

The German Communication Attitude Test for Preschool and Kindergarten Children Who Stutter (KiddyCAT-G): Reliability and First Reference Data

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Abstract

Objective: To investigate reliability and describe reference data of the KiddyCAT-G, an authorized German adaptation of the 'Communication Attitude Test for preschool and kindergarten children who stutter'.

Method: Children (3.0-5.11 yrs) who do not stutter (CWNS; n=150) and children who stutter (CWS; n=30) completed the KiddyCAT-G. In order to determine test-retest reliability, the KiddyCAT-G was re-administered to a sub-sample of children (n=35; CWNS: n=15, CWS: n=20) one week later. Their parents completed a sociodemographic questionnaire.

Results: The KiddyCAT-G had moderate to high values of internal consistency for both groups (CWNS: $\alpha=0.61$; CWS: $\alpha=0.79$), as well as high test-retest-reliability ($r=0.983$, $p<0.001$). Group comparisons showed significantly higher mean scores for CWS (M=3.73, SD=2.92) than for CWNS (M=1.47, SD=1.65). In both groups, younger children (3.0-4.6 yrs) scored descriptively higher than older ones, a difference that was non-significant for the CWS, but significant for CWNS.

Conclusion: The internal consistency and test-retest-reliability of this assessment tool of communication attitude supports its use by SLPs for clinical and research purposes in German-speaking children. Data of 150 CWNS give first reference values.

Keywords: Communication attitude; Fluency disorder; Stuttering; Preschoolers; KiddyCAT; Test-retest-reliability; Internal consistency

Introduction

Children Who Stutter (CWS) are subjected to a multi-dimensional disorder [1,2] which is characterized by an interruption of speech fluency, but also in a broader way by co-occurring events, e.g. secondary physical characteristics, which often disturb the communication outcomes of the children negatively [3]. Unfavorable experiences with communication can lead to negative communication attitudes in CWS. Therefore, it is important to include children's individual estimation of their communication attitude in overall speech-language assessment [4,5].

The long tradition of studying communication attitudes in adults who stutter lead to the evidence indicating that they show significantly more negative attitudes towards their speech and communication than fluent speakers [6-9]. Therefore, additional studies with adolescents and school-aged children were conducted to investigate development of negative communication attitude [10,11].

As Zollinger [12] stated, children are able to compare their own communication performance relative to their peers by three years of age. Mathieu [13] found that by age four, children with speech-

language disorders (i.e. speech comprehension difficulties) developed strategies to hide these difficulties from peers. Therefore, it is not surprising, that studies have shown awareness of stuttering among preschool children who stutter [14,15].

The development of the KiddyCAT [16] made it possible to investigate the communication attitude of preschool children [17-19]. The KiddyCAT is a well-validated measure in its Swedish [20], Slovenian [21], Persian [22], American [16,17,23], Dutch [16,23] and Polish [15] version. Other normative and validation studies are in progress in African, Asian and European countries.

Previous studies identified good reliability of the KiddyCAT. The American version was found to have high internal consistency for CWS (Cronbach coefficients $\alpha=0.75$, n=45) and children who do not stutter (CWNS) ($\alpha=0.72$, n=63) [16]. The same holds for the Dutch KiddyCAT ($\alpha=0.75$, n=249 CWS and $\alpha=0.70$, n=264 CWNS) [23]. The Polish version also proved to be internally reliable for both groups of CWNS and CWS ($\alpha=0.71$, n=128) [15], as did the Slovenian form ($\alpha=0.73$, n=123) [21]. The Swedish version, only based on a group of CWNS, provided a reliability of $\alpha=0.64$ [20] whereas the Persian KiddyCAT, tested on 30 CWS, revealed a high internal consistency of $\alpha=0.83$ [22].

High test-retest reliability was successfully established for the Dutch KiddyCAT with a group of CWS ($r=0.90$, $n=34$) and CWNS ($r=0.67$, $n=42$) [24]. The Slovenian version also verified a high test-retest reliability for a group of CWS ($r=0.953$, $n=49$) and a group of CWNS ($r=0.985$, $n=75$) [21]. In addition, the KiddyCAT has repeatedly shown to differentiate CWS from CWNS based on their communication attitude [9,16,19,21,23,25].

In order to use the KiddyCAT with German CWS, an authorized translation and adaptation into German (KiddyCAT-G) was developed by the first author, which was verified by a professional translation company. Following this, back translation took place between the first author and one of the test authors in order to ensure that the items captured the intended content, but were also culturally appropriate.

