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Communicative and psychological dimensions of the KiddyCAT

Chagit E. Clark[a,*], **Edward G. Conture**[a], **Carl B. Frankel**[b], and **Tedra A. Walden**[b]

Chagit E. Clark: chagit.edery.clark@Vanderbilt.edu; Edward G. Conture: edward.g.conture@Vanderbilt.Edu; Carl B. Frankel: carl.frankel@Vanderbilt.Edu; Tedra A. Walden: tedra.walden@Vanderbilt.Edu

[a]Department of Hearing and Speech Sciences, Vanderbilt University, 1215 21st Avenue South, Suite 8310 MCE South Tower, Nashville, TN 37232-8242

[b]Department of Psychology and Human Development, Peabody College, Vanderbilt University, 230 Appleton Place, Nashville, TN 37203-5721

Abstract

Purpose—The purpose of the present study was to investigate the underlying constructs of the Communication Attitude Test for Preschool and Kindergarten Children Who Stutter (KiddyCAT; Vanryckeghem & Brutten, 2007), especially those related to awareness of stuttering and negative speech-associated attitudes.

Method—Participants were 114 preschool-age children who stutter (CWS; $n = 52$; 15 females) and children who do not stutter (CWNS; $n = 62$; 31 females). Their scores on the KiddyCAT were assessed to determine whether they differed with respect to talker group (CWS vs. CWNS), chronological age, younger versus older age groups, and gender. A categorical data principal components factor analysis (CATPCA) assessed the quantity and quality of the KiddyCAT dimensions.

Results—Findings indicated that preschool-age CWS scored significantly higher than CWNS on the KiddyCAT, regardless of age or gender. Additionally, the extraction of a single factor from the CATPCA indicated that one dimension—speech difficulty—appears to underlie the KiddyCAT items.

Conclusions—As reported by its test developers, the KiddyCAT differentiates between CWS and CWNS. Furthermore, one factor, which appears related to participants' attitudes towards speech difficulty, underlies the questionnaire. Findings were taken to suggest that children's responses to the KiddyCAT are related to their perception that speech is difficult, which, for CWS, may be associated with relatively frequent experiences with their speaking difficulties (i.e., stuttering).

Keywords

stuttering; preschool; assessment; KiddyCAT; attitude; awareness

[*]Corresponding author at: Department of Hearing and Speech Sciences, Vanderbilt University, 1215 21st Avenue South, Suite 8310 MCE South Tower, Nashville, TN 37232-8242. Phone: +1 718-781-6758, Fax: +1 615-936-6914.

1. Introduction

Investigators have provided various theoretical explanations for the concepts of "attitude" and "awareness." Eagly and Chaiken define *attitude* as one's "propensity to evaluate a particular entity with some degree of favorability or unfavorability" (p. 583).[1] Similarly, Petty, Briñol, and DeMarree, (2007) posit that "attitudes commonly refer to people's evaluations of a wide variety of objects, issues, and people, including the self" (p. 658). According to Eagly and Chaiken (2007), an individual must first be (un)consciously aware of the "attitude object"—or in the present study, stuttering—prior to forming an attitude towards said object. Applying the above considerations to preschool-age children who stutter (CWS), it would be necessary for these children to be aware of their speaking abilities prior to negatively evaluating their stuttering. Furthermore, it is likely that children's awareness of their stuttering might contribute to the formation of negative attitudes towards their speaking abilities.

Although awareness of stuttering and the emergence of speech-associated attitudes in CWS have long been discussed (e.g., Bluemel, 1932; Johnson, 1942), the quantity and quality of children's awareness of their stuttering remain unclear. Some have stated that there is an essential lack of awareness in the early stage of childhood stuttering (e.g., Bluemel, 1932), while others have suggested that awareness may appear sooner for some children, in varying degrees (e.g., Bloodstein, 1960; Yairi & Ambrose, 2005). Yairi and Ambrose (2005) also observed that at the onset of stuttering, "many [children] continue on as before, giving little or no evidence of awareness of it" (p. 270). Bloodstein (1960) noted that "young stutterers [who may be] aware of their blocks … are, by and large, unconcerned about them" (p. 236). Such observations have seemingly led other investigators to focus the study of awareness and attitudes on grade school-age children and older individuals who stutter (e.g., Andrew & Cutler, 1974; Brutten & Dunham, 1989; Erickson, 1969; Yaruss & Quesal, 2008).

Investigators who *have* explored preschool-age CWS' awareness of stuttering have shown that children as young as two years of age might exhibit some degree of awareness of stuttered versus fluent speech patterns (Ezrati-Vinacour, Platzky, & Yairi, 2001; Grinager Ambrose & Yairi, 1994). For example, Grinager Ambrose and Yairi (1994) explored awareness of stuttering in 2 to 6 year-old children who do and do not stutter, matched for age and gender, over the course of two years. Each child was presented with a video recording of identical puppets, differing solely with respect to fluency (i.e., one puppet exhibited fluent speech, while the other exhibited stuttered disfluencies consisting of sound repetitions). In a subsequent awareness task (i.e., "point to the puppet that talks the way you do"), children from both groups were found to accurately identify their speech patterns (i.e., fluent versus stuttered) with those of the puppets'. In other words, these findings suggest that children as young as 2 years of age might be aware of their speech fluency.

In another study of preschoolers' development of fluency awareness (Ezrati-Vinacour et al., 2001), typically fluent 3 to 7 year-old children were presented with two physically identical puppets, with one exhibiting fluent speech and the other exhibiting stuttered disfluencies (i.e., sound/syllable and monosyllablic word repetitions, blocks, and prolongations). Participants engaged in a number of awareness tasks using these puppets, including fluency *discrimination* (i.e., "Do the puppets talk in the same way?"), *identification* (i.e., "Which puppet talks like you?"), *labeling* (what is this type of speech called?), and *evaluation* ("Is this talking good or not good?"). Findings indicated that children who do not stutter (CWNS), as young as 3 or 4 years old, are apparently aware of stuttering.

