 1992a,b), and validity (Brutten & Vanryckeghem, 2003a, 2007; DeKort, 1997; Johannisson et al., 2009). Cross-cultural investigations have repeatedly shown that the CAT differentiates stuttering from nonstuttering children based on their speech-associated attitude (Bernardini, Vanryckeghem, Brutten, Cocco, & Zmarich, 2009; Boutsen & Brutten, 1990; Brutten & Vanryckeghem, 2003a, 2007; De Nil & Brutten, 1990, 1991; De Nil, Brutten & Claeys, 1985; Gačnik & Vanryckeghem, 2014; Green, 1998; Jacksic-Jelcic & Brestovci, 2000; Kawai, Healey, Nagasawa, & Vanryckeghem, 2012; Nagasawa & Kawai, 1998; Vanryckeghem & Brutten, 1992a, 1997, 2001). More specifically, CWS score statistically significantly higher compared to children who do not stutter (CWNS), indicating that their speech-associated belief system is typically more negative than that of their nonstuttering peers. This significant difference between the two groups was shown to appear already by the age of six. In addition, the CAT scores of CWS and CWNS diverge with age (Vanryckeghem & Brutten, 1997); the limited negative speech-associated attitude of CWNS significantly decreases with age, whereas that of CWS increases (Brutten & Vanryckeghem, 2003a, 2007; Vanryckeghem & Brutten, 1997).

Both the significant difference in CAT scores and the fact that, with age, the directional trend of speech-associated attitudes of CWS and CWNS diverge, suggested that there may be a difference in speech-related belief at a younger age (Vanryckeghem & Brutten, 1997). This possible implication, in light of the fact that stuttering has its onset earlier than age six, led to exploratory research into the speech-associated attitude of preschoolers and kindergartners. In the same vein, it is important to note that Grinager Ambrose and Yairi (1994), and Ezrati-Vinacour, Platzky and Yairi (2001) came to the conclusion that children as young as three in many cases already show an awareness of stuttering. Also Boey et al. (2009) found that awareness of stuttering is present close to its onset and increases with age. More specifically, 57% of their two-year olds and 90% of their seven year olds indicated awareness of speech difficulty. In their survey of parents of three to six year old children, relative to their perception of how stuttering impacted their child, Langevin, Packman and Onslow (2010) found that in 82% of the cases, parents indicated frustration on the part of the child; and mood reactions (e.g. confusion) were reported to occur in 43% of the children.

It is clear that using a self-report test like the CAT would not be possible for children younger than six because of the inability of preschoolers and kindergartners to read or fully understand the test items. Because of this, the KiddyCAT (Vanryckeghem & Brutten, 2007) was designed, a test aimed at investigating the cognitive component of the stuttering disorder in this age group. The KiddyCAT (Communication Attitude Test for Preschool and Kindergarten Children who Stutter) consists of 12 statements exploring a child's belief about his or her speech and speech ability. The child is requested to answer "yes" or "no" to statements such as "Do mom and dad think that you speak well?", "Is talking hard for you?"

Initial research with the KiddyCAT in the United States with a group of CWNS and CWS between the age of three and six (Vanryckeghem & Brutten, 2007; Vanryckeghem, Brutten, & Hernandez, 2005) revealed score differences that were statistically significant and a large effect size (1.44), indicating that CWS, as young as three years of age, report having a speech-associated attitude that is significantly more negative than that of their nonstuttering peers. By means of this research study, evidence was provided for the fact that children as young as three do not only have awareness of stuttering (Grinager Ambrose & Yairi, 1994; Ezrati-Vinacour, Platzky & Yairi, 2001), but that CWS already *think* negatively about their speech, and that the KiddyCAT has clinical utility in assessing this cognitive component in young children.

Since its development in 2007, cross-cultural research investigations with the KiddyCAT have been undertaken or are currently being conducted in the USA, Canada, parts of Western and Eastern Europe, Asia and the middle East. One such investigation explored the KiddyCAT's underlying constructs (Clark, Conture, Frankel & Walden, 2012). Factor analysis indicated that one dimension "speech difficulty" is basic to all twelve KiddyCAT items, and that the CWS and CWNS in this study responded differently to the underlying construct of this self-report test. Clark et al.'s data

