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Journal of Fluency Disorders xxx (2008) xxx–xxx

Journal of FLUENCY DISORDERS

A randomized control trial to investigate the impact of the Lidcombe Program on early stuttering in German-speaking preschoolers

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Received 15 January 2007; received in revised form 6 December 2007; accepted 13 December 2007

Abstract

In order to investigate whether the Lidcombe Program effects a short-term reduction of stuttered speech beyond natural recovery, 46 German preschool children were randomly assigned to a wait-contrast group or to an experimental group which received the Lidcombe Program for 16 weeks. The children were between 3;0 and 5;11 years old, their and both of their parents' native language was German, stuttering onset had been at least 6 months before, and their stuttering frequency was higher than 3% stuttered syllables. Spontaneous speech samples were recorded at home and in the clinic prior to treatment and after 4 months. Compared to the wait-contrast group, the treatment group showed a significantly higher decrease in stuttered syllables in home-measurements (6.9%SS vs. 1.6%SS) and clinic-measurements (6.8%SS vs. 3.6%SS), and the same increase in articulation rate. The program is considered an enrichment of currently applied early stuttering interventions in Germany.

Educational objectives: Readers will learn about (1) the short-term effects of the Lidcombe Program in comparison to natural recovery on stuttering; (2) the impact of the Lidcombe Program on early stuttering in German-speaking preschool children.

Keywords: Childhood stuttering; Lidcombe Program; Short-term effects; Spontaneous recovery; German-speaking preschoolers

The onset of a fluency disorder is most likely to occur between ages 2 and 5 years (Andrews et al., 1983). While the overall incidence of stuttering appears to be approximately 5%, estimates of the prevalence are 1% in school-aged children and even less in adults (Bloodstein, 1995). The difference between incidence and prevalence suggests that many children recover with or without formal treatment. Longitudinal studies for early childhood stuttering show recovery rates ranging from 65 to 85% (Andrews & Harris, 1964; Ryan, 1990; Yairi, Ambrose, Paden, & Throneburg, 1996) with estimates of the two most recent studies lying in the mid-70% range (Mansson, 2000; Yairi & Ambrose, 1999). Yairi and Ambrose (1999) reported recovery in approximately 74% of the children within the first 4 years of onset. A few more children recovered over the next years resulting in a recovery rate of approximately 75–85%. Mansson (2000) found that 71% of the children who stuttered recovered within 2 years. Whether recovery rates for children who are presented to a clinic are population estimates remains unknown. The following factors

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doi:10.1016/j.jfludis.2007.12.002

may be associated with recovery: female gender, recovery of relatives who had stuttered, decrease in stuttering-like disfluencies during the first 12 months after onset, and good language and articulation skills (Andrews et al., 1983; Yairi & Ambrose, 1992; Yairi et al., 1996). The occurrence of natural recovery tends to decrease with age, presumably in association with a decrease in neural plasticity. However, it cannot be predicted whether an individual child will develop persistent stuttering or recover. Because a chronic fluency disorder is likely to impact negatively on the social-emotional, educational, and vocational development of a child, treatment early in the preschool years is recommendable.

Fluency disorders in children are currently treated with a broad variety of indirect and direct treatment methods. The treatment efficacy of many of these approaches, however, has either been evaluated insufficiently or not at all. In Germany, there is a lack of studies analyzing the efficacy of early stuttering intervention. During the last five decades, to the best of our knowledge two studies were published in this area. Randoll (1988) translated Shine's Systematic Fluency Training for Young Children (SFTYC) into German and studied the treatment effect with nine children. However, the author admitted that the study design and in part the implementation was deficient and concluded that only individual elements of this program should be integrated into a multi-factorial approach. The SFTYC has not been established as a treatment method in Germany.

Pape-Neumann, Bosshardt, Natke, and Oertle (2004) published test-phase results of the program for the evaluation of stuttering therapies PEVOS (Programm zur Evaluation von Stottertherapien). Analyses of the questionnaire-based speech data of 42 children showed a significant decrease in the mean percentage of syllables stuttered (%SS) between pre-treatment and post-treatment conditions, an increase in mean speech rate, and an improvement in speech naturalness. No information was provided about the therapy methods, no differentiation was made between pre-school and school-aged children, and no untreated control group was included.

For early stuttering intervention only the Lidcombe Program has been investigated with phase I and phase II clinical trials (Onslow et al., 2003). The Lidcombe Program is an operant, parent conducted method. Its objectives are to increase stutterfree speech through the use of parental verbal contingencies for stutterfree speech and stuttering. The program is implemented in two stages. In the first stage parents are trained to provide the treatment and to monitor and modify the therapy program as the child makes progress. In the second stage treatment is gradually withdrawn. Over the course of approximately 12–18 months the verbal contingencies are faded out and therapy is finally completed. The goal of the second stage is to maintain effects in the long term and to establish independence of the parent from the clinician.

With respect to natural recovery it remains an open question whether children who stutter should be treated as soon as possible after stuttering onset or whether treatment should be delayed for the benefit of a possible natural recovery (Yairi & Ambrose, 1999). It is as yet impossible to identify those who will recover spontaneously. Hence it is not acceptable to delay treatment for an extended period of time. There also remains the question which proportion of the positive outcome has to be attributed to a treatment and which to natural recovery. This issue has received much interest and relates to clinical efficacy research already forcing a debate about the need, usefulness, and cost-effectiveness of early clinical treatment in early childhood stuttering (Andrews, 1984; Curlee & Yairi, 1997; Curlee & Yairi, 1998; Ingham & Cordes, 1998; Packman & Onslow, 1998). The answer to this question may support clinicians in their decisions about timing of intervention. However, this would require the comparison of a treatment group with a no-treatment group for several years. Such a study design cannot be justified for ethical reasons. Consequently, researchers have started to investigate the short-term effects of the Lidcombe Program on the background of expected rates of natural recovery (Harris, Onlsow, Packman, Harrison, & Menzies, 2002).