[1]See Eagly & Chaiken (2007) and Breckler (1984) for further discussion on the involvement of affect, behavior, and cognition in the formation and expression of attitudes.

The above findings seem to suggest that at least some preschool-age children are aware of stuttering, whether it is present in their own or others' speech. Thus, given Eagly and Chaiken's (2007) theory of awareness and attitude formation (i.e., one must first be aware of an object/entity prior to forming attitudes towards that object/entity), one reasonable means to begin studying the association between awareness, attitudes, and stuttering in CWS is by empirical assessment of their speech-related attitudes.

Vanryckeghem and Brutten (1997) investigated speech-associated attitudes of 6–13 year-old CWS and CWNS (n = 55 per talker group), and reported that CWS, as young as 6 years of age, exhibit significantly more negative attitudes towards their speech than CWNS. Therefore, Vanryckeghem, Brutten, and Hernandez (2005) hypothesized that negative speech-associated attitudes would appear earlier (i.e., preschool-age children, younger than age 6).

To date, however, there have been few reported studies of preschool-age CWS' attitudes beyond anecdotal/parental reports or observations (e.g., Gillam, Logan, & Pearson, 2009; Johnson, 1942). Although parental reports are often the primary source of information regarding their preschoolers' speech-associated attitudes, Vanryckeghem (1995) reported weak correlations between parents' and their school-aged children's scores on the Communication Attitude Test (CAT; Brutten, 1985; De Nil & Brutten, 1991). Vanryckeghem and Brutten (2007) interpreted this result as parental perceptions of their children's attitudes toward speech "reflect[ing] their own attitude about their offspring's speech disorder, rather than … that of their children" (p. 3). Given these findings, it seemed appropriate to explore other means for assessing attitudes of young children who stutter.

Hence, Vanryckeghem and Brutten developed the Communication Attitude Test for Preschool and Kindergarten Children Who Stutter (KiddyCAT; Vanryckeghem & Brutten, 2007; Vanryckeghem et al., 2005). The KiddyCAT is a twelve-item, yes/no response questionnaire, designed to obtain 3 to 6 year old children's self-reported "cognitive data about the belief system"—interpreted as "attitudes"—regarding their speech abilities (Vanryckeghem & Brutten, 2007). A higher score (out of 12) on the KiddyCAT suggests greater negative attitudes towards one's speech.

In their study of the KiddyCAT, Vanryckeghem et al. (2005) reported that preschool-age CWS scored significantly higher on the KiddyCAT than their peers who do not stutter. Based on these results, the test developers speculated that CWS are more likely to demonstrate negative attitudes toward their speaking abilities than preschool-age CWNS, and that the KiddyCAT has the potential to "validly distinguish between" the groups (Vanryckeghem & Brutten, 2007). They further postulated that "attitude is inextricably tied to awareness. This suggests that the negative belief that CWS have about their speech is related to an internally and/or externally derived awareness of reactions to the way they talk" (p. 314).

To the present authors' knowledge, the KiddyCAT is currently the only assessment tool of its kind, developed specifically for preschool-age children known or suspected to be stuttering. Given its utility, this instrument is becoming more widely used by researchers and clinicians to assess preschool-age CWS' attitudes toward talking, beyond parental reports. Therefore, it seems important to better understand what dimensions are embedded in the test items to help us more comprehensively interpret KiddyCAT results. At present, however, our understanding of the underlying dimensions is less than fully developed. For instance, although the test was based on the notions of awareness and attitude as "reactive aspects" of stuttering (Vanryckeghem & Brutten, 2007), and attitude as an extension of beliefs

(Vanryckeghem & Brutten, 2007; Vanryckeghem et al., 2005), there are no studies showing how these concepts might be linked to KiddyCAT test items.

The purpose of the present study was, therefore, to assess CWS' and CWNS' KiddyCAT responses to better understand the possible contributions of communicative and psychological processes to childhood stuttering. This was accomplished by the collection of KiddyCAT responses of preschool-age CWS and CWNS, and applying a categorical data principal components factor analysis (CATPCA). Factor loadings were thought to help clarify some of the underlying constructs of the KiddyCAT and possibly reveal differentiating response tendencies of CWS when compared to CWNS.

We formulated three testable hypotheses. Our first hypothesis was that, overall, CWS will score higher on the KiddyCAT, indicating more negative speech-related attitudes, than CWNS. Our second hypothesis was that multiple factors will be extracted from the KiddyCAT test items. That is, each factor may reflect or be associated with the child's perception of a different facet related to his/her speech-language planning or production. For example, the KiddyCAT item "Do people like how you talk?" may target awareness of social/communicative situations, whereas the item "Do words sometimes get stuck in your mouth?" may target awareness of speech production. Our third hypothesis was that preschool-age CWS and CWNS would respond differently to the underlying test dimensions of the KiddyCAT, as indicated by differences within each of the talker groups' individual factors (e.g., in terms of the number and/or type of items retained). Empirical support or refutation of these hypotheses should further our understanding of possible communicative or psychological processes that underlie children's reponses to the KiddyCAT.

2. Method

2.1 Participants

Participants included 52 monolingual, English speaking 3;0–5;11 year-old children who stutter (CWS; 15 females and 37 males, $M = 47.44$ months, $SD = 8.09$), and 62 children who do not stutter (CWNS; 31 female, 31 males, $M = 49.95$ months, $SD = 9.70$), with no significant between group differences in chronological age.

According to parental report, 89% (CWS = 45 and CWNS = 56) of the 114 participants did not receive any form of speech-language or fluency treatment. Seven (CWS = 4 and CWNS = 3) of the remaining 13 participants received treatment,[2] but parental reports were less than precise regarding the quantity and quality of treatment provided. Treatment information was unavailable for the remaining 6 participants (3 CWS and 3 CWNS).