suggest that CWS perceive speaking as being difficult. Other investigations have specifically focused on obtaining normative and comparative data on stuttering and nonstuttering preschoolers and kindergartners. A normative investigation with CWNS employing a Swedish version of the KiddyCAT (Gustavsson & Karltorp, 2010) revealed low mean and median scores, indicating little in the way of negative speech-associated attitude, and the fact that there is room for higher scores as anticipated to be obtained by CWS. Comparative investigations in the USA, Italy and Poland (Clark et al., 2012; Bernardini et al., 2012; Węsierska & Vanryckeghem, 2015; Węsierska, Vanryckeghem, Jeziorczak, & Wilk, 2014) confirm that CWS score statistically significantly higher on the KiddyCAT compared to CWNS. The current research investigation involves a Dutch version of the KiddyCAT (Vanryckeghem & Brutten) and was aimed at determining its test-retest reliability. As an aside, normative data on a Belgian sample of CWS and CWNS were obtained.

## 1. METHOD

### 1.1 Participants

The KiddyCAT was administered to a pool of 42 nonstuttering Belgian preschoolers whose native language was Dutch. The children resided in the Flemish provinces of Belgium and are considered representative of the Flemish (or Dutch) speaking population. The CWNS were selected by means of convenience sampling. Only those children who were not exposed to two or more languages, did not exhibit stuttering behaviors (according to the definition by Wingate, 1964) and did not have a developmental delay or articulation impairment were included. In order to eliminate those children, the researchers analyzed their speech from a video recording of a spontaneous speech sample. This speech sample consisted of the children's responses to six stimulus pictures from the Dutch version of the Reynell Taalontwikkelingsschaal [Reynell Language Development Scale] part Speech Production – subtest 'content of speech' (Schaerlaekens, Zink & Van Ommeslaeghe, 2003). In addition, a questionnaire was provided to the parents investigating the presence or absence of language and/or speech disorders. Children who did not meet the inclusion criteria were excluded from the subject pool. Of the original pool of 52 preschoolers and kindergartners, 10 were excluded. One child had a development and language delay, two were bilingual, two had an articulation impairment and one had a history of stuttering. In addition, after initial administration of the KiddyCAT, four children were excluded because they showed a stereotypic pattern in answering the test items (see Procedure). Of the resulting pool of 42 children, 20 were male and 22 were female. The age of the children varied between 38 and 73 months, with an average age of 57 months.

The sample of CWS was obtained by contacting fluency specialists in the same areas of Flanders where the CWNS resided. As reported by their speech-language pathologist by means of a questionnaire, in addition to stuttering, two children had a language disorder, and one child did not have Dutch as his native language. These children, together with two who showed a response set in answering the KiddyCAT, were excluded from the original pool of 39 CWS. At the time of data collection, of the remaining sample of 34 CWS, 12 children were seen for initial assessment and were diagnosed as CWS, 22 were already enrolled in therapy (between 2 weeks, and 2 years 2 months). The age of the 25 boys and 9 girls ranged from 39 months to 80 months, with an average age of 60 months. Time since stuttering onset was reported to be between 3 months and 3 years.

### 1.2 Materials and Procedure

The KiddyCAT was administered to both groups of children on an individual base. For the group of CWNS, the self-report test was administered by three undergraduate students from the Artevelde College in Belgium. The students were trained in the administration of the test procedure by the first test author. As mentioned above, before test administration, the children were video-recorded while talking spontaneously in response to six illustrations from the Reynell Language Developmental Scale (Schaerlaekens, Zink, & Van Ommeslaeghe, 2003). Immediately following the video recording, the administration of the KiddyCAT took place. The KiddyCAT was given to the CWS by their therapist who was briefed by the first test author relative to the modus operandi for delivery of the test.

Administration of the KiddyCAT was done according to the instructions of the test's protocol. Each child was given two practice items. After each practice item, the child's answer was acknowledged by repeating the response. This allowed the test administrators to observe if the child agreed with his or her answer. When it was clear that the instructions were understood, the researcher proceeded by verbalizing the 12 statements related to the child's speech and way of speaking. Following each 'yes' or 'no' answer, the child was given a marble to insert in one of the twelve holes in an egg carton. This was done in order to hold the child's attention and to inform him or her of the progress within the 12-item test procedure. At the completion of the test, the child received a reward in the form of a sticker. When the child did not understand a question, the test administrator provided additional information in a non-suggestive way. When the child answered in a stereotypic pattern, a 'dummy' question was asked after items 5 and 10. In case of stereotypic "yes" answers, the question was posed in a way that required a "no" answer. E.g. in the case of a boy who repeatedly answered "yes", the question after item 5 was: "are you a girl?" The questions were: "Are you a boy (girl)?" and

"Can you fly (walk)?" When a stereotypic answer pattern was confirmed after item 10, the child was excluded from the pool of participants. As indicated before, four of the CWNS and two of the CWS were excluded from the original pool of participants because they gave stereotypic answers.