Two studies have analyzed the short-term fluency effects of the Lidcombe Program. Harris et al. (2002) assigned 23 preschool children randomly to either a no-treatment wait-contrast group or to a group treated with the Lidcombe Program for 12 weeks. After 3 months the increase in fluent speech production was significantly higher in the treatment group than in the wait-contrast group. Children in the wait-contrast group did decrease their stuttering, as expected by spontaneous recovery. However, the reduction in the treatment group was around twice that amount. Jones et al. (2005) evaluated the efficacy of the Lidcombe Program in a randomized controlled trial. Twenty-nine preschool children were assigned to the treatment group and 25 to the wait-contrast group, which received no formal treatment. The mean proportion of syllables stuttered in both groups was compared before randomization and 9 months later. After 9 months the reduction of stuttering in the treatment group was significantly greater than that of natural recovery. Both studies show that treatment with the Lidcombe Program early on is more efficacious than no formal therapy for preschool children who stutter.

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Franken, Kielstra-Van der Schalk, and Boelens (2005) compared the Lidcombe Program to a Demands and Capacities Model treatment. Thirty preschool children were randomly assigned to one of the treatment groups. Stuttering frequencies and severity ratings were collected before and after treatment (12 weeks). No group differences were found. The dependent measures decreased significantly in both groups and the authors concluded that their study did not provide any evidence for the superiority of either of the two treatments.

Although there is extensively published data on outcomes of the Lidcombe Program, the underlying mechanisms by which fluency is attained during the course of treatment remain elusive. Bonelli, Dixon, Bernstein Ratner, and Onslow (2000) analyzed speech samples of nine children before and after treatment with the Lidcombe Program. Although all children's language measures were within or above normal limits for their chronological age before and after treatment, some of them did not meet time-adjusted expectations for maturation in measured linguistic variables (Mean Length of Utterance, Developmental Sentence Score, and Number of Different Words) during the period of the study. The data showed no corresponding changes in child or parent speech rate, interspeaker turn latencies, and pragmatic functioning. The results of this study suggested that treatment did not induce extensive curtailment of language functioning. Onslow, Stocker, Packman, and McLeod (2002) conducted a study making selected acoustic measures of speech timing in eight preschool children before and after receiving treatment with the Lidcombe Program. The results showed no systematic changes in either acoustic segment duration or variability of acoustic segment duration, and no systematic change in articulation rate, thereby supporting Bonelli's et al.'s findings.

The goal of the present study was to investigate whether the short-term effects of treatment with the Lidcombe Program are significantly greater than those of natural recovery in German-speaking preschool children.

1. Methods

1.1. Participants

Fifty-eight preschool children were recruited for the study. Their parents had learned about the study in the media. Seven children could not be included because their parents were unwilling to wait any time for therapy onset. An additional five children did not fulfill all of the following inclusion criteria: (1) age between 3;0 and 5;11 years; (2) German the first language for the child and both parents; (3) 6 months or longer since reported onset of stuttering; (4) stuttering at a rate of 3% or greater (average of home and clinic speech samples); (5) no history of neurological disorder and no regular medication intake.

Of the remaining 46 participants, 39 children were diagnosed for stuttering by two of the authors in the Clinic of Phoniatrics and Pediatric Audiology of the University of Frankfurt am Main. Seven children were assessed by the first author in a private speech-language-pathology practice. All children came from varying socio-economic backgrounds and lived in the provinces Hesse, Bavaria, and Baden-Wuerttemberg.

Twenty-three children were assigned to the wait-contrast group (22 boys, 1 girl, mean age 48 months). The parents of the girl could not complete the experimental procedures and did not provide the necessary tape recordings because of the birth of a sibling. The mean percentage of stuttered syllables was 8.8% (median 7.1) pre-treatment. The mean time since onset of stuttering had been 15 months (range 6–42 months).

The treatment group included 23 children (20 boys, 3 girls, mean age 53 months). Their mean percentage of syllables stuttered before treatment start was 9.5% (median 8.2) with a mean time since stuttering onset being 21 months.

Together, 45 participants (22 treatment, 23 wait-contrast) were included in the final data analysis. The Appendix shows the individual data including former treatments and family history of stuttering.

1.2. Procedure

1.2.1. Assignment

Parents gave written consent for participation in the study. In addition to general information about the nature of stuttering, they received the following information about the study: (a) Their child would be randomly assigned to either a treatment group or a wait-contrast group; (b) the study would last approximately 16 weeks; (c) after completion of the study, the treatment children would continue and the wait-contrast children would start treatment with the Lidcombe-Program when their name came to the top of the waiting list.

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The participating children were randomly assigned to treatment or wait-contrast group by serial assignment according to the registration list. The children of the treatment group started therapy immediately. Treatment was conducted by the first author who is a member of the Lidcombe Program Trainer Consortium and has extensive experience with the Lidcombe Program.