Participants' data were collected as part of a large-scale empirical investigation of linguistic and emotional contributions to developmental stuttering (e.g., Arnold, Conture, Key & Walden, 2011; Byrd, Conture, & Ohde, 2007; Coulter, Anderson, & Conture, 2009; Johnson, Walden, Conture, & Karrass, 2010; Richels, Buhr, Conture, & Ntourou, 2010; Walden, Frankel, Buhr, Johnson, Conture, & Karrass, in press). All were paid volunteers whose parents either learned of the study from an advertisement in a free, monthly parent magazine circulated throughout Middle Tennessee, were contacted from Tennessee State birth records, or were referred to the Vanderbilt Bill Wilkerson Hearing and Speech Center for an evaluation. Informed consent by parents and assent by children were obtained.

[2]The possible impact of treatment for these 13 participants on overall findings will be discussed in the Caveats section of the Discussion.

The Hollingshead Four-Factor Index of Social Position (Hollingshead, 1975) was used in the present study to provide a descriptive/demographic measure classifying participants' socioeconomic status (SES). This index takes into account both parents' educational levels, occupation, gender, and marital status, based on caregivers' reports. Computed scores range from eight to 66, with a higher score indicating a higher socioeconomic status.

2.2 Classification and Inclusion Criteria

To minimize the possibility that results may be confounded by clinically significant speech-language-hearing deficits, all participants' articulation, receptive and expressive language skills, as well as hearing abilities were assessed using standardized measures. Particularly, the "Sounds in Words" subtest of the Goldman-Fristoe Test of Articulation-2 (GFTA-2; Goldman & Fristoe, 2000) measured children's articulation; receptive vocabulary was assessed using the Peabody Picture Vocabulary Test-Third Edition (PPVT-III; Dunn & Dunn, 1997); the Expressive Vocabulary Test (EVT; Williams, 1997) measured expressive vocabulary; and the Test of Early Language Development-3 (TELD-3; Hresko, Reid, & Hamill, 1999) evaluated participants' receptive and expressive language abilities. In addition, bilateral pure tone and tympanometric hearing screenings were conducted to rule out hearing concerns.

Children were excluded from the study if they scored below the 16th percentile (i.e., one standard deviation below the mean) on any one of the standardized speech or language tests. Furthermore, all included participants were expected to perform within normal limits on the bilateral pure tone and tympanometric hearing screening (American Speech–Language–Hearing Association, 1990).

Participants were assigned to the CWS group if they (a) exhibited three or more stutterings (i.e., sound/syllable repetitions, sound prolongations, broken words or monosyllabic whole word repetitions) per 100 words of conversational speech (Conture, 2001; Yaruss, 1998), and (b) scored 11 or greater (i.e., severity of at least "mild") on the Stuttering Severity Instrument-3 (SSI-3; Riley, 1994).

Participants were classified as CWNS if they (a) exhibited two or fewer stutterings (i.e., sound/syllable repetitions, sound prolongations, broken words or monosyllabic whole-word repetitions) per 100 words of conversational speech, and (b) scored 10 or lower on the SSI-3 (i.e., severity of less than "mild").

2.3 Measurement of Speech Fluency

Speech fluency was measured with respect to frequency, type, and severity of stuttering. These values were derived from a 300-word conversational speech sample, obtained through child-examiner play, in conjunction with the SSI-3. As with similar published studies of preschool-age children (e.g., Coulter et al., 2009; Richels et al., 2010), stuttered disfluencies included sound/syllable repetitions (e.g., "s-s-s-sorry"), monosyllable whole-word repetitions (e.g., "the-the-the"), sound prolongations (e.g., "ssssorry"), and broken words (e.g., "g—oing").

2.4 KiddyCAT Measures

The KiddyCAT (Vanryckeghem & Brutten, 2007) is a 12-item, binary (i.e., yes or no) response questionnaire, designed to assess preschool-age children's attitudes towards communication. This questionnaire was normed on 45 CWS and 63 CWNS between the ages of 3 and 6 years. Children could achieve a maximum possible score of 12, with a greater score indicating that the child has more negative attitudes towards his/her speaking abilities. For the present study, a categorical data principal components factor analysis

(CATPCA) was used to determine the underlying dimensions of the KiddyCAT test items, as described below.

2.5 Procedures

Data collection for all participants consisted of a parent interview, wherein information was obtained regarding the family's SES, history of speech-language and fluency disorders, as well as caregivers' concerns about their children's speech-language abilities (for further information regarding this interview process, see Conture, 2001). While one examiner conducted the parent interview, another examiner engaged the child in conversation during free-play, from which measures of speech fluency were obtained (see Measurement of Speech Fluency section above). Participants were then administered a series of standardized speech and language tests in the following, fixed order: GFTA, PPVT, EVT, and TELD-3. Standardized testing was followed by the administration of the KiddyCAT, as well as bilateral pure tone and tympanometric hearing screenings. Although testing procedures might have introduced an element of fatigue to some of the later administered tests (e.g., TELD-3), this error was a constant one for all participants. Furthermore, the authors found the above procedure to maximize the chances that the greatest number of preschool-age children will successfully complete all such testing.

Testing was conducted in a controlled laboratory environment as part of a pre-experimental diagnosis/screening to determine inclusion/exclusion for subsequent experimental research (e.g., Byrd et al., 2007; Coulter et al., 2009; Johnson et al., 2010). Furthermore, all audiometric equipment was routinely calibrated.

2.6 Data Analyses

Prior to testing the present study's main hypothesis, the investigators assessed the descriptive statistics for the talker groups' (CWS, CWNS) performance on each of the speech-language and fluency measures, as well as their performance on the KiddyCAT. Analyses of variance (ANOVA) were employed to determine possible between-group differences on the various standardized speech-language tests (e.g., TELD-3, PPVT-III, EVT, and GFTA), and measures of speech disfluencies.