It is important that translated assessments, like the German KiddyCAT-G, have established psychometric properties before being adopted into widespread use [26]. Referring to previous data on reliability of the KiddyCAT and its translations, we expected comparable findings for its German adaptation. Therefore, our first aim was to determine the KiddyCAT-G's internal consistency and test-retest reliability. A second aim was to provide German reference data and to investigate group differences between CWNS and CWS. Additionally, we aimed to evaluate the possible influence of variables such as age, gender, and socioeconomic criteria on communication attitude.

Method

This study was conducted with the approval from the Human Ethics Committee at the University of Cologne. Parents provided written informed consent.

Participants

For recruitment of CWNS, living in urban and rural areas, 17 kindergarten/preschools in the Western part of Germany were chosen and invited to join our study, 13 of which agreed. Parent information evenings were organized at the children's schools, inviting all parents ($n=341$) of CWNS. Inclusion criteria for CWNS were: no symptoms of speech-language or fluency disorder reported by parent self-report, diagnosed and/or treated, and no hearing amplification devices were used. 211 parents of CWNS attended the meetings, and were informed and invited to join the study. CWS ($n=39$) were referred by 13 speech-language pathologists specialized in fluency disorders in Germany and the German speaking part of Switzerland.

Final consent to participate was given by parents of 180 children between 3.0 and 5.11 yrs: 150 CWNS (76 males, 74 females; mean age 4.13 yrs; $SD = 0.825$) and 30 CWS (25 males, 5 females; mean age 4.03 yrs; $SD = 0.850$; for further details, see Table 1). The CWS did not have any co-existing speech/language disorders. For CWS, the onset of stuttering was six to 12 months prior to data collection, and they had all been in speech therapy for three to six months.

Characteristics		CWNS	CWS
		(n=150)	(n=30)
Age of children	M	4.13	4.03
	SD	0.825	0.85
	range	3.0-5.11	3.03-5.11

Sex of children, n (%)	male	76 (50.7)	25 (83.3)
	female	74 (49.3)	5 (16.7)
Socioeconomic status ^a , n (%)	high	68 (45.3)	13 (43.3)
	mid	62 (41.3)	8 (26.7)
	low	17 (11.3)	9 (30.0)
Home environment ^a , n (%)	urban	75 (50.0)	16 (53.3)
	rural	72 (48.0)	11 (36.7)

Table 1: Demographic characteristics of the 150 CWNS and 30 CWS; **Note:** ^a: For these categories, percentages add up to less than 100% because of missing values. **Key:** CWNS=Children who do not stutter, CWS=children who stutter.

All children ($n=180$) spoke German as their first language, nine of which (5.4%) were regularly spoken to in a language other than German. Family socio-economic status (SES) was based on the German Social Class Index [27].

Most children belonged to high to mid SES: 86.6% of the CWNS and 70% of the CWS (Table 1). Group comparisons in terms of frequency distributions and their significance showed that there were significant differences between the two groups for sex ($\chi^2[1, n=180]=10.83$, $p=0.001$) and socioeconomic status ($\chi^2[2, n=177]=7.33$, $p=0.026$), but not for age, $t(178)=0.59$, $p=.561$, BCa 95% CI [-0.216, 0.403], and home environment ($\chi^2[1, n=174]=0.62$, $p=.431$) (Table 1).

For analysis of test-retest-reliability, in total 35 children (CWNS=15; CWS=20; 25 boys, 10 girls; mean age 4.26 yrs, $SD=0.86$) were subjected to a second administration of the KiddyCAT-G, seven days after initial assessment. The test was given to a particular child by the same researcher at the same location.

Instrumentation

KiddyCAT-G

The KiddyCAT-G is a 12-item self-report test. After the instructions are read to the child, and two sample questions are answered, the test administrator proceeds to the administration of the test. Twelve questions about the child's speech are posed, which the child answers with 'yes' or 'no' depending on whether or not the item applies to him or her. Administration takes about ten minutes. An example of an item and its German translation is: KiddyCAT-G, Item 2: "Do you think you talk right?", KiddyCAT-G: "Denkst Du, dass Du richtig sprichst?" The response options are a dichotomous "yes" or "no". The total score can range between 0 and 12 points, where a lower KiddyCAT-G total score reflects a more positive communication attitude. Details on the tool's development and its theoretical foundations are described elsewhere [16].