Given that some KiddyCAT items contain the terms 'difficult', 'hard' and 'easy', it was considered important that the test administrator determines, prior to testing, whether or not the child understands these terms by means of a practical example. This aspect has been added to the original test protocol. In order to do this, two different closed jars, containing an object, were presented to the child. The lid on one was loose and could be opened *easily*. The lid on the other jar, was tightly screwed on, making it *difficult* to open. The test administrator asked the child to open one and then the other jar. As the child did this, he or she was asked if it was 'easy' or 'difficult' to open the jar. In addition, the difference in the effort required to open the jars was emphasized by the test administrator while using the terms 'easy' and 'difficult'. This pre-test component provided evidence that the child to be tested correctly understood the meaning of 'easy' and 'difficult'. None of the children tested had an issue with understanding the connotation of these terms.

In order to establish the KiddyCAT's test-retest reliability, the test was administered on two different occasions. The second test administration was scheduled one week to maximally 12 days following the initial test administration. The test was always given to a particular child by the same researcher at the same location.

Scoring of the KiddyCAT was done according to the test's scoring key: an answer indicative of a negative attitude toward speech, is scored 1; an answer that indicates a positive attitude gets a score of 0. This means that the possible minimum score on the KiddyCAT is 0 and the maximum score can be 12. Six questions if answered 'yes' and six if answered 'no' indicate a negative speech-associated attitude. The higher the score, the more negative the communication attitude of a preschool or kindergarten child is. All KiddyCAT tests were scored twice, by two undergraduate students. The inter-rater reliability was 100%.

## 2. RESULTS

The mean KiddyCAT scores for the CWNS were 1.48 and 1.14 (*SD*=1.45 and 1.18, respectively) for first and second test administration. Figure 1 illustrates the distribution in percentage of KiddyCAT scores for both test moments. From the graph it is clear that the CWNS' scores ranged from zero to 5 for both test administrations, and are predominantly grouped around 0 and 1, indicating either the absence, or the presence of a very limited amount, of negative speech-associated attitude. The median score was 1 on both occasions. For the CWS, their mean score for the first administration was 2.79 (*SD*=3.04), and 2.72 (*SD*=3.08) for the second test administration. As is clear from Figure 2, the range of scores spanned between 0 and 10 both times. The median score was 2 for both test occasions.

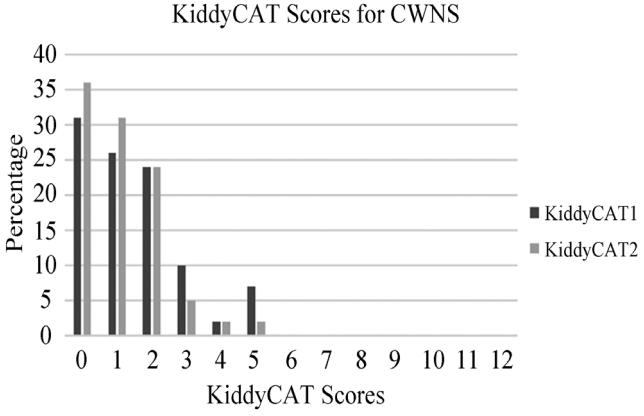


**Figure 1**
**Distribution in Percentage of the Scores of 42 CWNS for the First (KiddyCAT 1) and Second (KiddyCAT 2) Administration of the KiddyCAT**

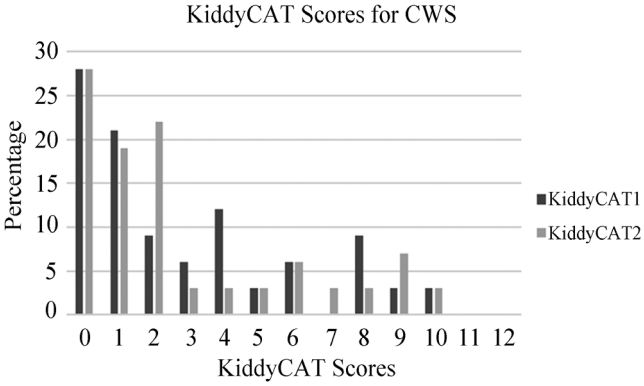


**Figure 2**
**Distribution in Percentage of the Scores of 34 CWS for the First (KiddyCAT 1) and Second (KiddyCAT 2) Administration of the KiddyCAT**

