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# Stressors associated with the onset of stuttering in native Dutch-speaking children

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## Abstract

It has been suggested that some stress situations might be related to the onset of stuttering. Studies of such stressors and their relationship with onset and speaker-related characteristics are limited. The purpose of this study has been to examine stressors associated with the onset of stuttering. By use of a semi-structured interview, parents of 1169 native Dutch-speaking stuttering children between the age of 21 and 143 months, could report stress situations near onset. Findings suggest that for 638 children (55%), parents reported such stressors. Classification of these stressors reveals that emotion, behavioral/developmental and physical stress are most frequently reported. Only a sudden manner of onset of stuttering showed a statistically significant relationship with stressors associated with onset. Stressors near onset of stuttering reported in the present study have been found to be similar compared to other epidemiological studies. It needs mentioning that the reported stressors are the result of the perception of parents observing precipitating factors near onset of stuttering.

## Learning outcomes:

Readers will learn about and understand (a) the number and kind of reported stressors near onset of stuttering; (b) the speaker-related characteristics with stressors near onset reported by the parents of stuttering children; (c) the possible role of such stressors.

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In epidemiological and phenomenological studies of childhood stuttering, specific situations, circumstances or events have been reported as being related to the onset of stuttering. Often these factors have been referred to as stress factors (Yairi and Ambrose, 2005) or as precipitating factors (Conture, 2001; Poulos & Webster, 1991; Van Riper, 1982). The results of these studies point to a wide range of factors associated with onset of stuttering, including physical factors (e.g., illness, injury, excessive fatigue etc.), emotional factors (e.g., excitement, emotional upset, fear, etc.), behavioral or developmental factors (e.g., attention deficits, temper tantrum etc.).

Johnson and associates (1959), questioned 300 parents of stuttering children about factors near onset of stuttering. Factors could not be mentioned in 21.3% of the cases by fathers (F) and in 27.3% of the cases by mothers (M). In all other cases, the factors perceived by both parents as being the most important ones in relation to the onset of stuttering, were: emotional factors (34.9% of F and 42.3% of M), nervousness (25.7% of F and 32.5% of M), discrepancy between talking and thinking (21.2% of F and 8.9% of M) and physical conditions (12.8% of F and 8.9% of M). Notice that in this study, emotional factors were distinguished from nervousness, although the latter can also be considered as emotional.

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Andrews and Harris (1964) carried out a factor analysis on the research material of 80 stuttering school children. They suggested three main factors related to the onset of stuttering, composed of characteristics of the environment and the child. The first being retardation and abnormal speech development, poor ability on tests of intellectual functioning and weak coping abilities of the child's mother. The second factor was described as being related to severe stuttering and is composed of late talking, early onset of stuttering, and behavior disorder items such as hyperactivity, irritability, poor interpersonal relationship and dependence. The third factor was explained as high intelligence of the child, in combination with emotional and behavioral characteristics such as disobedience, aggression, anxiety, irritability, hyperactivity, quarrelsomeness. However, it is not clear how these factors relate to the concept of stress situations associated with the onset of stuttering.

Yairi and Ambrose (1992) studied characteristics of the onset of stuttering in 87 preschool children. For many of the children in their study (57%), the parents reported physical and emotional stress as being related to the onset of stuttering. Examples of physical stress have been respiratory problems at birth, surgery or illness requiring hospitalization in infancy, asthma requiring continuous medical treatment, and acute illness shortly before stuttering onset. Examples of emotional stress have been events such as divorce of parents, moving to another house, excessive sibling rivalry, or difficult day care arrangements, occurring within a few months preceding the onset of stuttering. They also found that the presence or absence of stress has been independent of gender. A sudden onset of stuttering (i.e., within a week) has been more often associated with stress factors near onset and more severe stuttering as perceived by the parents. Almost a quarter of the children (23%) have been characterized with a gradual onset, a positive familial history and no associated stress.

Yairi and Ambrose (2005) reinvestigated the matter of precipitating factors in relation to the onset of 146 stuttering young children. They found "that 14% of the children were reported to experience illness or excessive fatigue just prior to onset, and over 40% experienced emotionally upsetting events in close proximity to onset. In addition, behavioral or developmental stress or change has been also reported for 36% of the children." (p. 63). No statistical significant differences between the genders have been found. Yairi and Ambrose (2005), mention that their "data indicate that physical and emotional stresses might play an active role in stuttering onset." (p. 63). They suggest that "if a child possesses predisposing factors to stutter, aggravating physical or emotional stresses might very well be responsible for triggering the onset." (p. 63).

Also in theoretical/empirical models of stuttering, precipitating factors have been incorporated. Conture, Walden, Arnold, Graham, Hartfield and Karrass (2006) presented a theoretical model of factors contributing to instances of developmental stuttering in children. They suggest that there is a connection between emotional reactivity, emotional regulation and increase of stuttering.