1.2.2. Treatment protocol

The child and the parent visited the clinic once a week for a session of 45 min duration. The speech-language pathologist (first author) trained the parents how to provide the treatment and to monitor and modify the therapy program as the child makes progress. To determine treatment progress, the therapist took a spontaneous speech sample at the beginning of each treatment session and measured the percentage syllables stuttered. In addition, the parents rated the stuttering severity of their children daily on a 10-point scale (1 = no stuttering, 2 = mild stuttering, 10 = extremely severe stuttering).

The treatment was performed at home by a parent. In the clinical setting, parents were trained to provide verbal praise ("That was great talking"), acknowledgment ("That was smooth"), or request for self-evaluation ("Were there any bumpy words?") for stutter-free speech and later on to acknowledge ("There was a little bump") or to request self-correction ("Can you say that again?") of unambiguous stuttering. In addition, in the present study non-verbal praise (gestures and noise makers) for stutter-free speech was introduced during the course of treatment, because this appeared to have been effective in ensuring that German parents provided sufficient praise in an effortless manner. The ratio of contingencies for fluent speech to unambiguous stuttering was individually determined for each child during each treatment session. However, the parents were trained to provide most contingencies for stutter-free speech rather than for unambiguous stuttering to ensure that the treatment was a positive experience for the child. Requests for self-correction were presented in a natural and supportive manner and the child was encouraged to continue talking.

Treatment started in a structured conversation where the child could achieve stutter-free speech in order to provide the parent with ample opportunities for positive verbal reinforcement. In the first stage, therapy was conducted as daily training sessions of about 15 min duration at home. When the clinician observed that contingencies were provided safely and appropriately the treatment setting was expanded to include more unstructured, natural conversations outside the training sessions and outside the home. The first stage was terminated when stuttering frequency was less than 1% for at least 3 consecutive weeks inside and outside the clinic. For a detailed description of the Lidcombe Program, see Onslow et al. (2003). The treatment manual is available from the website of the Australian Stuttering Research Centre (www.fhs.usyd.edu.au/ASRC).

1.2.3. Measurements

Speech samples were recorded at intake (first measurement occasion) and 16 weeks later, i.e. after 16 weeks of therapy for the treatment group and after a respective waiting time for the wait-contrast group (second measurement occasion). For each child four spontaneous speech samples were recorded at each of the two measurement occasions. At the first occasion, two samples were collected at home prior to treatment start, one sample recording a conversation with a familiar partner and the other one with a different familiar partner, the latter without the child's knowledge of the recording. Parents were asked to either audio or video-tape a play situation involving free-play activities or picture books of at least 10 min duration in the week following the initial assessment. Another two samples were collected at the clinic, one sample a conversation with the therapist and the other one with the parent. At the second measurement occasion 16 weeks later, this procedure was repeated. The recordings at the clinic did not involve any form of Lidcombe Program therapy but free-play with a standard set of toys, talking about picture books, and conversations with the parent and the therapist.

The within-clinic samples were recorded using a digital camera (Sony Digital 8) and a microphone (Philips, ME 670). The measures were calculated by the therapist. The 180 speech samples recorded at home were given a code number by another person not involved in the study, so that the therapist was blind to measurement occasion. With few exceptions, each speech sample of the four different conditions contained 300 syllables of the child and the corresponding utterances of the conversational partner.

The percentage of syllables stuttered (%SS) as the main disfluency measure was tallied from the recordings and incorporates the following types of speech disfluencies: sound repetition, syllable repetition, whole-word repetition, prolongations, and blocks. The measure does not include normal disfluencies such as interjections, single effortless

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whole-word repetitions, revisions, and phrase-repetitions. The pre-and post-treatment scores of the %SS were the non-weighted means of the %SS at the four measurement conditions.

One speech sample of a conversation between child and parent recorded before treatment start and one after 16 weeks ($n = 90$), were used by the first author to calculate the articulation rate in syllables per second. Only samples recorded at the clinic were taken because of their higher sound-quality compared to recordings collected at home. Each sample contained 300 syllables. Articulation rate was defined as the average number of non-stuttered syllables per second of speaking time. To obtain this measure, the speech samples were transcribed and coded orthographically from the videotapes using the Computerized Language Analysis-Program (CLAN; Bernstein Ratner, Rooney, & MacWhinney, 1996; MacWhinney, 1995). The program Sound Forge 4.5 (1999) was used to generate speech waveforms for all samples. Data analysis was carried out with the coded script for each sample and its link to the referring audio signal. The time elapsed for producing the utterance was calculated in seconds via cursors placed at the beginning and end of each utterance. Onset and offset of utterances were visually identified by intensity patterns showing a sharp rise from the background signal. Non-speech sounds and pauses greater than 250 ms were excluded (Miller, Grosjean, & Lomanto, 1984). Segments with a disfluency as shown in the time domain were subtracted from the total elapsed time for producing the utterance. The number of syllables for each utterance was divided by the duration of the utterance to calculate the articulation rate.

1.2.4. Reliability and objectivity

To obtain intra-observer reliability for the stuttering frequency measures, 180 randomly selected audio and video samples (half of all samples employed) were rescored by the first author 4 months after the original measurement had taken place. The Pearson correlation between the first and the second rating was $r = .99$.