The 1st hypothesis was tested by performing ANOVAs, which assessed whether CWS scored differently from CWNS on the KiddyCAT, particularly with respect to chronological age, younger versus older age groups, and gender. Given the small sample size of the older CWS subgroup ($n = 10$), a nonparametric statistic (i.e., Mann-Whitney U) was used to analyze the older age group effect between talker groups, as well as the younger versus older age group effect within CWS.

To test the 2nd hypothesis that the KiddyCAT measures multiple dimensions of attitude and awareness, KiddyCAT data were subjected to a CATPCA[3] using the Categories module in SPSS (Meulman, Heiser, & SPSS, 2010). Factor extractions/dimensions with a Cronbach's alpha greater than or equal to 0.70 (i.e., suggesting adequate internal consistency for that particular factor) were retained. Within a factor, components with a value exceeding |0.40| were considered to be satisfactory; items with a factor loading below |0.40| were omitted.

To assess the 3rd hypothesis, that CWS will respond differently to the underlying test dimension(s) compared to CWNS, separate CATPCAs were applied to each of the talker group's KiddyCAT data. We further estimated the similarities between CWS' and CWNS'

[3]PCA, a "manifest variable" procedure employing orthogonal solutions, allows for the analysis of underlying variables that can be directly measured or observed (e.g., attitudes). CATPCA is a type of PCA that analyzes categorical data (i.e., "yes" or "no" responses). See Velicer and Jackson (1990) for further discussion.

individual factor loadings by computing a factor congruence coefficient—a statistic that measures the similarity of two factorial configurations/structures, with resulting values ranging from −1 to +1 (Abdi, 2007).

Within our Results section, a finding was considered to be significant if the associated p-value was 0.05 or less, and when less, we reported the actual p-values obtained.

2.7 Inter- and Intra-judge Measurement Reliability for Stuttering

The present authors' inter- and intra-judge measurement reliability for stuttering in preschool-age children has been documented elsewhere (e.g., Arnold et al., 2011; Byrd et al., 2007; Johnson et al., 2010; Richels et al., 2010), with inter/intrajudge agreements ranging from 87% to 100%, Cronbach's alpha ranging between .83 and .99, and kappa coefficients from .76 to .84.

3. Results

3.1 Descriptive and Demographic Information

3.1.1 Speech Fluency—As would be expected, based on talker group classification, preschool-age CWS exhibited significantly greater mean total disfluencies ($M = 0.12$, $SD = 0.06$) than preschool-age CWNS ($M = 0.04$, $SD = 0.02$), $F(1, 112) = 111.429$, $p < 0.001$. Furthermore, CWS exhibited significantly more stutterings ($M = 0.08$, $SD = 0.05$) than CWNS ($M = 0.01$, SD = 0.01), $F(1, 112) = 130.841$, $p < 0.001$. CWS also exhibited significantly more non-stuttered disfluencies ($M = 0.04$, $SD = 0.03$) than CWNS ($M = .03$, $SD = .02$), $F(1, 112) = 11.599$, $p = 0.001$. Consistent with these findings, CWS exhibited significantly higher mean scores on the SSI-3 ($M = 18.7$, SD = 5.4) than CWNS ($M = 7.0$, $SD = 1.7$), $F(1, 112) = 264.613$, $p < 0.001$.

3.1.2 KiddyCAT Scores—Overall, preschool-age CWS scored higher ($M = 4.42$, $SD = 2.52$) on the KiddyCAT than preschool-age CWNS ($M = 2.61$, $SD = 2.20$), a finding consistent with those reported in the previous literature (Vanryckeghem et al., 2005; Vanryckeghem & Brutten 2007). See Table 1 for further descriptive information (i.e., M and SD) regarding the talker groups' KiddyCAT scores stratified by age, as found in the present study and compared to those reported by the test developers.

3.1.3 Socio-economic Status (SES)—Of the 114 total participants, SES information was only available for 100 children. For these 100 participants, no significant between-group difference in SES was found between CWS ($n = 45$, $M = 43.28$, $SD = 13.06$) and CWNS ($n = 55$, $M = 44.66$, $SD = 11.48$), F (1, 98) = .318, p = .574.[4]

3.1.4 Speech and Language Abilities—Although all participants scored within normal limits (i.e., at or above the 16th percentile) on the various standardized speech-language tests (e.g., TELD-3, PPVT-III, EVT, and GFTA; see Table 2), ANOVA results indicated significant between-group differences for the receptive subtest of the TELD-3, $F(1, 112) = 5.210$, $p = .024$, with preschool-age CWNS scoring higher than preschool-age CWS.[5] No significant between-group differences were found for the GFTA, PPVT-III, EVT, or the expressive subtest of the TELD-3. The possible impact of between-group differences on the

[4]For the 100 participants for whom SES data was available, ANOVAs were performed with SES as a covariate to assess the possible effects of SES on KiddyCAT scores. No significant effects were found for SES on talker group or KiddyCAT scores. Thus, all 114 participants (i.e., the 100 with plus the 14 without SES data) were included in the present study's final data corpus .

[5]Because of this significant finding, TELD-3 receptive scores were included as covariates in the first statistical model to assess competing explanations for possible between-group differences in KiddyCAT scores.

TELD-3 on KiddyCAT scores will be considered in the statistical/analytical models described immediately below.

3.2 Group Differences in KiddyCAT Scores

3.2.1 Talker Group, Chronological Age, and Gender—To assess the 1st hypothesis (i.e., CWS would exhibit significantly higher KiddyCAT scores than the CWNS), two separate ANOVAs were employed. Besides talker group, the first model also contained terms for other possible explanations of variation in KiddyCAT scores, specifically, chronological age, gender, receptive language abilities (i.e., participants' scores on the TELD-3 receptive subscale), talker group X age interaction, and talker group X gender interaction. Neither of the interactions were significant, nor was there any effect for receptive language (*p* values ranged from .783 to .128). We subsequently omitted the two interactions as predictors in the model, as well as receptive language abilities (i.e., TELD-3 performance).