In order to study the onset of stuttering, data have to rely almost entirely on retrospective parental reports (Yairi & Ambrose, 1992). However, the interpretation of findings concerning the reported onset of stuttering offers some difficulties. First, one can question the precision of the parents' reports. Yairi and Ambrose (1992) have discussed that the findings in their study were based on parental report "including parent's ability to retrieve and describe details of past events". In an attempt to make the reported data more accurate, Yairi and Ambrose (1992) had constructed a procedure to interview parents and encourage them to narrow down the date, manner and circumstances of the onset and making use of a bracketing pattern to question parents. Second, when relying on data reported by parents, their influence of perception, attribution and interpretation processes cannot be excluded. As formulated by Yairi and Ambrose (1992) "the data presented in this report is a reflection of individual parents' perceptions and threshold differences for normal disfluency, stuttering, severity, sudden or gradual onset, stress, and so forth." (p. 788). This does not necessarily mean that a priori reported data are worthless. For example, in case of asthma or allergy a parent can observe a valid relationship between a precipitating stimulus and the asthmatic or allergic reaction. Nevertheless, reported data related to the onset of stuttering might reflect "pure" perception and attribution of parents concerning a

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relation between the onset of stuttering and a stress situation. If so, the data can be taken as object to study perception and attribution processes of parents of stuttering children with regard to the onset of stuttering. It can be interesting to know (a) what kind of attributions are made by parents, across time or culture, (b) what might trigger such attributions and (c) what can be the consequences of such an attribution processes for e.g. the stuttering child. As in social sciences, marketing inquiries, political studies or psychological studies, reported data can be of use to investigate phenomena, related variables and relationships. Reported data of onset of stuttering might also reflect environmental or behavioral influence on stuttering. Assuming that other conditions such as a possible genetic predisposition (Drayna, 2001; Riaz, Steinberg, Ahmad et al., 2005; Suresh, Ambrose, Roe, et al., 2006; Shugart, Mundorff, Kilshaw et al., 2004; Wittke-Thompson, Ambrose, Yairi et al., 2007) or developmental prenatal processes related to brain cell migration and maturation (Geschwind & Galaburda, 1985) are also necessary to cause stuttering, these pre-mentioned environmental or behavioral influences can be considered as part of causal factors, if it proves to be necessary for the onset. Even when excluding the existence of stuttering induced by physical brain trauma, environmental and behavioral influence alone are insufficient to cause developmental stuttering. However, when accepting environmental and behavioral factors as distal or proximal causes of brain functioning related to the onset of stuttering as parental reported data might suggest, the problem of validation remains. This problem can only be solved by application of an external criterion to validate. For instance, Yairi and Ambrose (1992) found that, according to the parental reports, at least for some children, stress situations have more often been associated with a rapid onset of severe stuttering. These findings can be taken as the result of “pure” attribution processes of parents of young stuttering children. The perception of a sudden onset and more severe stuttering might have stimulated the search for a situation or event considered to be responsible for the beginning of stuttering. These findings, however, can be interpreted as if parents did observe environmental or behavioral circumstances related to the onset of severe stuttering. Such interpretation can lead to an experimental design to observe a direct effect of a reported stress situation on stuttering. This is what Yairi and Ambrose (1992) suggested, namely that data reported by parents “should be supplemented by more direct observations and measurements.” (p. 788). They also encourage the use of larger number of subjects in order to clarify the relationship of several specific stressor with onset of stuttering, as well as the possible interaction of several related variables. In addition, theoretical/empirical models of the onset of stuttering suggest that e.g. emotion, fatigue might play a role near the onset of stuttering. If so, as a start to support such models, one should find the suggested stress situations on a phenomenological level. Furthermore, in a clinical practice, clinicians are confronted with parents of stuttering children who report stress situations near onset of stuttering, asking the clinician if their experience makes sense or trying to convince the clinician of their causal attribution. Research can try to find the appropriate answers in order to support the clinical work. Finally, after comprehensively reviewing literature, the authors were able to find only a small number of studies that have been conducted on the subject of situations related to the onset of stuttering.

The purpose of the present study has been to collect data on stress situations perceived near onset of stuttering in a relatively large group of stuttering children, which can increase the credence and generalization of findings. Partially, the present study can be considered as a replication of the Yairi and Ambrose (1992) study. First, parental reported data have been obtained, making use of a standardized interview procedure as described by Yairi and Ambrose (1992). Second, their criteria to classify sudden or gradual onset of stuttering have been applied in the present study. Third, some of their findings concerning onset-related variables have been reexamined. In addition, Yairi and Ambrose (1992) suggested the search for more specific stressors and relationships related to the onset of stuttering.

Concretely, our research questions were:

1. How frequently do parents report stress situations associated with the onset of stuttering?
2. What kind of stress situations are perceived as associated with the onset of stuttering?
3. Are stressors associated with the onset of stuttering related to one or more of the following variables: age, gender, manner of onset, tempo of speech and language development, stuttering frequency at intake, parental concern? In other words, do stuttering children with reported stressors near onset of their stuttering, differ with the stuttering children without reported stressors near onset of stuttering, with regard to the forementioned variables?

*Ad 1.* The examination of reported stressors near onset of stuttering has been established on relatively small groups (i.e., < 200). In the present study, however, a relatively large number of participants (i.e., 1169) has been interviewed. The results were comparable to the findings in the Yairi and Ambrose (1992) study.

*Ad 2.* Specifically, Johnson and associates (1959) and Yairi and Ambrose (1992, 2005) mention emotional and physical stressors associated with the onset of stuttering. In the present study, the reported stress situations will be listed as correct as possible given the parental description. In order to compare the findings of the different studies available, the list of stressors will be classified according to method used by the Johnson and associates (1959) and the one used by Yairi and Ambrose (1992, 2005).