To assess inter-observer reliability, an independent and experienced speech-language pathologist with expertise in the area of fluency disorders, who was instructed about the coding procedure but was blind to the group assignment of a sample, coded one randomly selected pre-treatment and one post-treatment speech sample from each participant (25% of all samples employed). The overall correlation between both judges was $r = .98$ ($N = 90$). The correlations calculated separately for each group (treatment or wait-contrast) varied between $r = .94$ (treatment group after treatment; $n = 23$) and $r = .99$ (wait-contrast group before treatment; $n = 22$). Thus, even for the treatment group after treatment the inter-observer reliability was with $r = .94$ still sufficiently high despite treatment-induced variance reduction in frequencies of disfluencies.

Additionally, an independent person calculated the articulation rates from 18 randomly selected speech samples (20% of the data) to quantify inter-observer reliability for these measurements. The correlation between both observers was $r = .98$.

2. Results

2.1. Home measurements

The %SS at the first measurement occasion outside the clinic, usually at home, was 7.5% (S.D. = 4.7, range 1.8–20.2) for the wait-contrast group and 9.5% (S.D. = 5.5, range 2.8–26.6) for the treatment group. The second measurement revealed a mean %SS of 6.2% (S.D. = 4.7, range 0.7–17.4) for the wait-contrast group and of 2.6% (S.D. = 1.9, range 0.0–7.3) for the treatment group. All children treated with the Lidcombe Program reduced their %SS score from the first to the second measurement occasion after 16 weeks, with a mean reduction of 6.9%. After 16 weeks an absolute mean reduction of 6.8% syllables stuttered was observed in the children treated with the Lidcombe Program, these children reduced their disfluency rate by a mean of 70.3% from their pre-treatment level. The wait-contrast group reduced the mean %SS score by 3.6% over the course of the study, thereby reducing its disfluency rate by a mean of 17.6% from the disfluency level at the first measurement occasion. In the wait-contrast group, 13 children decreased their stuttering frequencies, whereas nine children increased them. Figs. 1a and 2a demonstrate the individual changes, and Fig. 3 the group changes. Appendix A shows the individual stuttering frequencies at both measurement occasions inside the clinic and at home for both groups.

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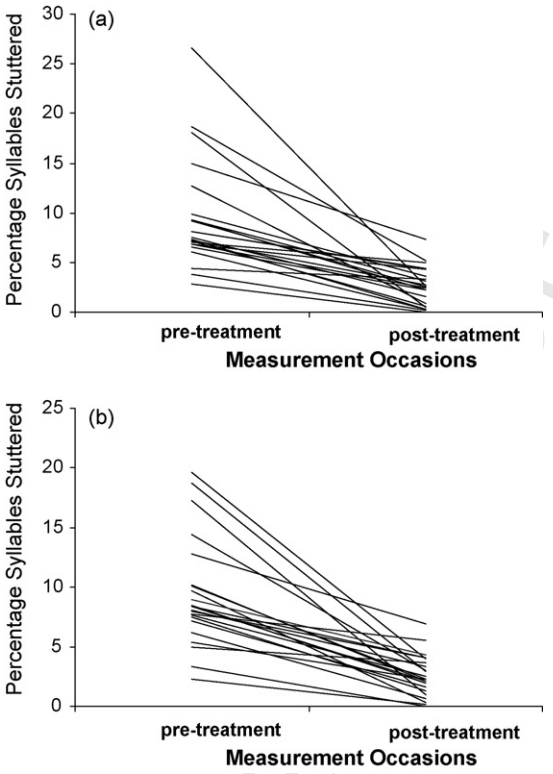

Fig. 1. Treatment group: mean percentage of syllables stuttered for each child. (a) Home measurements and (b) clinic measurements.

2.2. Within-clinic measurements

At the first measurement occasion inside the clinic the %SS was 10.0% (S.D. = 7.7, range 3.6–39.6) for the wait-contrast group and 9.4% (S.D. = 4.5, range 2.3–19.7) for the treatment group. The second measurement revealed a mean %SS of 6.4% (S.D. = 3.7, range 0.5–14.8) for the wait-contrast group and of 2.6% (S.D. = 1.7, range 0.0–6.9) for the treatment group. After 16 weeks an absolute mean reduction of 6.8% syllables stuttered was observed in the children treated with the Lidcombe Program, these children reduced their disfluency rate by a mean of 70.6% from their pre-treatment level. The wait-contrast group showed an absolute mean reduction of 1.6% SS, thereby reducing its disfluency rate by a mean of 25.4% from the disfluency level at the first measurement occasion. Fifteen children showed a decrease of their stuttering frequencies, whereas seven children displayed an increase. Figs. 1b and 2b show the individual changes, and Fig. 4 the group changes.

2.3. Statistical analysis

A repeated-measures ANCOVA was calculated, with percentage of stuttered syllables as dependent variable and group (treatment vs. wait-contrast) and measurement occasion (before treatment vs. after treatment) as independent variables. Age of child at first measurement occasion and period between stuttering onset and first measurement occasion were entered as covariates. The inclusion of age as a covariate was necessary because the mean age of the children in the treatment group (56 months) ended up significantly higher than the mean age of the children in the wait-contrast group (47 months). The improvement in fluency from before to after treatment correlated numerically higher with age in the wait-contrast group than in the treatment group. This is plausible because the probability of spontaneous recovery is known to decrease with age (Andrews et al., 1983). For the clinic measurements, the correlation between improvement in fluency and age was even significant in the wait-contrast group ($r = -.48$, $p = .03$). The period between stuttering onset and first measurement occasion also differed between both groups, but not significantly.