Consistent with our 1st hypothesis, results of a between-subjects ANOVA, including age, gender, and talker group, indicated a significant main effect for talker group, $F(1, 110) = 12.114$, $p = .001$, $\eta_p^2 = .099$, with preschool-age CWS scoring significantly higher (EM = 4.19, SEE = .309)[6] on the KiddyCAT than preschool-age CWNS (EM = 2.75, SEE = .270). A significant main effect was also found for chronological age, $F(1, 110) = 27.639$, $p < .001$, est. $\beta = -.118$, $\eta_p^2 = .201$, in that the older participants tended to score lower on the KiddyCAT than the younger participants. No significant effects were found for gender (males: EM = 3.645, SEE = .258; females: EM = 3.29, SEE = .322), $F(1, 110) = .718$, $p = .399$, $\eta_p^2 = .006$. Thus, KiddyCAT scores do not appear to significantly differ as a result of gender. The positive findings for talker group and age, and the negative finding for gender are consistent with findings reported by Vanryckeghem & Brutten (2007).

3.2.2 Younger versus Older Age Group—To assess the possible effect of age on KiddyCAT scores, in a fashion similar to that employed during the development of the questionnaire (Vanryckeghem & Brutten, 2007; Vanryckeghem et al., 2005), participants in the present study were divided into two groups: a 'younger' age group (3;0–4;6 years of age; $N = 85$; $EM = 44.65$ months, $SEE = 5.72$) and 'older' age group (4;7–5;11 years of age; $N = 29$; E$M = 61.00$ months, $SEE = 5.09$). Significant effects were found for *talker group*, $F(1, 110) = 13.147$, $p < .001$, $\eta_p^2 = .107$, and *age group* (younger vs. older), $F(1, 110) = 12.822$, $p = .001$, $\eta_p^2 = .104$, with younger children scoring higher (EM = 3.94, SEE = .246) than older children (EM = 2.19, SEE = .427).

A separate *between-group* analysis indicated that the younger CWS scored significantly higher (EM = 4.572, SEE = .376) on the KiddyCAT than younger CWNS (EM = 3.306, SEE = .355), $F(1, 82) = 5.898$, $p = .017$, $h_p^2 = .067$. A significant between-group difference was also observed for the older CWS (Mdn = 20.80) versus older CWNS (Mdn = 11.95), U = 37.0, $p = .006$, r = .51. [7] Separate *within-group* analyses, using the Mann-Whitney U statistic for the CWS, indicated that the older CWNS scored significantly lower (EM = 1.00, SEE = .447) than the younger CWNS (EM = 3.324, SEE = .297), $F(1, 59) = 18.607$, $p < .001$, $\eta_p^2 = .240$; however, no such age effect was not found for the CWS (younger Mdn = 27.39; older Mdn = 22.75), U = 172.5, $p = .379$, r = .12. These findings are consistent with those reported by Vanryckeghem and Brutten (2007).

[6]For these inferential statistical models, the associated estimated marginal means (EM) and standard estimated error values (SEE) are reported. For descriptive purposes (e.g., Table 1), unadjusted means and SDs are reported.

[7]Given the small sample size of the older CWS subgroup ($n = 10$), nonparametric statistics, Mann-Whitney U-tests (U), were used to analyze the older age group effect between talker groups, as well as the younger versus older age group effect within CWS; medians (Mdn) rather than means were reported for descriptive purposes.

3.3 CATPCA and Factor Congruence Coefficient Results

To assess the 2nd hypothesis (i.e., that multiple factors would be extracted from the KiddyCAT test items), a categorical data principal components factor analysis (CATPCA) was applied to KiddyCAT responses of all children (CWS and CWNS) combined, indicating the underlying test dimension(s). To assess the 3rd hypothesis (i.e., CWS and CWNS will respond differently to the underlying dimensions of the questionnaire), two additional CATPCAs were conducted, subjecting KiddyCAT data for each talker group separately (i.e., one for only CWS' KiddyCAT responses and one for only CWNS' KiddyCAT responses). A factor congruence coefficient was then computed to compare the talker-groups' individual factors to one another. Table 3 displays factor loadings for all children (CWS and CWNS) combined, CWNS alone, and CWS alone. Salient details to these results are discussed immediately below.

3.3.1 Factor Loadings for All Participants (i.e., CWS + CWNS)—Contrary to our 2nd hypothesis, application of a CATPCA to all participants' (N = 114) data, using the above criteria (i.e., Cronbach's alpha ≥ 0.70), resulted in only one factor being extracted from the KiddyCAT test items (Cronbach's alpha = 0.734). This model accounted for 25.49% of total variance and resulted in the omission of six test items due to loadings below |0.40| (Table 3). Items with high factor loadings appeared to be mostly related to speech difficulty (e.g., "Is it hard for you to say your name?").

3.3.2 Factor Loadings for CWNS—Based on only CWNS' (n = 62) KiddyCAT data, one factor was extracted from the test items (Cronbach's alpha = 0.738) by means of a CATPCA. This single-factor model accounted for 25.77% of the variance and resulted in the omission of seven test items due to loadings below |0.40| (Table 3). As with factor loadings for all participants, items with high factor loadings for CWNS appeared to be mostly related to speech difficulty. In other words, CWNS tend to *agree* with KiddyCAT questions related to "speech is hard."

3.3.3 Factor Loadings for CWS—A similar CATPCA was applied to only CWS' (n = 52) KiddyCAT data, which resulted in a single factor (Cronbach's alpha = 0.768) accounting for 28.18% of the variance. This factor retained 10 of the 12 test items (Table 3) related to speech difficulty, with *positive* loadings on negative speech-related questions indicating that "speech is hard" (e.g., "Is it hard for you to say your name?"), as well as *negative* loadings on positive speech-related questions (e.g., "Do your words come out easily?" and "Do people like how you talk?"). In other words, CWS tend to *agree* with questions related to "speech is hard," and *disagree* with more positive speech-related questions.