Socio-demographic questionnaire

A socio-demographic questionnaire, consisting of 11 questions (e.g., level of education for the mother and father, place of residence and income) was administered to investigate the SES of participating families. The family's social class was investigated by calculating the Winkler Social Class Index [27].

Procedure

All children in both groups were administered the KiddyCAT-G in a quiet room in the kindergarten/preschool (CWNS group) or clinical setting (CWS) by either the first author, an individually trained (~3 h) research assistant or the CWS's SLP who was familiarized with the test administration. To assess test-retest reliability, 15 CWNS and 20 CWS were administered the KiddyCAT-G a second time one week later. On average, 7.21 days (SD=0.69) elapsed between time points 1 and 2.

Data analysis

Raw KiddyCAT-G scores were calculated and entered into IBM SPSS 24.0 for Windows (IBM Corp., 2016) to run analyses. The data from the total sample of participants were evaluated for the purpose of determining internal consistency and discriminatory ability of the KiddyCAT. To test for internal consistency, Cronbach's alpha coefficients were calculated and the guidelines from George and Mallery [28], where used: $\alpha > 0.90$ =excellent, $0.70 < \alpha < 0.90$ =good, $0.60 < \alpha < 0.70$ =acceptable, $0.50 < \alpha < 0.60$ =poor, $\alpha < 0.50$ =unacceptable. For other correlation determinations, guidelines from Hinkle, Wiersma, and Jurs [29] were applied. For analysis of test-retest-reliability, the data from a subsample of CWNS and CWS (n=35) were used to determine the correlation of the total score at time points one and two. A bivariate correlation analysis was run and the Pearson coefficient and significance interpreted. All tests were two-tailed. The ability of the KiddyCAT-G to differentiate between groups was investigated using t test statistics, and effect sizes (η^2 : Cohen's d and Hedges g respectively, also specified as d) [30]. T-tests were calculated using the method of Bootstrapping (N=1000), which according to Efron and Tibshirani [31] is robust in terms of normal distribution. For calculation of the confidence intervals with Bootstrapping, the BCa method was used (bias corrected and accelerated), which Hayes and Scharkow [32] recommend regarding reliability. In order to investigate the impact of various sociodemographic variables on the KiddyCAT-G score, two forced entry multiple linear regression analysis were calculated, for the total group of children as well as for CWNS and CWS separately.

Results

Reliability: Internal consistency

The results for the KiddyCAT-G's inter-correlations show an overall moderate internal consistency for the group of CWNS (n=145) with Cronbach's $\alpha=0.61$, and a high Cronbach's α of 0.79 for the group of CWS (n=30).

Test-Retest-Reliability

Children's time-1 KiddyCAT-G scores ranged from 0 to 9, out of a possible maximum of 12 points (M=1.85, SD=2.09). The children's time-2 KiddyCAT-G scores, one week later, ranged from 0 to 8 (M=3.14, SD=2.44). The correlation was high ($r=0.983$, $p < 0.001$), which reflects good test-retest-reliability.

Differences in communication attitude between CWNS and CWS

Children's distribution of KiddyCAT-G scores in percentage for the group of CWNS (n=150) and CWS (n=30) are presented in Figure 1. As indicated in Table 2, the median and modal scores for the CWNS were 1 and 0, respectively, while for CWS the median was 3 and the

lowest mode was 1 (Figure 2). The mean score for CWS was 3.73 (SD=2.92), whereas it was 1.47 (SD=1.65) for CWNS. The difference of -2.26, BCa 95% CI [-3.291,-1.191], between the two groups in reported speech-associated attitude was statistically significant ($t(32.78)=-4.11$, $p=.003$, with a high effect of $d=1.37$ [33]). In addition, a discriminant analysis showed that the KiddyCAT-G has good discriminatory power between CWNS and CWS, classifying 95.3% of CWNS and 70% of CWS correctly, with 84.4% of the original grouped cases correctly classified ($\Lambda=0.836$, $\chi^2(1)=31.69$, $p < 0.001$).