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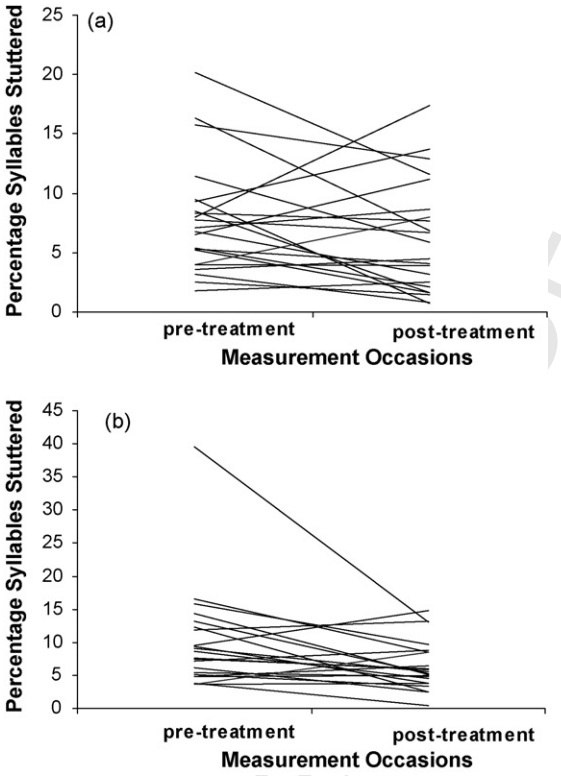

Fig. 2. Wait-contrast group: mean percentage of syllables stuttered for each child. (a) Home measurements and (b) clinic measurements.

The ANCOVA of the home measurements showed no main effect of stuttering frequencies for Group, $F(1,41) = 0.381$, $p = .54$, no main effect for Assessment Occasion, $F(1,41) = 0.442$, $p = .51$, and a very significant effect for the interaction Group by Assessment Occasion, $F(1,41) = 10.300$, $p = .003$, partial $\eta^2 = .201$. Both covariates were not significant. The interaction effect identifies the genuine therapeutic effect, that is, the improvement in disfluencies over and beyond the improvement shown in the wait-contrast group.

The ANCOVA of the clinic measurements showed no main effect of stuttering frequencies for Group, $F(1,41) = 1.338$, $p = .25$, a significant main effect for Assessment Occasion, $F(1,41) = 5.718$, $p = .021$, partial $\eta^2 = .122$, and a significant effect for the interaction Group by Assessment Occasion, $F(1,41) = 5.400$, $p = .025$, partial $\eta^2 = .116$. Both covariates were not significant.

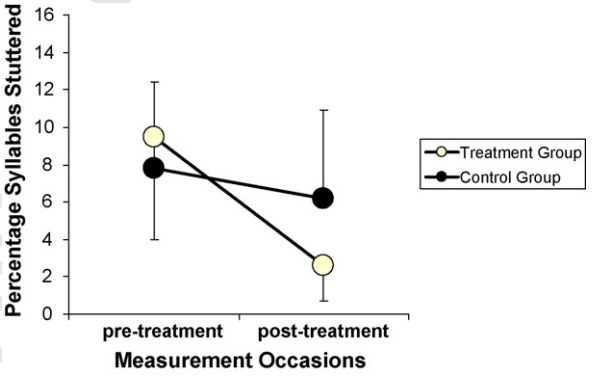

Fig. 3. Home recordings of the percentage syllables stuttered for the treatment group and the wait-contrast group at first and second measurement occasion; error bars indicate standard deviations.

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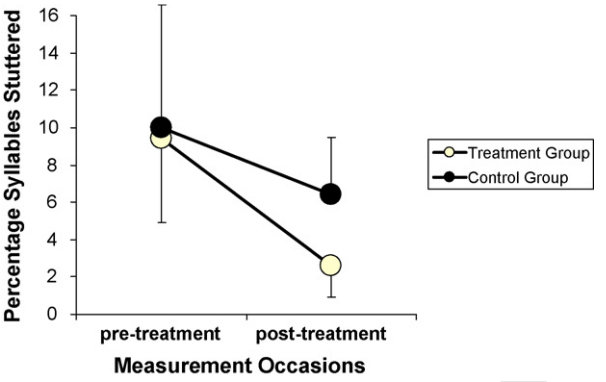

Fig. 4. Clinic recordings of the percentage syllables stuttered for the treatment group and the wait-contrast group at first and second measurement occasion; error bars indicate standard deviations.

The period between stuttering onset and first measurement occasion lasted between 7 and 41 months for children of the treatment group and between 6 and 42 months for children of the wait-contrast group. Time since stuttering onset and reduction of percentage syllables stuttered to percentage of pretreatment level (home and clinic measures combined) did not correlate significantly, neither for the treatment group ($r = -.14$), nor for the wait-contrast group ($r = .31$).

The amount of stuttering reduction between first and second measurement occasion did not differ significantly (t-test, not corrected for repeated comparisons) between the children with and the children without a family history of stuttering in the treatment group, neither for home nor for clinic measurements.

In the subsample of children with a family history of stuttering we compared those children where at least one stuttering family member had shown a spontaneous recovery ($n = 11$) with the children without a familial spontaneous recovery ($n = 11$). The extent of stuttering reduction between first and second measurement occasion (home and clinic measurements combined) did not differ significantly (t-test, not corrected for repeated comparisons) between both subsamples, neither for the treatment group nor for the wait-contrast group.