A factor congruence coefficient was computed for the loadings of the derived factors for CWS versus CWNS, r = .857, suggesting that the two groups respond in a similar but not identical fashion.[8] Taken together (i.e., CATPCA results for each talker group's individual factors, along with the factor congruence coefficient results), the finding that CWS and CWNS responded similarly but somewhat differently partially confirmed our 3rd hypothesis that the two talker groups (i.e., CWS and CWNS) would respond differently to the underlying test dimensions.

[8]At present, no entirely satisfactory means for testing the significance of the factor congruence coefficient (FCC) is readily available (Abdi, 2007). For guidance in interpreting the FCC, see Bedeian, Armenakis, and Randolph (1988).

4. Discussion

4.1 Overall KiddyCAT Findings

The present study resulted in three main findings. First, findings confirmed our initial hypothesis that CWS score higher on the KiddyCAT than CWNS. Our second hypothesis that multiple factors will be extracted from the KiddyCAT test items was not confirmed. Instead, we found that only a single factor underlies the questionnaire, one that relates to elements of speech difficulty. Finally, findings partially confirmed our third hypothesis that the two talker groups (i.e., CWS and CWNS) respond differently to the underlying test dimensions. Further discussion and implications of these results will be addressed immediately below.

4.2 Hypothesis 1: Preschool-age CWS will score higher than preschool-age CWNS on the KiddyCAT

Confirming our initial hypothesis, findings indicated that CWS scored significantly higher on the KiddyCAT than CWNS, regardless of age and gender. In other words, the KiddyCAT significantly differentiates preschool-age CWS from their normally fluent peers, a finding consistent with the original results of the test developers (Vanryckeghem & Brutten, 2007; Vanryckeghem et al., 2005). This independent replication suggests at least two things: (1) the KiddyCAT is one viable, seemingly reliable means for distinguishing the speech-associated attitudes of preschool-age CWS from preschool-age CWNS, and (2) even at this young age, at or near the onset of stuttering, preschoolers have formed or are forming attitudes towards speaking that may either facilitate (in the case of CWNS) or inhibit (in the case of CWS) their ability to establish normally fluent speech-language planning and production. The issue of "directionality"—that is, do attitudes precede or follow the onset of stuttering—is one worthy of future empirical study, something that was neither attempted nor could be addressed using present methodology.

4.3 Hypothesis 2: Multiple Constructs underlie the KiddyCAT

Contrary to our second hypothesis, only a single dimension appears to account for the KiddyCAT. As indicated by the CATPCA results, the loadings within the single construct for all children (both CWS and CWNS) related to elements of speech difficulty. Perhaps this finding suggests that all preschool-age children with typical language skills begin to develop some basic level of understanding that speech, language, or communication is sometimes difficult.

4.4 Hypothesis 3: CWS and CWNS respond differently to the underlying test dimensions

Upon further assessment of the talker groups' individual CATPCA results (i.e., CWS' factor versus CWNS' factor), one would observe that five additional items loaded within CWS' factor. Specifically, all five items that loaded for CWNS, which related to speech difficulty, also loaded for CWS. The five additional items within the CWS' factor appear to include more examples of speech difficulty and negative responses to positive speech-related experiences (e.g., the easiness of speech, as in "Do your words come out easily?"; and enjoyment/approval of their talking, as in "Do people like how you talk?"). The sources for CWS' performance on the KiddyCAT, compared to CWNS', remain unclear. Such results begs the question of why, a question we address immediately below.

First, we speculate that the CATPCA findings reflect CWS' experience with and observations of their speech abilities, listeners' reactions, and the child's reaction, in turn, to listeners' reactions. In other words, we conjecture that due to their stuttering, CWS, as compared to CWNS, have relatively more instances of negative speech-related experiences as well as relatively more instances of positive speech-related experiences potentially

becoming negative (in CWS' perspective). Indeed, according to Eagly and Chaiken (2007), "experience establishes a tendency to respond with some degree of positivity or negativity to an attitude object" (p. 585).

Of course, experience alone does not necessarily imply that children will develop negative attitudes. Perhaps preschoolers' frequent experiences with their stuttering foster changes in their level of speech-related awareness. Together, a greater quantity of stuttering-related experiences along with increased awareness of these experiences may lead to changes in children's quality of attitudes towards communication, in general, and their own speaking, in specific. Of course, this conjectured relationship between awareness, quantity of experiences, and quality of attitudes rests on the basic assumption that experience with stuttering are associated with changes in awareness and/or attitudes towards communication. All such speculation, while not unreasonable, still lacks empirical data to support or refute its veracity.

Nevertheless, contrary to historical viewpoints (e.g., Bluemel, 1932), present findings seem to support the notion that at least some young CWS do appear to be, on some level, aware of their experiences with stuttering. Such "awareness," of course, may not necessarily be consistent across all instances of stuttering, speaking situations, listeners, etc. Indeed, it is unclear whether preschool-age children's awareness of stuttering/speech difficulties differs with changes in the length and complexity of their utterances, speaking situations, number/nature of listeners, and so forth. Further speculation on this topic must await further empirical study, with implications of such investigations seemingly having both theoretical as well as clinical significance.

Our second interpretation of the above findings indicates that CWS over-monitor or are hyper-attentive to their own speaking, speaking situations, listener reactions, etc., including those, which might be positive (speculation consistent with findings/speculation of Civier, Tasko, & Guenther, 2010). While such over-monitoring/hyper-attentiveness does not necessarily lead to an automatic development of negative speech-related attitudes, it is possible that it might incline CWS to develop greater negative evaluation of both fluent as well as disfluent speaking behaviors. Such speculations would explain CWS' negative responses to positive speech-related questions, as well as their agreement with the speech-difficulty related questions (as indicated by their factor loadings). On the contrary, CWNS might be aware of difficult moments of speech without being overly-attentive to all other speaking situations, as indicated by CWNS' factor consisting of only the speech-difficulty related questions.