*Ad 3.* Yairi and Ambrose (1992) found no significant dependent correlation between gender and stress categories related to the onset of stuttering. However, they have suggested “But as we continue to identify more subjects in each of the categories, significant dependency may be demonstrated.” (p. 785). In the present study, given the large number of participants, the relationship between gender and stressors near onset of stuttering can be reexamined. Furthermore, the findings in the Yairi and Ambrose (1992) study suggested a relationship between gradual onset, family history and no stressors for almost a quarter of the participants, and a relationship between an early age of onset, a sudden onset, stuttering severity, female gender and more often reported stressors near onset. In the present study, more specifically, the relationship among variables related to reported stressors near the onset will be examined. This makes comparison between it possible to compare with the findings of the Yairi and Ambrose (1992) study and ours possible. In addition, as suggested in the discussion on how to interpret the reported data, perhaps some suggestions can be formulated to inspire experimental research that finally can clarify the status of the reported data of parents, being the result of pure attribution processes only, or reflect on environmental and behavioral influence near the onset of stuttering.

## **Method**

The present study is part of an epidemiological and phenomenological study on stuttering with a total of 1898 native Dutch-speaking stuttering participants, living in Flanders, Belgium. Between June 1992 and September 2005 reported and observed data related to stuttering-like disfluencies, onset of stuttering, stuttering associated behaviour, speech attitude, personality, and environmental characteristics have been gathered in a clinical setting with the same method and instruments by the first author.

### ***Participants***

Participants in the present study have been 1169 children and their parents. According to the criteria described in next part, all children, including 885 boys and 472 girls, have been diagnosed as stuttering, in the Centre for Stuttering Therapy, a clinical practice of the first author, specialized in the assessment and treatment of stuttering. The total group has been divided in two subgroups, a group of

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kindergarten children (group 1) and a group of school children (group II). Group 1 (n = 920) consisted of 688 boys and 232 girls (mean age is 48.6 months, SD = 11.9, range = 21-71 months, median = 48 months), resulting a ratio of 2.97 male:1 female. Group 2 (n = 249) consisted of 197 boys and 52 girls (mean age = 94.2 months, SD = 20.6, range = 72-143 months, median = 85.5 months), resulting a gender ratio of 3.79 male: 1 female.

### ***Criteria for participation***

A participant has been selected only if he lived up to all of the following criteria: (a) being labeled as stuttering by one or both parents, (b) directly brought by the parents and/or referred to the Centre for Stuttering Therapy by a physician, a speech language pathologist, or a school guidance team for reasons of stuttering, (c) affirmative description of characteristics of stuttering in the structured interview with the parents (20-40 minutes) such as repetitions of sounds and syllables, prolongation of vowels or consonants, blocks of sounds and/or stuttering-associated behaviour such as physical tensioned grimaces, foot tapping, (d) the observation of 3% stuttering-like disfluencies to total words in conversational speech, found to be a highly specific and sensitive criterion Boey, Wuyts, Van de Heyning, De Bodt, Heylen (2007), (e) for young children (2 to 7 years) a score of 10 or more on the the Stuttering Prediction Instrument (SPI) (Riley, 1981) and/or a score of 3 or more on the Test voor Stotterernst NietLezers (TvS-NL) [Test for Stuttering Severity Non-Readers] a test for native Dutch speakers, published test (Boey, 2000), (f) for children older then 7 years) a score of 1 or more on the Stuttering Severity Instrument (Riley, 1984) and/or a score of 1 or more on the Test voor Stotterernst-Lezers [Test for Stuttering Severity Readers] (TvS-L) a test for native Dutch speakers published test (Boey, 2000), (g) a positive detection of stuttering based on the answers on a screening list filled in by the parents and scored by the clinician. (Note: for this purpose the “DIS” is used (Stes & Boey, 1997) which is an instrument used for detection of stuttering amongst Dutch-speaking individuals. The construction has been based on the work of Pindzola and Withe (1986) and of Riley and Riley (1989). A score of 8 or lower indicates non-stuttering and normal fluency and has a false detection rate of two per thousand cases (based on DIS published norms). A score of 9 to 11 indicates the possible presence of stuttering and provides correct detection of 88% of observed cases in the standardization sample (n = 436 normally fluent children and 620 stuttering children). Finally, a score of 12 or more indicates stuttering with no false detections reported to date.)

Children who did not meet all of the preceding criteria have not been selected for participation in the present study. This means: (a) the absence of labeling of stuttering now or in the past by both parents as well as by others: grandparents, family members, a teacher, a physician etc. (b) in addition, confirmation of the absence of speech-language pathology by review of the record in the child's medical-educational file in school, (c) absence of stuttering-like disfluencies (or < 3%) and a score of 0 or subclinical on a stuttering severity test, (d) a score on DIS of 8 or lower.

### ***Data Collection – Onset Related Data***

A structured clinician-parent interview (40-90 minutes) concerning the speech difficulties of the child has been taken. For young children, the child was seated on the carpet in the examination room, and given a set of toys to play with. The clinician (first author) and parents were seated at the table in the same room. Topographic data of speech and stuttering in the child have been collected by means of this interview procedure. The answers to questions were recorded at the interview form. Sections of the interview include personal identification data, description of the problem, description of disfluent and/or stuttering events and/or associated behavior, variability of speech fluency, onset of stuttering (age, manner, circumstances), speech and language development and other speech or language difficulties, reactions of the child towards his or her speech, reactions of the environment (parents, family members, peers, school teacher...), past treatment(s), medical and familial record, milestones of development, personality traits of the child, behavior-educational characteristics, school and extra mural activities, family characteristics, leisure time activities (hobby's).