With respect to articulation rate (syllables/s, home and clinic measurements combined), a 2 (Group: treatment vs. wait-contrast) by 2 (Assessment Occasion: before vs. after therapy) repeated-measures ANCOVA, with (1) child age at first measurement occasion and (2) period between stuttering onset and first measurement occasion as covariates, showed no main effect for Group, $F(1,41) = 1.108$, $p = .30$, a significant effect for Assessment Occasion, $F(1,41) = 4.356$, $p = .043$, partial $\eta^2 = .096$, and no significant effect for the interaction Group by Assessment Occasion, $F(1,41) = 1.354$, $p = .25$. Thus, both the treatment as well as the wait contrast-group increased their articulation rates from first to second measurement occasion, the treatment group from a mean of 3.49–3.58 syllables/s, the wait-contrast-group from 3.16 to 3.28 syllables/s.

3. Discussion

The purpose of the present study was to investigate whether the short-term effects of treatment with the Lidcombe Program are significantly greater than the decrease expected in the same time period on the basis of natural recovery in German-speaking preschoolers. After 4 months, treatment with the Lidcombe Program resulted in a significantly higher decrease in stuttering, both at home and in the clinic, compared to a wait-contrast group. The study replicates the results of Harris et al. (2002), but with a larger cohort and native German speakers.

The children were randomly assigned to the treatment or to the wait-contrast group as they entered the project but were not matched on age, time since stuttering onset, gender, family history of stuttering including history of recovery, and language/phonological development, because proper matching would have required unmanageable sample sizes beyond available resources. The potential confounding influence of age and time since stuttering onset has been

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statistically removed. The role of the remaining potential confounds will be discussed now on the basis of the current data.

Persons with a relative with a reported disfluency history have a smaller likelihood for spontaneous recovery from stuttering than persons without any known family history of stuttering (Kidd, 1980). Yairi and Ambrose (2005) suggested that having relatives who recovered from stuttering may be a factor being associated with spontaneous recovery. It could, therefore, be hypothesized that children with a family history of recovered stuttering would have a better prognosis for spontaneous recovery and therefore would show a larger decrease of stuttered utterances, also under therapy. Both factors, family history of stuttering and recovery in relatives, did not have any detectable effect with respect to reduction of disfluencies in the present study, neither in the treatment nor in the wait-contrast group, admittedly with small samples and with 4 months a relatively short observation period.

Although child age is correlated positively with spontaneous recovery, preschool age appears to be uncorrelated with assisted recovery of Lidcombe therapy, the required treatment duration of which is reported to be independent of preschool age (Jones, Onslow, Harrison, & Packman, 2000; Kingston, Huber, Onslow, Jones, & Packman, 2003). A comparable observation was made in the present study. Age did not correlate with reduction in disfluencies in the treatment group, neither in home nor in clinical measurements, but in the wait-contrast group there was a significant correlation in the home measurements. In the clinic measurements the correlation was also numerically higher than the one of the treatment group but did not reach statistical significance.

As to the role of time interval between stuttering onset and treatment start, Jones et al. (2000) and Kingston et al. (2003) reported no correlation between onset-to-treatment intervals and required treatment time. In the current study, time interval between stuttering onset and treatment start did likewise not correlate with the treatment effect. Hence, for children younger than 6 years a short delay before beginning treatment with the Lidcombe Program appears not to impact therapy benefit notwithstanding the finding by Yairi et al. (1996) of decreasing chances of spontaneous recovery with increasing time lapse since stuttering onset.

The question may be asked whether the wait-contrast-group is strictly comparable to the treatment group except for the absence of treatment. A denied treatment may be more than just no treatment; it may impact the dependent variables in its own right. Parents of wait-contrast children may feel stressed by waiting, especially if they know that early treatment is best, and their stress may possibly affect the child's speech negatively, a conjecture voiced by Bernstein Ratner and Guitar (2006). It seems, however, far-fetched to argue that the emotional concomitants of parental waiting for therapy would impact the child's stuttering so negatively that it accounts artifactually for the observed difference between therapy group and wait-contrast group at the second measurement occasion. However, a partial influence of omitted support, like the children of the treatment group received by the therapy and the therapy-induced positive interactions with the parent cannot be ruled out with certainty. After all, the children who had to wait for treatment had to cope with their stuttering without the support the treated children and their parents received.

The children treated with the Lidcombe Program showed a considerable decrease in percentage syllables stuttered in-home measurements and an even higher decrease in clinic measurements. Many children who stutter tend to produce more fluent speech in a clinical setting associated with prior or on-going speech therapy. For example, Hartfield, Conture, and Graham (2004) reported that mean length of utterance (MLU) and utterance complexity of children who stutter are significantly affected by the speaking situation, with the clinical setting associated with the lowest MLU, whether the child is interacting with the clinician or the parent. Disfluencies are known to increase with longer and linguistically more complex sentences (Bernstein Ratner, 1997) which suggest that a clinical setting with the likelihood of the child producing a low MLU would yield less stuttering. Nevertheless, the treatment effect is not restricted to clinic situations in the present study, but is also observed in the children's daily environment.

Treatment and wait-contrast groups differed significantly in age, and age is an important variable both with respect to probability of spontaneous recovery and with promise of treatment effect. Group matching by age after termination of recruitment phase would have prevented this age difference. However, for ethical reasons the onset of treatment could not be unduly delayed for the purpose of methodological rigor.