As suggested above, we are still uncertain regarding the point in development when CWS (1) first become aware that their "speech is hard," (2) can distinguish "hard" from "easy" aspects of their speaking abilities and communicative situations, and (3) develop negative attitudes regarding communication, in general, and/or, more specifically, their speaking performance. Perhaps there is considerable individual difference regarding this point of development, with some children arriving at this point of development rather quickly, others slowly, and still others not at all. Unfortunately, present methodology precludes us from determining whether there is a subgroup of preschool-age CWS who are not aware of and/or concerned about their disfluencies. To help address these issues, future research should consider assessing other aspects of stuttering (e.g., time since onset), to determine how the KiddyCAT relates to developmental components of stuttering over and beyond diagnostic differences between CWS and CWNS. Furthermore, future exploration of CWS' versus CWNS' attention to and monitoring of their speech abilities appear to be warranted as they are of great theoretical and clinical import.

As previously mentioned, we found partial support for our third hypothesis. Specifically, the loadings within each of the talker group's individual factors suggest that preschool-age CWS responded somewhat differently than their CWNS peers to the underlying test dimension. Thus, although one factor resulted for each of the talker groups, indicating that both CWS and CWNS tend to *agree* with questions related to "speech is hard" (consistent with the factor congruence coefficient), CWS' loadings indicated that they also *disagree* with more positive speech-related questions (i.e., "speech is easy" and enjoyment/approval of speech). Perhaps CWS "generalize" from negative experiences with some aspects of speech-language to other aspects of speech-language, even those more demonstrably positive. At present, it is unknown whether such generalization occurs gradually (i.e., incremental changes over time) or more rapidly (i.e., moving from minimum to maximum negativity toward communication). What *is* clear from these findings is that the talker groups respond somewhat differently to the test's underlying construct, a difference that may be salient for preschool-age CWS's ability to establish normally fluent speech, and a topic worthy of further empirical exploration.

4.5 Ancillary Issues

4.5.1 Impact of Age on KiddyCAT performance—Within-group comparisons indicated that younger preschool-age CWNS (ages 3;0 – 4;6 years) scored significantly higher on the KiddyCAT than older preschool-age CWNS (ages 4;7 – 5;11 years); however, no such age-related difference was found for CWS. Perhaps this age effect suggests that younger children are, in general, somewhat concerned about speaking because of their immature/developing speech and language abilities. These concerns of speaking may be resolved for older preschoolers who do not stutter, as their speech-language abilities generally improve with age. However, for CWS who continue to struggle with their speech disfluencies/speech-language development, it seems reasonable to speculate that they are at greater risk for continuing to have negative speech-related attitudes.

Inferences regarding the age-effect should, however, be made with caution, given this study's relatively small sample size of the older age group. Further, the present study was unable to examine if CWS who will later recover from stuttering will perform differently on the KiddyCAT with age as compared to CWS whose stuttering will persist. Thus, a more precise understanding of these age-related differences on the KiddyCAT must await further empirical studies employing larger samples of younger versus older preschool-age CWS and CWNS.

4.5.2 Speech is difficult/hard: A clinical perspective—The notion that preschool-age CWS perceive their speech as "hard" can be viewed from at least one clinical perspective. The terms *hard* versus *easy*, often introduced during the "identification" phase of treatment with young CWS, have typically been based on a perception of duration (length) and manner (tension) of stuttering (Conture, 2001; Williams, 1971). Hard speech has been characterized as "physically tense and relatively rapid," and *easy speech* as "physically relaxed and relatively slow" (Conture, 2001). When providing therapy to preschoolers who stutter, some clinicians have tried to help CWS identify and explicitly compare instances of "hard" versus "easy" speech in themselves and others, with the goal of reducing the length of as well as perceived tension associated with the child's speech difficulty (Conture, 2001). This approach to therapy is thought to constructively promote young CWS' awareness or ability to differentiate "hard" from "easy" speech. It is assumed that having such "knowledge" should help change their speaking difficulties.

The above procedures, used by some clinicians to help their clients identify and/or describe their stutterings and associated behaviors, seem fairly consistent with preschool-age CWS'

awareness of their stuttering. Is this apparent congruence between clinician approach and client awareness happenstance? Presently, there is no clear answer to this question. However, it is intriguing to consider the possibility that certain treatment approaches arose, for better or worse, from clinician's intuitions, observations and/or percepts about their clients' concerns about speaking and/or their abilities to do so. Such possibilities, of course, must await further study.

5. Caveats

As previously mentioned, 7 of the total 114 participants received some form of speech-language treatment (CWS = 4 and CWNS = 3); no treatment information was available for 6 other participants (CWS = 3 and CWNS = 3). Although the quantity and quality of treatment provided was unclear for these 11% of participants, it is possible that treatment, in general, might have affected their responses to the KiddyCAT test items. For instance, it could be that some children may become more aware of their stuttering or begin to over-monitor their speaking behavior during the course of treatment. However, given the nature of the present study and the relatively small sample of participants who received treatment, we cannot determine with certainty what impact treatment has, if any, on children's KiddyCAT responses.

Similarly, as previously noted, SES data was only available for 100 of the 114 total participants. Although inferential statistical assessment indicated that there was no apparent influence of SES on the data for these 100 participants, one cannot completely rule out the possibility that SES might have an impact on children's speech-related attitudes. Therefore, subsequent empirical studies of the KiddyCAT should attempt to obtain SES data for all participants as well as address SES as a potential factor contributing to children's KiddyCAT scores.

Another limitation of the present study was the relatively small *N* on which a CATPCA was performed. Additionally, all participants were typically developing children without any apparent disorders/disabilities other than stuttering. Therefore, findings may not be generalized to other populations, for example, CWS with co-morbid speech or language disorders/difficulties (for a meta-analytical review of language and stuttering, see Ntourou, Conture, & Lipsey, 2011). It would be interesting to learn how preschool-age children with clinically significant speech/language difficulties respond to the KiddyCAT, compared to preschool-age CWS and CWNS; the questionnaire might provide insight into speech-related attitudes beyond stuttering.