At the start of this study, the interview protocol had been standardized according to directives on assessment and interviewing of clients in a clinical setting in speech-language pathology or psychotherapy. For the present study, the following parts of the interview have been important: determining (a) the age at onset of stuttering, (b) the manner of onset, (c) circumstances, events, factors near onset. Special care was taken to narrow down the age at onset as well as the manner and the circumstances of onset. Parents who informed about specific circumstances or events near the onset of stuttering, often offered their interpretation (e.g., “the child’s fatigue caused his stuttering”). Then the clinician asked for more descriptive terms and clarification. The answers of parent have been checked by conclusive questions such as: “Do I get it right that you have the impression that fatigue of your child had something to do with the onset of stuttering ?” If parents confirmed, the answer has been registered, in the above-mentioned example as “fatigue”.

### ***Definition of onset-related data***

The age of onset has been marked in years and months. The difference between the age at onset and the age at intake has been calculated (in months) and defined as time since onset. The circumstances near onset reported by parents, were listed according to key words (e.g., moving, excitement about celebration...). See table 1 hereafter.

### ***Other data collected***

Other data that have been collected were birth date and chronological age, gender, stuttering frequency, tempo of speech/language development and concern of parents. The stuttering frequency has been defined as the ratio of stuttering-like disfluencies to total words (Boey, Wuyts, Van de Heyning, De Bodt, Heylen, 2007; Conture, 2001; Yairi and Ambrose, 2005). Concern of parents has been defined by use of the response 1 (concerned) or 2 (very concerned) on item 5, section II of the SPI (Riley, 1981). The rate and quality of speech/language development (DevSL) is classified as “precocious”, “normal”, or “delayed” based on parental information and screening of the child’s speech/language capacity performed by the clinician based on the clinician-child conversation. In case of conflict, the screening judgment has been used. An advanced DevSL refers to the production of speech and language at an early age with (a) an extended comprehension and production of vocabulary, (b) early use of complete sentences (+ 18 months), (c) a high quality of intelligibility of speech with a well developed articulation at a very young age 2-3, (d) a high quality of communication skills. Parents could use the information registered by Kind en Gezin i.e. a National Service for Child Health Care and Development. In case of kindergarten children they could use information of the teacher’s evaluation.

In case of a normal DevSL speech and language developed within normal ages limits (e.g. first words at 12-14 months, first combination of words about 18-24 months, first sentences from 24 months etc.) and without extreme capacities with regard to vocabulary, sentence construction, conversation skills, articulation. Finally, delayed DevSL refers to a late start of speech/language use (> 18 months) with limited vocabulary, sentence construction and conversation skills, often accompanied with phonological and articulatory developmental problems and problems with the child’s speech intelligibility.

### ***Data analysis***

All interview data have been recorded according to the protocol and have been registered into a computer database (Filemaker Pro). Age-related data (i.e., chronological age at intake, age at onset of stuttering and time since onset), gender, manner of onset of stuttering and reported factors near onset were exported to Excel and SPSS for statistical description and analysis (Altman, 1999; Petrie & Sabin, 2000). First, in order to answer question 1 and 2 formulated earlier, descriptive data on reported factors have been listed and categorized twice, once according to Johnson and associates (1959) i.e. physical, emotional/behavioral, imitation and once according to Yairi & Ambrose (1992, 2005) i.e. physical, emotional, behavioral, developmental. Second, binary logistic regression analysis and

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multinomial logistic regression analysis have been performed to examine whether children classified with reported factors near onset differed from these without, specifically concerning age, time since onset, age at onset, gender, manner of onset, stuttering frequency, rate of speech/language development and concern of parents.

## Results

### *Number of participants with reported factors near onset*

*Age group.* For 638 of all children (54.6%), parents reported factors near onset. For approximately half of the children ( $n = 466$  or 50.7%) of group I factors near onset have been reported. This is less than compared to the children of group II ( $n = 172$  or 69.1%) with reported factors.

*Gender.* Considering gender within the group of children with reported factors near onset, 350 are male (50.9%) and 116 female (50.0%). For 1092 children the manner of onset could be registered. For the other 100 children, the parents remained undecided about the manner of onset.

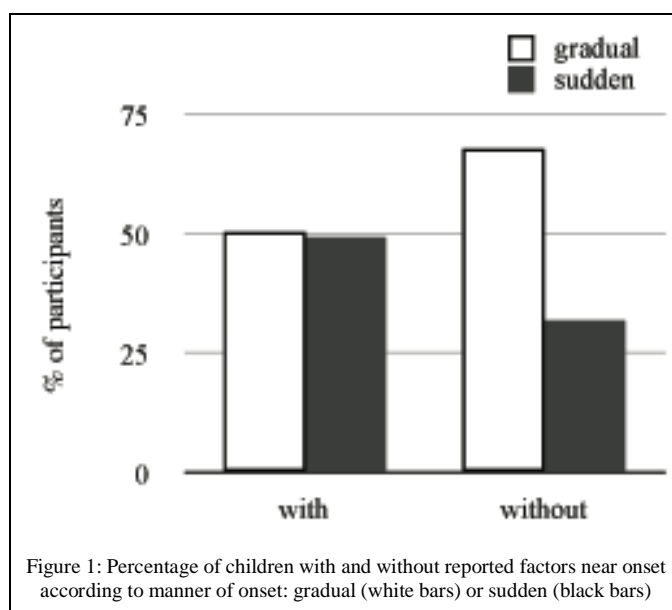
*Manner of onset.* For 627 children (57.4%) the onset of stuttering has been described as gradual, and for 465 children (42.6%) as sudden. In the group of children with a gradual onset, 285 (45.5%) children have been noticed with reported factors near onset, and 342 (54.5%) without. In the group of children with a sudden onset of stuttering, 305 (65.6%) have been reported with factors near onset known, and 160 (34.4%) without. This is illustrated in figure 1.