The results of this study did not support the suspicion that children treated with the Lidcombe Program achieve fluent speech by the well-known phenomenon of disfluency reduction by reduction of articulation rate (e.g. Perkins, 1979). Instead, both treatment and wait-contrast children increased their articulation rates, assumedly due to developmental progress. This finding is in agreement with data of two previous studies (Bonelli et al., 2000; Onslow et al., 2002). After all, the Lidcombe Program is an operant treatment method

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which does not induce a novel speech pattern. The children are told that the treatment aims at stutter-free speech, but they have to achieve this by their own means. As suggested by Onslow et al. (2002), children who have been stuttering only for a few years – or months, as was the case for some children in the present study – may be able to draw on their existing fluency skills and learn to substitute fluent speech for stuttering.

Children of the treatment group attended 13 treatment sessions on average (see Appendix A). Three children (27, 31, 33) were able to complete phase I of the Lidcombe Program during the 16 week period. Two boys (27 and 31) were included into the study although they showed 3.1% SS at the pre-treatment measurement occasion, thereby meeting the inclusion criteria only marginally. However, the parents of these children reported that both children had been stuttering permanently since the onset of the fluency disorder, displaying a fluctuating stuttering severity including episodes of moderate and severe stuttering.

In the Lidcombe studies of Jones et al. (2000) in Australia and of Kingston et al. (2003) in Great Britain the children needed a median treatment time of 11 clinical visits to complete the first stage. In the present study, however, only three children were able to complete this stage within 16 weeks. This longer duration might be due to cultural differences. The role of praise in the upbringing of a child and thus its kind and frequency may differ between Anglo-Australian and German-speaking countries. German parents and teachers appear to be comparatively sparse in the application of praise. Many of the parents in the present study reported that initially it was difficult for them to provide the required amount of praise. Daily praise of fluent speech as required by the Lidcombe Program appeared to be unnatural and exaggerated. The first author, who has experience with the application of the Lidcombe Program in North America and in Australia, had to spend comparatively more time training German parents to correctly and naturally implement the praise in a way that was acceptable for both parents and child. If parents reported to still feel odd giving praise, they were trained to use also non-verbal praise to supplement their training sessions at home, e.g. noise-makers and individual gestures. As it appeared that the non-verbal praise resulted in a successful and more effortless increase of overall praise for German parents, the first author then decided to introduce non-verbal contingencies in addition to the verbal praise to all parents in this study. This proved to be a feasible method to increase praise in training sessions and every-day life without parents feeling uncomfortable or forgetting to use it.

Another factor that may have had an impact on treatment time is the choice of games and toys for preschool children in Germany. Many typical German preschool board games are intended to support the development of a child and to increase cognitive, linguistic, social or concentration skills. In this context, many parents are opposed to "plastic toys without pedagogical value". Some of the parents also reported that it was difficult to embrace the idea of their child "having fun and learning" at the same time. They associated more drill-work with speech treatment. These parents were also sceptical about the idea that praise was able to influence the speech fluency. In these cases the therapist had to spend more time counselling the parents to choose appropriate play activities and games that would be fun for the child as well as acceptable to the parents.

Finally, treatment is free of cost for children in Germany which may have caused a more relaxed attitude towards therapy commitment and thus lengthened therapy duration. Some parents made statements like "I do not mind if treatment takes 10 or 20 sessions longer as I do not pay for it anyway." or "We did not practise last week, we just needed a break and who cares if treatment takes longer?"

Four children from the treatment group and five from the wait-contrast group had received speech therapy previously. These children were nevertheless included as their treatment had been terminated between 8 and 23 months before and parents reported that the fluency disorder had remained unchanged or worsened since discharge. However, this factor may have influenced treatment outcome. In four cases, the previous treatment had involved two to three sessions of parent counselling only. The remaining five children had received between 10 and 20 therapy sessions. Parents of these children had not been involved in treatment and stated that they were not given information regarding specific treatment methods and goals. Four parents reported that the clinician had counselled them about boosting their child's self-esteem and self-confidence through free-play activities. One child sang with the clinician and chanted rhymes. In all cases, parents reported being unsatisfied with the treatment as speech fluency did not improve. These descriptions reflect the difficult situation faced by parents of stuttering children in Germany. Although more and more clinicians specialize in the area of fluency disorders and attend workshops for continuing education, the overall number is still too small to meet the demand for therapy.

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The results of the present study indicate that the Lidcombe Program is an efficient treatment method to reduce stuttering in German-speaking children. Therefore, this treatment program is considered an enrichment of current early stuttering interventions in Germany.

Acknowledgments

The authors thank the parents and children who participated in this study. This research project has been partially supported by the Rotary Club, Wiesbaden, Germany.

CONTINUING EDUCATION

A randomized control trial to investigate the impact of the Lidcombe Program on early stuttering in German-speaking preschoolers