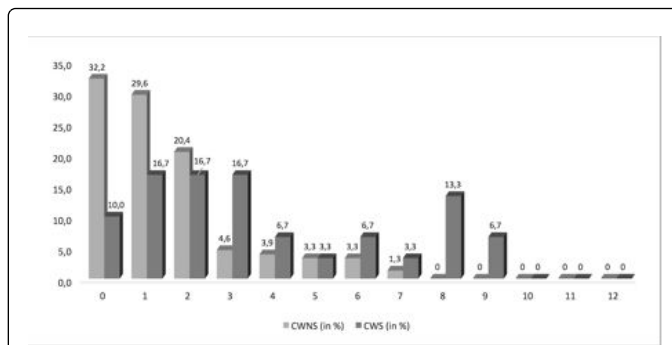


Figure 1: Distribution of KiddyCAT scores for CWNS and CWS

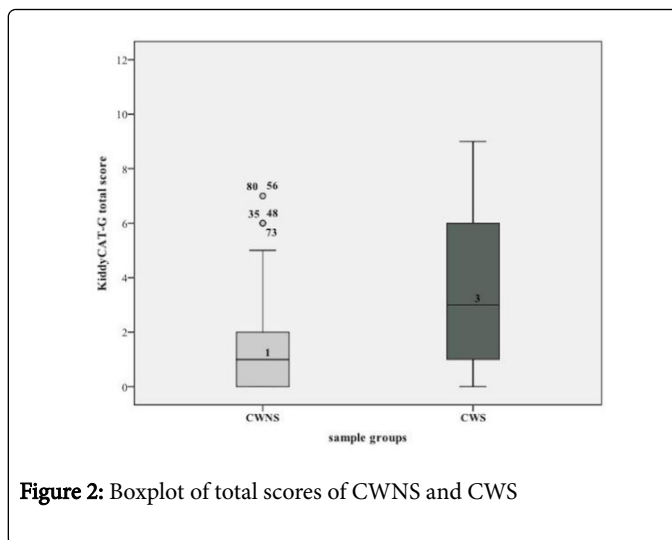


Figure 2: Boxplot of total scores of CWNS and CWS

	CWNS (n=150)	CWS (n=30)
Mean (M)	1.47	3.73
Std Deviation (SD)	1.65	2.92
M + 2 SD (cut-off point)	4.77	
Minimum	0	0
Maximum	7	9
Median	1	3
Mode	0	1 ^a

Table 2: Means and standard deviations of CWNS and CWS on the KiddyCAT; **Note:** ^a: More than one mode, the smallest is indicated.

A score of two or more standard deviations above the mean of CWNS is considered to be atypical according to the original KiddyCAT test manual [16]. Therefore, a KiddyCAT-G score of 5 or higher has to be interpreted as indicating a communication attitude that is more typical for a CWS (Table 2). In the group of CWS, 33.3% of the study group obtained a score of 5 or higher, whereas only 7.9% of the control group reached a score of 5 or higher. To the contrary, 26.7% of CWS had a score of 0 or 1, whereas these scores were obtained by almost two-thirds of CWNS (62.7%) (Table 2).

Age and communication attitude

In order to investigate the possible effect of age on attitude toward speech, the participants in the two groups were divided into two different age groups, referring to recent studies [17,21]. Across the two groups, it was found that younger children (3.0-4.6 yrs) scored higher than older ones (4.7-5.11 yrs) (Table 3). However, within the group of CWS and CWNS the significance of this age difference as it relates to the KiddyCAT score varied. Within the group of CWS, the age difference was not significant, $t(28)=0.87$, $p=0.391$, with a mean difference of -0.93 , BCa 95% CI $[-2.970, 1.396]$ and an effect size of $d=0.32$. On the contrary, within the group of CWNS, the age difference was highly significant with $t(148)=-3.23$, $p=.002$, a mean difference of 0.87 , BCa 95% CI $[-1.386, -0.317]$ and an effect size of $d=1.12$.

Age (yrs)	CWNS (n=150)			CWS (n=30)		
	n	M	SD	n	M	SD
3.0-4.6	69	1.94	1.88	15	4.2	2.96
4.7-5.11	81	1.07	1.31	15	3.27	2.92

Table 3: Means and standard deviations of younger (3.0-4.6 yrs) and older (4.7-5.11 yrs) children on the KiddyCAT-G

Gender and communication attitude

Because of the small n-size of the CWS sample, we were only able to evaluate the KiddyCAT-G scores of the boys and girls in the CWNS group to determine if gender differentially influenced the communication attitude of children. The mean score of the male ($M=1.74$, $SD=1.66$) and the female CWNS ($M=1.20$, $SD=1.61$) did not differ significantly, though marginally, $t(148)=-2.00$, $p=0.056$, with a mean difference of -0.53 , BCa 95% CI $[-1.145, 0.004]$ and a small effect of $d=0.34$.