*Tempo of speech/language development.* Of the children for who the DevSL could be determined, 343 (30.1%) have been classified as “delayed”, 398 (34.9%) as “normal” and another 398 (34.9%) as “precocious”. Of all children with factors near onset being known, 29.6% have been classified as having a delayed DevSL, 33.0% with normal DevSL, and 37.4% with a precocious DevSL.

*Stuttering frequency.* The group of children with reported factors near onset ( $n = 629$ ) had a lower mean frequency of stuttering ( $M = 14.22$ ,  $SD = 10.36$ ) than the group of children without reported factors near onset ( $n = 511$ ) ( $M = 15.27$ ,  $SD = 8.24$ ). The standard deviation for the group of children with factors near onset being known, reveals a higher variability than compared to the group of children without factors near onset.

*Parental concern.* The subscores on item 5 of the SPI (Riley, 1981) have been used to define parental concern and have been available for 1038 children. Subscore 0 (= unconcerned) was not added in the analysis because of insufficient amount of data available (i.e. 7 cases). For subscore 1 (= concerned,  $n = 461$ ) and subscore 2 (= very concerned,  $n = 577$ ) the presence of reported factors near onset has been calculated. Descriptive data suggest that more often factors have been reported as being known for parents being evaluated as very concerned ( $n = 317$  or 59.7%) compared to parents with concern ( $n = 214$  or 46.4%).

Descriptive results suggest that factors near onset have been more frequently reported for (a) older children, (b) in cases with of a sudden onset of stuttering, (c) for children with a precocious speech/language development, and (d) for parents observed as very concerned. No differences related to gender have been observed between the group of children with or without reported factors near



onset. Further, children with reported factors near onset, obtained, as a group, a lower frequency of stuttering than the children without reported factors.

### ***Kind of reported factors***

In table 1 a list of 16 different precipitating factors is shown for the 638 children as reported by their parents. The five most frequently reported stress situations have been associated with (a) school (e.g., entering school, new school year, a lot of different teachers) for 24.65% of all children, (b) language development (e.g., spurt, sudden growth of vocabulary, sentence formulation) for 11.45%, (c) high anxiety for a specific event (e.g. ugly monsters in films, aggressive animal) for 8.68%, (d) family vacations (e.g., travelling, visiting foreign countries) for 8.05% and (e) becoming upset with the birth of a sibling for 7.80% of the children. The other factors have been difficult day care situations (e.g., problems with day care nursery), death of a beloved person, excitement (e.g., about Saint-Nicholas, anniversary celebration, New year's eve), illness (with hospitalization, surgery), moving, divorce of parents, taking speech therapy to improve articulation, imitation (of stuttering), accident, extreme fatigue and handedness.

The factors have been categorized according to Johnson and associates (1959 p. 166-167). For 89.43% of the children the reported precipitating factors were classified as emotional/behavioral, for 8.17% as physical and for 2.39% as imitation. When the reported factors have been classified according to Yairi and Ambrose (2005) p. 63, for 50.44% of the children the factors have been emotional, for 27.04% behavioral, for 14.59% developmental and for 7.92% physical. See table 1.

### ***Statistical analysis***

Children have been classified into a group with stressors near onset as reported by their parents, and into a second group without such stressors. In order to examine if such a classification is determined by fore-mentioned variables such as age, gender, manner of onset etc. chi-square tests or binary logistic regression analyses have been performed.

*Age.* Factors near onset seemed to be more obvious in the group of older children (group II) than in the group of younger children (group I). This difference between age groups is statistically significant:  $\chi^2(1, N = 1169) = 26.832, p < 0.000$ .

*Time since onset.* The comparison of the variances of the time-of-onset-data from group I with group II reveals heteroscedasticity (Kline, 2005; Petrie & Sabin, 2000). In order to perform statistical analysis properly, only the data for children younger than 85 months ( $n = 1039$ ) could be used, and the data for time since onset have been log10 transformed. Time since onset log10 transformed is statistically significantly related with the factors near onset reported as being known to the parents (Wald  $\chi^2 = 6.411, p = 0.011$ ), without effect of chronological age (Wald  $\chi^2 = 2.460, p = 0.117$ ). When compared to children without reported stressors associated with onset of stuttering, children with such reported stressors were brought to the clinical practice closer to the onset of their stuttering.

*Gender.* Descriptive results of reported factors near onset revealed that such factors have been reported approximately as much for males than for females, a non-significant statistical difference (Wald  $\chi^2 = 0.468, p = 0.494$ ).

*Manner of onset.* In cases of sudden onset of stuttering, factors near onset have been mentioned to be known more frequently, than in the cases with gradual onset, a statistically significant relationship (Wald  $\chi^2 = 42,890, p < 0.000$ ).

*Tempo of speech/language development.* Findings suggest that stressors near onset are most frequently reported for the children with a precocious DevSL. For the children with a delayed DevSL, factors near onset have been reported the least. For the children with a normal DevSL, the number of reported factors near onset lay between the latter two. This tendency however, does not seem to be statistically significant ( $\chi^2 = 1.771, p = 0.183$ ).