QUESTIONS

1. Which of the following factors are associated with higher spontaneous recovery rates:
   (a) male gender
   (b) female gender
   (c) above average intelligence score
   (d) good non verbal intelligence score
   (e) recovery of relatives who had stuttered
2. The Lidcombe Program:
   (a) is solely conducted by the therapist in the clinic
   (b) is implemented in two stages
   (c) requires constant verbal parental contingencies
   (d) is a behavioral treatment method
   (e) involves a 2 to 6 months maintenance phase
3. Results of this study show:
   (a) an increase in articulation rate for the treatment group but not for the wait-contrast group
   (b) a decrease in articulation rate for the treatment group and an increase for the wait-contrast group
   (c) a significant higher increase in articulation rate for the treatment group compared to the wait-contrast group
   (d) a decrease in articulation rate for the wait-contrast group and an increase for the treatment group
   (e) an increase in articulation rate for the treatment group and for the wait-contrast group
4. In the present study, treatment time may have been influenced by:
   (a) the time duration between stuttering onset and treatment start
   (b) the children's age
   (c) difficulties to select acceptable toys and games
   (d) the linguistic and phonological abilities of the children
   (e) parents having difficulties to implement ample praise
5. In this study, children in the treatment group:
   (a) decreased their percentage syllables stuttered significantly more compared to the wait-contrast group
   (b) showed no significant decrease in their percentage syllables stuttered compared to the wait-contrast group
   (c) decreased their percentage syllables stuttered half as much as the control children
   (d) showed an increase in percentage syllables stuttered
   (e) decreased their percentage syllables stuttered almost to the same extent as the control children

Appendix A

Q2 Participants, months since stuttering onset, previous treatment of stuttering, reported family history of stuttering in first- or second-degree relatives, percentage of syllables stuttered before and after treatment (home and clinic measurements), and number of treatment sessions

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Child #	Age	Sex	Mos. since onset	Previous treatment	Family history	%SS before treatment		# of treatm sess	%SS after treatment	
						Home	Clinic		Home	Clinic
Wait-contrast group										
1	5;2	M	13	No	No	6.8	6.2	0	3.2	2.5
2	4;6	M	9	No	Yes	8.3	7.5	0	7.7	6.1
3	5;8	M	42	No	Yes	2.5	3.6	0	1.5	3.8
4	3;3	M	13	No	Yes	1.8	12.3	0	2.5	2.5
5	3;3	M	18	No	n.d.	6.5	5.1	0	11.2	3.3
6	4;8	M	28	Yes	Yes	5.2	4.8	0	1.6	6.5
7	4;1	M	14	Yes	Yes	7.8	4.8	0	6.7	5.0
8	3;0	M	6	No	No	9.5	7.7	0	0.7	5.8
9	3;11	M	12	Yes	Yes	8.0	11.9	0	17.4	13.2
10	3;1	M	18	No	Yes	7.1	7.2	0	8.7	8.8
11	3;2	M	6	No	No	8.5	13.3	0	1.6	5.3
12	3;0	M	6	No	n.d.	5.4	9.2	0	2.1	5.6
13	4;1	M	10	No	Yes	3.2	3.8	0	0.8	0.5
14	5;3	M	30	No	No	4.0	3.6	0	8.0	8.5
15	3;0	M	6	No	No	20.2	39.6	0	11.6	13.1
16	4;2	M	17	Yes	Yes	9.3	9.6	0	13.7	14.8
17	5;3	M	12	No	Yes	15.8	15.9	0	12.9	9.7
18	4;0	M	24	No	Yes	3.6	5.5	0	4.5	4.8
19	4;4	M	8	Yes	n.d.	16.3	16.6	0	6.9	8.6
20	3;6	M	7	No	No	5.3	8.7	0	4.1	4.6
21	3;5	M	7	No	No	4.0	9.5	0	3.9	3.8
22	3;0	M	13	No	Yes	11.4	14.3	0	5.9	5.2
23	5;9	F	5	No	No	5.7	3.9	0	n.d.	n.d.
Treatment group										
24	3;8	M	7	No	Yes	7.2	7.7	13	2.7	2.5
25	5;6	F	24	No	Yes	7.1	6.2	14	0.6	0.7
26	5;11	M	36	Yes	No	9.3	8.1	12	3.1	3.3
27	5;8	M	31	No	Yes	3.8	2.3	12	0.2	0.2
28	3;7	M	23	No	No	15.0	12.8	13	7.3	6.9
29	4;5	F	30	No	No	9.2	14.4	14	2.5	3.1
30	4;1	M	18	No	n.d.	6.5	5.4	15	2.2	2.3
31	5;11	M	34	No	No	2.8	3.3	11	0.0	0.0
32	5;8	M	7	No	No	9.3	10.1	13	2.2	2.3
33	3;5	M	7	No	No	6.1	7.5	10	0.3	1.3
34	4;11	M	24	No	Yes	7.0	7.7	14	5.0	5.5
35	4;9	M	24	No	Yes	7.3	9.7	13	0.3	0.3
36	4;11	M	12	No	No	6.8	7.2	13	2.4	1.6
37	5;8	M	18	No	No	4.4	5.0	12	3.3	3.7
38	3;0	M	8	No	Yes	6.8	8.5	15	4.3	2.0
39	5;11	M	41	Yes	Yes	18.1	17.3	12	0.5	0.1
40	4;8	M	24	Yes	No	18.7	19.7	14	5.2	4.0
41	4;2	M	13	No	No	8.1	9.0	12	4.3	4.3
42	4;11	M	18	No	No	26.6	18.8	16	2.6	3.0
43	5;2	M	12	No	No	12.7	8.0	15	0.9	4.1
44	4;8	M	34	No	No	9.9	10.2	14	3.6	2.1
45	3;6	F	18	No	No	8.1	8.4	16	4.4	4.1
46	3;8	M	13	Yes	Yes	7.5	8.4	15	1.6	2.1

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Please cite this article in press as: Lattermann, C., et al., A randomized control trial to investigate the impact of the Lidcombe Program on early stuttering in German-speaking preschoolers, J Fluency Disord (2008), doi:10.1016/j.jfludis.2007.12.002

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