Additional influences on communication attitude

We hypothesized that different sociodemographic variables could influence KiddyCAT-G scores. Therefore, additional external variables and their possible influence on test results of the KiddyCAT-G were investigated. Concerning the total group of CWNS and CWS, multiple regression analysis with an overall model fit of $R^2=0.181$ showed, that neither school ($\beta=0.766$, 95% CI $[-0.749, 2.280]$, $p=0.319$), place of residence ($\beta=-0.585$, 95% CI $[-1.208, 0.038]$, $p=0.066$), mother's education level ($\beta=-0.130$, 95% CI $[-0.388, 0.128]$, $p=0.321$), family's SES ($\beta=-0.15$, 95% CI $[-0.161, 0.131]$, $p=0.836$) nor household net income ($\beta=-0.186$, 95% CI $[-0.558, 0.186]$, $p=0.325$) had a significant effect on the KiddyCAT-G scores. As it relates to the groups separately, multiple regression analysis for the group of CWNS also showed no significant influence of these different variables ($F(5,123)=2.181$, $p=0.060$). For the group of CWS the model as a whole was also not

significant ($F(4,20)=1.226$, $p=0.331$), inferring no need for further analysis.

Discussion

The KiddyCAT-G's internal consistency was evident, irrespective of the investigated groups, which indicates that the German KiddyCAT is a reliable tool for assessing attitude in preschool children. As can be seen in Table 4, our results are consistent with the data of the Swedish version of the KiddyCAT for the group of CWNS [20]. For the group of CWS, the inter-correlations (Cronbach's α) of our results correspond to the scores obtained in Iran with the Persian version of this test [22], the Dutch [23], the American [19], the Polish [15] and the Slovenian version [21].

The current data regarding test-retest-reliability of the German KiddyCAT are in line with other KiddyCAT investigations, such as the Dutch KiddyCAT [5,24] and the Slovenian version [21].

Concerning the group differences of CWS and CWNS as it relates to the KiddyCAT-G scores compared to other cross-cultural samples (Table 4), the German study CWNS' mean score is most consistent with the American [16,19], Dutch [23] and Polish data [15]. For the CWS, the current measures of central tendency are also comparable to Dutch [23] and American data [25] (Table 4). However, as can be seen, most of the international results indicate descriptively higher mean scores, with $M>4$, compared to our study.

All former validation studies of the KiddyCAT, investigating between-group differences, showed a significant difference between the CWNS and CWS group, confirming the presence of a more negative attitude towards speech in the group of CWS. The KiddyCAT-G finds itself in line with those findings, pointing to the fact that German-speaking preschool children who stutter show a significantly higher negative communication attitude compared to their fluent speaking peers.

In terms of age influence on the KiddyCAT-G scores, our study confirms the results of the original American KiddyCAT version (Vanryckeghem and Brutton, 2007), showing higher scores for younger than for older children in both groups (CWNS and CWS), underlining that negative attitude towards speech seems to increase with age. As it relates to the significance of these age differences, the current results are comparable to those of Clark et al. [17] and Vanryckeghem and Brutton [23]. In those investigations, the age differences were only statistically significant for the group of CWNS, but not for the CWS. As Clark and colleagues [17] hypothesized, this divergent development might be related to the CWS' continued struggle with their dyfluencies, whereas CWNS get more and more self-assured as they improve their speech-language abilities.

The current results deviate from the Polish KiddyCAT [15] and those of the Slovenian version [21], where no significant differences were found between two age groups within the group of CWNS and CWS. They found either a more positive attitude towards speech among older children in the group of CWS [15] or in both the CWNS and CWS groups [21]. Taking into consideration the differences that exist among the internationally-based results as it relates to age and attitude, future research with larger samples are needed to shed more light on the so far inconsistent data dealing with the influence of age on communication attitude.

Similar to what was observed in previous studies [15,17,21,23], the KiddyCAT-G scores were not influenced by gender for either group of CWS and CWNS.