Lastly, the binary nature of the KiddyCAT (i.e., "yes/no" response) provides but one view of children's perceptions regarding their speech-related experiences. Perhaps, the use of follow-up, open-ended questions might augment KiddyCAT results, and provide an enhanced perspective regarding children's feelings or experiences with speaking and communication. Thus, given present findings, one could only conclude that the questionnaire taps into preschool-age children's "assessment" of communicative difficulties, but not other facets of the child's life (e.g., social concerns).

6. Conclusions

Given that the KiddyCAT test items ask children to *evaluate* their speaking, it seems reasonable to conclude that the questionnaire does, in fact, assess their *attitude* towards their speaking abilities and communication. Furthermore, this instrument appears to significantly differentiate preschool-age CWS from their normally fluent peers by tapping into their attitudes towards their speech abilities/difficulties; for CWS, this single factor includes additional attitudinal elements. It seems possible that CWS' responses are driven by frequent

experiences with their speech being “hard” and less positive, as indicated by their factor loadings. At present, it is unknown whether there are individual variations in the time course of CWS’ development of negative speech-related attitudes; for example, some CWS might incrementally/gradually develop this attitude over time, whereas other CWS might rapidly develop this attitude in a seemingly “over-night” fashion.

Taken together, the single factor—“speech difficulty”—underlying the KiddyCAT appears related to communicative and psychological processes. This factor seems appropriate on both empirical (i.e., principal components analysis) as well as conceptual (i.e., the quality of the factor) grounds. Thus, present findings support the inclusion of the KiddyCAT as part of a comprehensive approach to the assessment of childhood stuttering. These findings also appear to help improve our ability to interpret KiddyCAT findings as well as further our understanding of how attitudes and awareness contribute to developmental stuttering in preschool-age children.

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Highlights

- KiddyCAT scores of preschool-age CWS and CWNS were compared.
- CWS scored higher than CWNS on the KiddyCAT, regardless of age and gender.
- A principal components factor analysis assessed KiddyCAT dimensions.
- A single factor—speech difficulty—appears to underlie the KiddyCAT.
- KiddyCAT responses relate to children's evaluation of their speech difficulties.

Table 1

Mean (M) and standard deviations (SD) of KiddyCAT scores for preschool-age children who stutter (CWS, *n* = 52) and preschool-age children who do not stutter (CWNS, *n* = 62), stratified by age

	Present Findings				Vanryckeghem & Brutten (2007)			
Talker Group	**CWS**		**CWNS**		**CWS**		**CWNS**	
Age Group[a]	Younger	Older	Younger	Older	Younger	Older	Younger	Older
N	42	10	43	19	28	17	29	34
M (SD) KiddyCAT Score by Age Group[b]	4.60 (2.50)	3.70 (2.58)	3.30 (2.11)	1.05 (1.51)	4.89 (3.06)	3.71 (2.47)	2.21 (1.93)	1.32 (1.53)
M (SD) KiddyCAT Score by Talker Group[b]	4.42 (2.52)		2.61 (2.20)		4.36 (2.78)		1.79 (1.78)	

[a]Vanryckeghem & Brutten's age groups were not specified by months, and may, therefore, slightly differ from the age groups in the present study. In the present study, children in the younger age group were between the ages of 36 – 54 months; the older age group consisted of children between the ages of 55 – 71 months. Vanryckeghem & Brutten's younger group included children 3 to 4 years of age, whereas the older group consisted of children 5 – 6 years of age.

[b]These "raw" or descriptive M and SD will be slightly different from the estimated marginal mean (EM) and standard error estimate (SEE) used in the inferential statistical modeling reported in the Results section.

Table 2

Mean (standard deviations; SD) scores on standardized speech-language tests of preschool-age children who stutter (CWS, $n = 52$) and preschool-age children who do not stutter (CWNS, $n = 62$)

Speech-Language Test	CWS Standard Score (SD)	CWNS Standard Score (SD)	*F*	*p*
PPVT-III	110.96 (10.8)	111.60 (12.1)	0.007	0.933
EVT	112.77 (10.4)	116.47 (12.1)	1.786	0.184
TELD – 3				
Expressive Subtest	107.67 (13.3)	109.19 (11.9)	1.045	0.309
Receptive Subtest	112.79 (15.2)	117.82 (12.2)	5.210	0.024
GFTA - 2	108.21 (9.5)	108.74 (11.0)	0.380	0.539

Table 3

PCA Results Factor loadings of KiddyCAT items (Vanryckeghem & Brutten, 2007) for all participants (N = 114), CWNS (n = 62), and CWS (n = 52). Shaded areas represent loadings that met the criteria (i.e., values ≥ | 0.40|) for retention within the factor

KiddyCAT Test Item[a]	Factor Loading:		
	All Children[b]	CWNS[c]	CWS[d]
12	.802	.815	.647
11	.798	.763	.560
4	.770	.801	.633
5	.710	.780	.519
8	.652	.627	.564
1	.434	.328	.580
2	.184	.146	−.045
3	.141	.088	−.273
10	−.119	−.032	−.663
7	.035	−.201	−.408
9	.009	.120	−.552
6	.000	.098	−.582

[a] Item numbers correspond with their respective questions on the KiddyCAT.

[b] Cronbach's alpha=0.734 (the estimated internal consistency for all children's factor loading); Eigenvalue=3.059; percent of variance= 25.491%

[c] Cronbach's alpha=0.738 (the estimated internal consistency for CWNS' factor loading); Eigenvalue=3.092; percent of variance=25.766%

[d] Cronbach's alpha=0.768 (the estimated internal consistency for CWS' factor loading); Eigenvalue=3.382; percent of variance=28.184%