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Factor no.	Factor	% Children	Category *	Category **
1	school (entering school, new school year...)	24.65	emotional/behavioral	behavioral
2	language development spurt	11.45	emotional/behavioral	developmental
3	high anxiety for a specific event	8.68	emotional/behavioral	emotional
4	family vacations, traveling	8.05	emotional/behavioral	emotional
5	birth of brother or sister	7.80	emotional/behavioral	emotional
6	difficult care situations	7.17	emotional/behavioral	emotional
7	dead of beloved person	6.04	emotional/behavioral	emotional
8	excitement (celebrations)	5.53	emotional/behavioral	emotional
9	illness, surgery, hospitalization	5.16	physical	physical
10	moving	3.65	emotional/behavioral	emotional
11	divorce	3.52	emotional/behavioral	emotional
12	speech therapy (articulation)	2.89	emotional/behavioral	developmental
13	imitation	2.39	imitation	behavioral
14	accident (car, fallen...)	2.26	physical	physical
15	extreme fatigue	0.50	physical	physical
16	change of handedness	0.25	physical	developmental

\* according to Johnson and associates [5] p. 166-167  
\*\* according to Yairi and Ambrose, [1] p. 62-64

**Table 1:** Percentage of children (total n = 638) with reported precipitating factors near onset of stuttering and categorization of factors.

### *Stuttering frequency*

The lower mean frequency of stuttering observed for the group of children with reported factors near onset did differ statistically significant with the group of children without reported factors near onset (Levene's test = 29.428,  $p < 0.000$ . Mann-Whitney,  $U = 14769.00$ ,  $p = 0.018$ ).

### *Parental concern*

Descriptive data suggest that more often factors have been reported as being known for parents being evaluated as very concerned compared to parents with concern. This difference is statistically significant ( $\chi^2 = 6.916$ ,  $p = 0.009$ ).

### **Interaction of variables**

Resuming the former findings, significantly more stressors near onset have been reported by parents for children with an older-age-group membership, a shorter time since onset, a sudden onset, a precocious tempo of speech/language development, a lower stuttering frequency as a group, and a higher parental concern. When controlled for all these variables of significance, multinomial logistic regression analysis reveals that only a sudden onset of stuttering remained statistically significant associated with the classification of reported factors near onset as being known ( $\chi^2 = 40.861$ ,  $p < 0.000$ ). No other statistically significant relationships with reported factors near stuttering remained, as tabulated in table 2.

### **Discussion**

First of all, the findings will be summarized to answer to the questions formulated at the start of the present paper. Secondly, the results will be compared to the findings in other studies. Thirdly, the discussion will focus on the interpretation of the findings and finally, limitations of the present study will be considered and some suggestions for future research will be made.

#### **Findings**

The first question was how frequently parents report stress situations associated with the onset of stuttering. In the present study, more than half of stuttering (i.e. 54.6%) factors

near onset of stuttering have been reported by their parents. This number is somewhat lower for the group of younger children (i.e. 50.7%) compared to the group of older children (69.1%). As for half of the male (50.0%) and female participants (50.9%) stressors have been reported, no significant difference between genders could be determined. For the group of children with a gradual onset, stressors have been associated in 45.5% of them compared with 65.6% of the group of children with a sudden onset of stuttering. Stressors near onset were most often reported for children classified with a precocious speech and language development (i.e. 37.4% of them), compared both to children with a normal speech and language development (i.e. 33.0%) and to children with a delayed speech and language development (i.e. 29.6%). Finally, the number of reported stressors was higher parents classified as “very concerned” (i.e. 59.7% of them) when compared to parents classified as “concerned” (i.e. 46.4%). In conclusion, these findings suggest that stress situations near the onset of stuttering have been more frequently reported for older children, in cases with of a sudden onset of stuttering, for children with a precocious speech and language development, and for parents observed as very concerned.

The second question was what kind of stress situations are assumed as associated with the onset of stuttering. When listed according to stress situation, the five most frequently occurring situations that have been associated with the onset of stuttering by parents are school-related, language development, high anxiety levels of the child for a specific event, excitement about family vacations and birth of a

Variable	Chi-square	df	p
age group	0.101	1	.544
onset	40.861	1	< .000
tempo of speech/language development	2.722	2	.256
gender	0.199	1	.655
parental concern	2.040	2	.361
stuttering frequency	0.984	1	.321
time since onset	0.355	1	.551

**Table 2:** Variables related to classification of children with reported factors near onset entered in a multi-nomial logistic regression analysis. Chi-square values, df and p-values

sibling. In addition still other, less frequently mentioned stress situations, have been reported. With the exception of language development, all other reported factors have emotional excitement in common.

The third question asked was whether stressors associated with the onset of stuttering are related to one or more of the following variables: age, gender, manner of onset, tempo of speech and language development, stuttering frequency at intake and parental concern. In other words, considering these variables, do stuttering children with reported stressors near onset of their stuttering differ from the stuttering children without reported stressors near onset of stuttering? At first, the output of statistical analysis suggests that children with reported factors near onset, more often (a) are members of the older age-group (72-143 months), (b) have been noticed with a sudden onset of stuttering, (c) have a shorter time since onset, (d) have a precocious speech/language development. (e) As group they obtained a lower mean frequency of stuttering, and finally (f) their parents have been more often scored as “very concerned” on item 5 of the SPI. However, when controlled for the effect on classification of all variables in the analysis, only a sudden onset of stuttering remains statistically significant associated with reported factors near onset being known to the parents.

### ***Comparison with findings of other studies***

#### ***Number of reported stress situations near onset of stuttering***

The number of reported stressors near onset of stuttering reported by Johnson and associates (1959) were reported for 78.7% of the children when reported by their father and for 72.7% when reported by their mother. Yairi and Ambrose (1992) reported that, in general, stress situations associated with the onset of stuttering have been mentioned for 43% of the children. The results of the present study indicate that stress situations were associated with the onset of stuttering for 54.6% of the children. This number lies within the range of the figures of the two other studies. However, it is closest near the findings of Yairi and Ambrose (1992), although a difference of 11.6% still is present. On the one hand, the same interview method can contribute to some similarity of results. On the other hand, Yairi and Ambrose (1992) seem to have restricted the number of reported stress situations to emotional and physical stress. This could perhaps explain the difference that has been found concerning the number of reported stress situations near the onset of stuttering. Of course, still other variables not observed in either study can explain this difference.