	CWS			CWNS			p	η^2	Internal consistency	Test-retest-reliability
	n	M	SD	n	M	SD			α (T/CWS/ CWNS)	r (T/CWS/ CWNS)
American ^{1a,b}	45	4.36	2.78	63	1.79	1.78	<0.001	0.341	n.i./0.75/0.72 ^a n.i./0.72/0.75 ^b	n.i.
American ²	46	3.63	2.45	66	2.65	2.09	0.025	0.044	n.i.	n.i.
American ³	52	4.42	2.52	62	2.61	2.2	0.001	0.099	n.i.	n.i.
Swedish	n.i.	n.i.	n.i.	119	1.26	1.63	n.i.	n.i.	ni./n.i./0.64	n.i.
Polish	58	4.6	2.46	70	1.47	1.05	<0.001	n.i.	0.71/0.68/0.55	/0.90/0.67
Dutch ⁴ (test/retest)	34	2.79/ 2.72	3.04/ 3.08	42	1.48/ 1.14	1.45/ 1.18	0.025/ 0.009	n.i.	n.i.	n.i./0.90/0.67
Dutch ⁵	249	3.47	2.77	264	1.15	1.22	<0.001	1.09	n.i./0.75/0.70	n.i.
Persian	30	4.23	3.15	n.i.	n.i.	n.i.	n.i.	n.i.	n.i./0.83/n.i.	n.i.
Slovenian	49	5.16	2.98	74	0.81	1.51	<0.001	0.485	0.73/0.73/0.75	n.i./0.953/0.985 $p<0.001$
German	30	3.73	2.92	150	1.47	1.65	0.003	0.319	n.i./0.79/0.61	0.983/n.i./n.i. $p<0.001$

Table 4: Comparison of German KiddyCAT data with cross-cultural investigations; **Note:** n.i.=not investigated; American Version Study1⁽¹⁾: Vanryckeghem et al., 2005^(1a); Vanryckeghem and Brutten, 2007^(1b); American Version Study 2⁽²⁾: Groner, Walden, and Jones (2016); American Version Study 3⁽³⁾: Clark et al., 2012; Swedish Version: Gustavsson and Karltorp, 2010; Polish Version: Węsierska and Vanryckeghem, 2015; Dutch Version⁴: Vanryckeghem et al., 2015; Dutch Version⁵: Vanryckeghem and Brutten (2015); Persian Version: Shafei, 2016; Slovenian Version: Novšak and Vanryckeghem, 2017.

Still unexplored was the fact whether or not certain external factors might influence negative communication attitude among young children. Hence, the possible relationship between certain external variables (place of residence, level of education of parents, SES and income) and KiddyCAT-G total scores of CWNS and CWS was investigated. Multiple regression analysis revealed no impact of these external variables on the total KiddyCAT-G score, irrespective of group. Our results are in line with the study of Clark et al. [17], where also no significant effects were found for SES on KiddyCAT scores for either group of CWS and CWNS. From these findings it seems reasonable to conclude that a socioeconomic background does not seem to influence KiddyCAT scores. Possible correlations between communication attitude and other psycho-social constructs (e.g. communicative participation or intelligibility in context), might be the focus of future studies by combining the KiddyCAT-G with other ICF-CY orientated measures.

The current results may find practical application in the diagnosis of CWS with German as a first language, not only in German-speaking countries, but also in other countries where people of German descent might have migrated. The KiddyCAT-G is the first German assessment tool to evaluate communication attitude in preschoolers and, therefore, has large clinical potential in detecting mal-attitude in young CWS. It

can help SLP's to optimize and customize their speech-language therapy.

Conclusion

The KiddyCAT-G showed strong evidence of internal consistency and test-retest-reliability, indicating that the KiddyCAT-G is a reliable clinical measure of communication attitude for preschool and kindergarten children. The present results confirm that the KiddyCAT-G is capable of differentiating CWS from CWNS based on their communication attitude, as has been indicated by data of other validation studies. Aside from serving as a diagnostic tool, the KiddyCAT-G can be used as an outcome measure of change. Based on the current findings, the KiddyCAT-G has clinical utility for SLPs working with children in German speaking countries and beyond. This important extension will allow SLPs to provide a culturally appropriate assessment and intervention for multilingual children who stutter.

Limitations

As is the case in every parental report, we cannot exclude the psychological phenomenon of acquiescence. Even though the present sample of children was relatively large and diverse in some aspects, it was only based on a total sample of 13 preschools and kindergartens

and 15 SLPs in the Western part of Germany and Switzerland. It is a convenience sample and, therefore, might not be representative of the overall population.

Conflict of Interest Statement

The first, third, fourth and last author do not report any financial relationships with other people or organizations that could inappropriately influence the content and writing of this paper. The authors alone are responsible for the content and writing of the paper. Therefore, the authors report no conflict of interest for this study. The second author has no financial relationship to the content of the paper. As author of the test which data are presented, she has a non-financial relationship to the content of the presentation.

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