For the CWNS, the KiddyCAT scores for first and second administration correlated moderate and significantly ($r$=.67; $p$=.000), an acceptable result given the truncation (Neale & Liebert, 1986) of the scores (range 0 to 5). In addition, the test-retest KiddyCAT averages did not differ significantly ($t$=1.594, $p$=.119). For the sample of CWS, a highly significant ($r$=.90, $p$=.000) correlation coefficient was obtained between the two test scores. Once again, the test averages did not differ significantly ($t$=1.034, $p$=.309).

Although not the main purpose of this investigation, the difference between the test scores of CWNS and CWS was examined. For the first test administration, the test scores of both samples of youngsters differed to a statistically significant extent ($t$=2.321, $p$=.025). The same was observed for the second KiddyCAT administration ($t$=2.743, $p$=.009).

## DISCUSSION

The fact that the KiddyCAT scores on first and second administration correlate significantly, leads to the conclusion that the KiddyCAT has a meaningful test-retest reliability and shows stability (Kerlinger, 2000). In addition, for neither group did the first and second set of test scores differ to a statistically significant extent. This positional stability of the test scores was also observed with the CAT, Communication Attitude Test for School-age Children (Vanryckeghem & Brutten, 1992a). The test-retest reliability for the CAT was .83 for both CWS and CWNS with a one week hiatus between the first and second test administration. Thus, it can be said that the KiddyCAT scores, like the CAT, show consistency, stability over time.

The solid test-retest reliability data, together with the validity data reported by Clark and colleagues (2012), pointing to one factor "speech difficulty" underlying the KiddyCAT, are important elements in the establishment of the usefulness of this self-report inventory for research and clinical purpose. They offer validation for the adequacy of the test.

Although not the purpose of the current investigation, the preliminary data with the Dutch version of the KiddyCAT, indicate that the scores of the CWS are statistically significantly higher than those obtained for CWNS. These data confirm what has been documented before, that CWS, as young as three years of age, as a group, think negatively about their speech and speech ability (Bernardini et al., 2012; Clark et al., 2012; Vanryckeghem & Brutten, 2007; Vanryckeghem, Brutten, & Hernandez, 2005; Węsierska, Vanryckeghem, Jeziorczak, & Wilk, 2014). Compared to those internationally-based investigations, pointing repeatedly to a significant difference in the KiddyCAT scores of CWS and their nonstuttering peers, the scores on the Dutch version of the KiddyCAT were, descriptively, somewhat lower than the scores obtained in Italy, the USA and Poland. A study involving larger samples of Flemish CWS and CWNS will need to shed light on whether or not the test scores are numerically lower compared to other countries. In any event, the KiddyCAT, like the CAT for school-age children (Bernardini, Vanryckeghem, Brutten, Cocco, & Zmarich, 2009; De Nil & Brutten, 1992; Gačnik & Vanryckeghem, 2014; Brutten & Vanryckeghem, 2003a, 2007; Vanryckeghem & Brutten, 1992, 1997), and the BigCAT for adults (Vanryckeghem & Brutten, 2011, 2012), is a test capable of differentiating individuals who stutter from those who do not based on their communication attitude.

This exploratory study with a Dutch translation of the KiddyCAT made clear that the test procedure itself did not pose any problem for the youngsters. Even the three year olds cooperated well and were able to hold their attention during the test administration, which lasted, on average, 10 minutes. The use of a game-like activity was stimulating for the children, served to hold their attention, and keep them motivated. In conclusion, the data from the present investigation with the Dutch form of the KiddyCAT indicate that the scores from first and second test administration are stable over time. Further research is needed to establish normative data with the Dutch form of the KiddyCAT for stuttering preschoolers and kindergartners. Information of this kind will likely assist in differential diagnostic decision making.

This study is not without limitation. The major constraint stems from the fact that both CWS who came for an initial assessment, as well as those who were already enrolled in treatment participated in this study. In addition, the length of time that these children had been in treatment ranged notably, as well as time since stuttering onset. Keeping these variables constant would be advantageous.

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