#### ***Kind of reported stress situations near onset of stuttering***

Table 3 tabulates the percentage of children with reported stress situations near onset of stuttering, according the stressor category as classified by according to Yairi and Ambrose (2005). In all studies that have been compared, the principal stressor category is “emotional” with approximately somewhat more than 40% of stressors classified. The major discrepancy between numbers of the different studies is 15.5%. The second important stressor category seems to be “behavioral” or “behavioral-developmental” when the latter stressor category is added as reported by Yairi and Ambrose (2005). When the figures of the other studies are added to the behavioral and developmental stressor category (i.e., 34.6% for the fathers and 46.3% for the mothers in the Johnson and associates (1959) study and 41.6% in the present study), the collapsed stressor category then classifies roughly also somewhat more than 40% of all stressors, with 7% as largest discrepancy between studies. Finally, the last stressor category is “physical” with around 10% of all stress situations classified. Here, the largest discrepancy between the considered studies is 6.1%. The order of importance of stressor categories remains remarkably similar between studies. Several possibilities can contribute to an explanation for this. First, the use of a broad system for classifying stress situations into stressor categories can have induced a similarity between results in different studies. Second, the findings might also suggest similarity of the attribution of parents across time and language. Third, when parents reported stress situations near the onset of stuttering, they just might have observed similar environmental and behavioral influence on stuttering.

Stressor category	Johnson and associates (1959)		Yairi & Ambrose (1992)	Yairi & Ambrose (2005)	Present study
	Fathers	Mothers			
emotional	34.9	42.3	43.0*	40.0	50.4
physical	8.9	12.8		14.0	7.9
behavioral	25.7	33.5	-	36.6**	27.0
developmental	8.9	12.8	-		14.6

\* emotional and physical stressor categories are added  
 \*\* behavioral and developmental stressor categories are added

**Table 3:** Percentage of stuttering children with parental reported stress situations near onset of stuttering according to different studies.

### *Variables related to stress situations near onset of stuttering*

In the present study a relationship has been found between the more frequently parental reported stressors near onset of stuttering and the older age-group, a shorter time since onset, a sudden onset, a precocious tempo of speech/language development, lower stuttering frequency at the intake, and a higher parental concern but not with gender. When controlled for significance of all these variables, only a sudden onset of stuttering remained statistically significantly associated with reported stressors near onset.

The findings of Yairi and Ambrose (1992) concerning the relationship between onset of stuttering and physical and emotional stress revealed that such relationship has been independent of gender, a finding confirmed in the present study. Furthermore, Yairi and Ambrose (1992) suggested a cluster between gradual onset, positive familial history and no associated stress near onset of stuttering. Such stressors have been suggested to be more frequently related to a sudden onset (Johnson, 1955; Van Riper, 1982; Yairi & Ambrose, 2005), which could also be confirmed in the present study. In fact, only the relationship between the manner of onset and reported stress situations near onset remains significant, when controlled for all variables put into the statistical analysis.

### *Interpretation of the findings*

The present findings reveal that, at least for about half of the stuttering children, specific situations or events have been associated with the onset of stuttering by their parents. In this context, emotional stressors have been reported most frequently. Findings indicate that parents significantly more often reported stressors concerning children with a sudden onset of stuttering. Yairi and Ambrose (2005) suggest two possibilities to interpret this major finding. First, "...parents' reports of gradual or sudden onset reflect whether early symptoms are mild or severe." (p. 57). In other words, the perception of severe stuttering makes them perceive a sudden onset and vice versa. Second, Yairi and Ambrose (2005) take their data to "indicate that physical and emotional stresses might play an active role in stuttering onset. If a child possesses predisposing (i.e., genetic) factors to stutter, aggravating physical and emotional stresses might very well trigger the onset." (p. 63).

Undoubtedly, the reported stress situations near onset obtained by interviewing parents, are always the result of perception and attribution of parents. The question remains whether reported factors are

purely the result of parental attribution or also refer to a process of “causing” the onset of stuttering or “increasing” the stuttering severity. The result that a sudden onset seems to be related more often with reported stressors near onset of stuttering, is often accepted as an argument to support the parental attribution process. The reasoning is that specifically a sudden onset of stuttering is more easily perceived by parents who seek an explanation for the beginning of stuttering, and associate it with an ongoing event, although such an event does not necessarily possess a causal effect on stuttering. However, accepting this explanation of more easily perceived sudden onset of stuttering does not automatically include the latter part of the argument, namely that the event is not causally related to the onset of stuttering. In other words, a facilitated parental perception and attribution concerning the sudden onset of stuttering does not exclude the perception of an effective causal relationship. In addition, one can assume that because of a sudden onset of stuttering, more often reported stress situations near onset are attributed by the parents. This assumption, however, fails to explain why for more than one-third of the children with a sudden onset (i.e., 34.4%) no stress situations have been reported. Also, it does not explain why of all children with a gradual onset of stuttering, less apt to be precised by parents, still for 45.5% of them stress situation near onset of stuttering have been reported. When still accepting only attribution processes, without a real causal relationship between a certain stressor and the onset of stuttering, in all the cases so far discussed, at least two groups of parents should be suggested, those who attribute and those who do not.

Another interpretation can be to accept a causal effect from a stress situation on the onset of stuttering. In some more recently developed models on stuttering, it is hypothesized that specific factors (e.g., emotion, fatigue, behavioral) can trigger stuttering. Conture et al. (2006) formulated a communication-emotional model of stuttering. In essence, related to this point, their model states that amongst other factors, e.g. emotion can cause disassociation of subcomponents of speech-language planning, finally resulting in stuttering, and can be considered as distal causal factors. In a neuromotor model of stuttering Alm (2004) emphasizes the function of basal ganglia circuits being sensitive to emotional factors, and having a stuttering evoking effect. According to a speech motor model of stuttering formulated by Zimmerman (1980) and Smith (1997, 1999), neural activity correlated with e.g. emotional processes, can provoke increased activity in motor speech area and/or cerebellum, finally leading to tensioned disruption of ongoing speech activity. In such models, the findings in the study of Yairi and Ambrose (1992, 2005) and in the present study suggest that the stressors function as distal causal factors or precipitating factors. If such a suggestion could be validated, as proposed in the next section of this discussion, the findings in the present study can be taken to support these models on stuttering on a phenomenological level.

### ***Limitations and suggestions for future research***

Knowledge about the onset of stuttering can be of importance to contribute to the theory of stuttering, and to a clinical intervention strategy. So far, only a few studies, all of which are epidemiological in nature, have been conducted focusing on the subject of the onset of stuttering and the circumstances in which this onset took place. For the majority of cases of developmental stuttering, parents observe the onset of stuttering. Inherently, epidemiological studies making use of parental reported data have some limitations. As Yairi and Ambrose (1992) pointed out, theoretically, the definition of the onset of stuttering is debatable, but practically the majority of the parents do report, more or less specifically, what they perceived as the beginning of stuttering. Consequently, data related to the onset of stuttering have to rely on retrospective parental reports. Inevitably, the data reported by parents still may contain “inaccuracies”, although the efforts for the refinement and standardization of the interview methods by Yairi and Ambrose (1992), replicated in the present study, may have forced parents to report as accurate as possible.

Another limitation concerns the status of reported data and findings. Undoubtedly, such data are the result of perception, attribution and reporting by parents. The problem is to reveal if reported stressors near the onset of stuttering are the result of only attributional processes, i.e. “pure attribution”, or if the

parental reported data refer to a causal relationship between a stressor and the onset of stuttering. The methodological design of an epidemiological study as used by Johnson and associates (1959), Yairi and Ambrose (1992) and in the present study cannot circumvent this problem. The suggestion is to use an external validation procedure, i.e. to formulate a hypothesis about a stressor and its relationship to the onset of stuttering and test that hypothesis. Needless to mention that there are ethical reasons why not to conduct such a study. Another possibility is, again, to formulate a hypothesis about a stressor and its relationship near the onset of stuttering, to observe if there is any effect on stuttering, e.g. an increase of severity. The stressor can be given and withdrawn (A-B design) and criteria and elements of stuttering can be observed directly (e.g., frequency, physical concomitants). In a certain way, Tudor has used this design in her doctoral study known as “the monster study”. However, in that study environmental pressure has been hypothesized to be a causal factor of stuttering.

The data of concordance of stuttering between monozygotic twins (i.e., 0.71 on the average), suggest that other factors than genetic ones can be involved in the causation of stuttering (Andrews et al., 1983; Howie, 1981; Felsenfeld et al. 2000). However, it has been difficult to identify what specific cues have impact on stuttering. According to Geschwind and Galabrudra (1985) prenatal conditions related to cell migration and lateralization are involved. Findings from epidemiological studies, suggesting that emotional stressors (e.g. excitement, high levels of anxiety related to a specific situation) and physical stressors (e.g., illness, fatigue) might have a correlation with the onset of stuttering (or a sudden increase of severity near the onset), can inspire the selection of a hypothesis to be tested.

Furthermore, models of brain functions related to speech and stuttering can, within the limits of the knowledge available, evaluate if findings about the stressors near onset of stuttering make sense. In fact this is an analysis of content validity, revealing if emotional or physical stressors have the capacity to provoke stuttering in a predisposed brain, and how it works on a neurophysiologically level. Fore mentioned models of Conture et al. (2006), Alm (2004), Smith (1997, 1999) take into account the possibility of emotional and physical stressors as a distal causal factor for stuttering although this has not yet been linked to findings from epidemiological studies yet.

## **Conclusions**

The objectives of the present study have been (a) to study how frequently parents report stress situations associated with the onset of stuttering, (b) to describe what kind of stress situations are perceived as associated with the onset of stuttering, and (c) to examine the relationship between reported stressors near onset and related variables (e.g., gender, manner of onset, tempo of speech and language development etc.). For approximately half of the stuttering children the parents report stress situation near the onset of stuttering. When classified into stressor categories, findings suggest that emotional, behavioral/developmental and physical stressors have most frequently been associated with the onset of stuttering. These findings seem to be similar compared to former epidemiological studies. According the present study, when controlled for all other related variables, only the manner of onset proved to be a statistically significant related to reported stressors near onset being known. More often such stressors were reported by parents when the onset of stuttering was sudden. The findings might only indicate that the reported stressors are the result of an attribution processes of parents, or in addition suggest a distal causal relationship between reported stressors with the onset of stuttering. An epidemiological study as such can not solve this conflict of interpretation. It can inspire experimental designs to test the capacity of reported stressor to provoke stuttering, or it can be evaluated in models of brain functioning in stuttering.

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***Author's note***

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