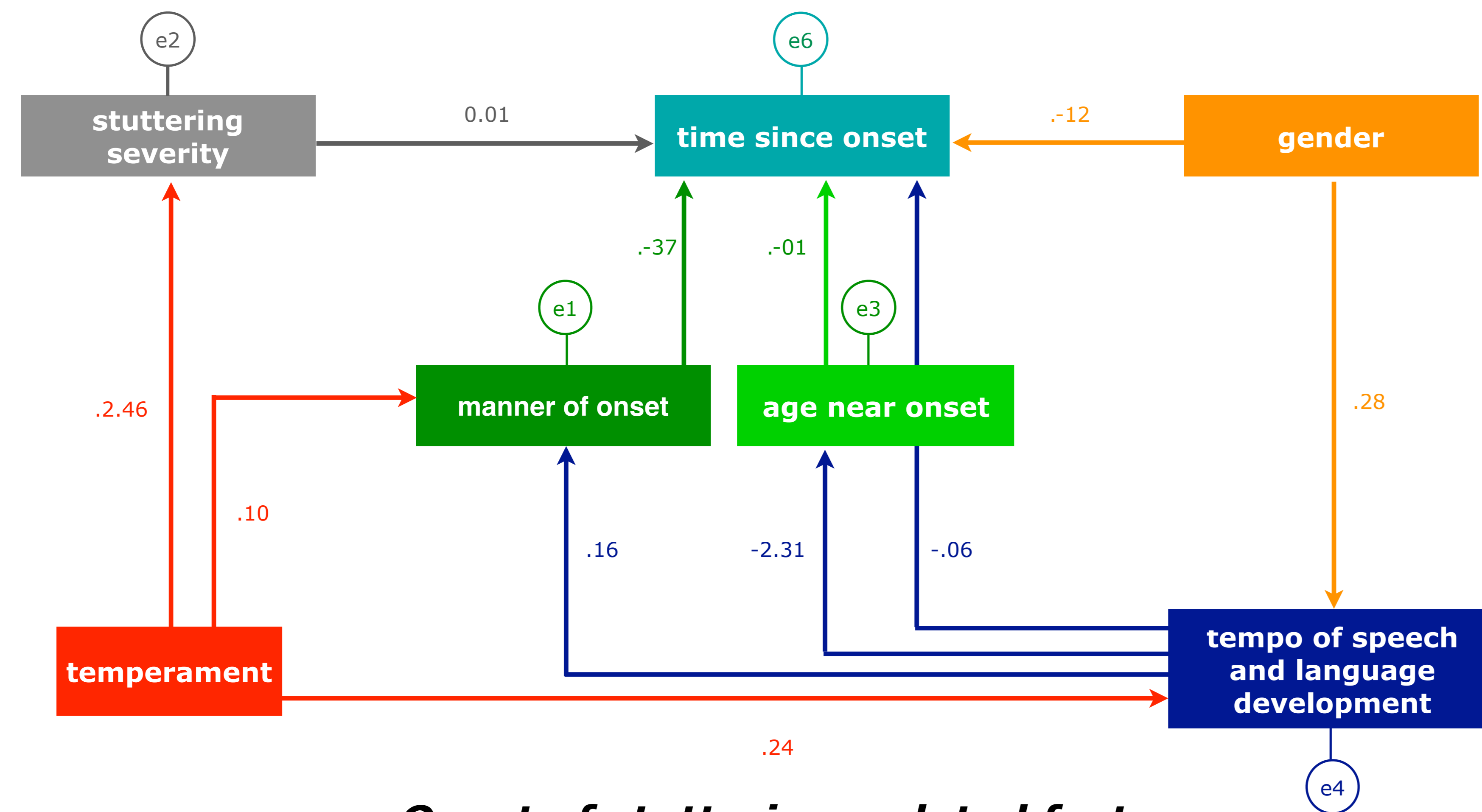


Stuttering: a Model of Onset and Related Factors

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In the Antwerp epidemiological and phenomenological study on stuttering, the onset and development of stuttering have been studied. Descriptive data related to the onset of stuttering have been obtained for a group of 1549 participants. However, in order to construct the structural equation model of onset of stuttering data for all considered variables were available for 437 young stuttering children out of the total group of participants.



Onset of stuttering: related factors

Structural Equation Modeling

Unstandard regression weights

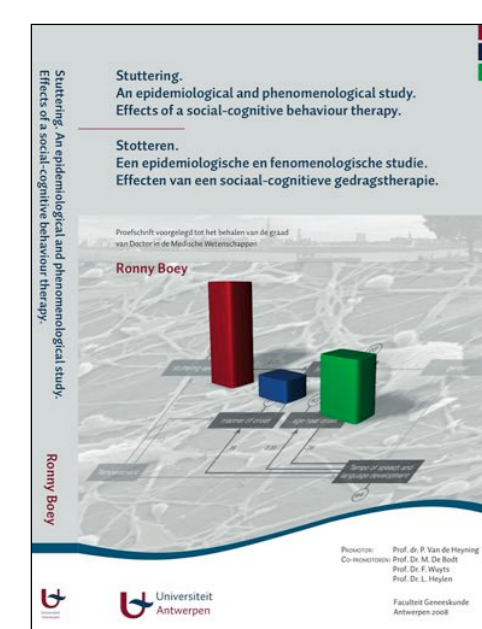
Fitness and Parsimony Characteristics of the model of onset

Unstandardised regression weights and *p*-level for relationships between variables for the structural equation model for the onset of stuttering

Related factors	Estimate	S.E.	C.R.	<i>p</i>
tempo SLDv* <--- temperament	0.242	0.079	3.067	.02
tempo SLDv* <--- gender	0.279	0.087	3.209	.001
stuttering severity <--- temperament	2.461	0.660	3.726	< .000
manner onset <--- temperament	0.102	0.048	2.130	.033
age near onset <--- tempo SLDv*	-2.305	0.588	-3.920	< .000
manner of onset <--- tempo SLDv*	0.162	0.028	5.709	< .000
time since onset <--- age near onset	-0.006	0.002	-3.352	< .000
time since onset <--- gender	-0.121	0.039	-3.149	.002
time since onset <--- tempo SLDv*	-0.058	0.022	-2.646	.008
time since onset <--- manner of onset	-0.292	0.035	-8.380	< .000
time since onset <--- stuttering severity	0.006	0.002	2.321	.02

* tempo SLDv = tempo of speech language development

Index	Value
Fitness & Parsimony	
RMSEA	0.000 pCLOSE = 0.942
RFI	0.900
IFI	1.000
TLI	1.000
CFI	1.000
Parsimony (0 = minimal parsimony; 1 = maximal parsimony)	
PRATIO	0.476
PNFI	0.454
PCFI	0.476
Sample bias	
HOELTER	811 (<i>p</i> = .05) 1028 (<i>p</i> = .01)
used <i>N</i>	437
no sample bias	
Perfect Fitness: χ^2_M equals <i>df_M</i> , <i>p</i>	Degrees of freedom <i>df_M</i> = 10
<i>n</i> = 437	Probability level <i>p</i> = 0.454
Chi-square χ^2_M	9.847



* The present findings are part of the results of a doctoral research project conducted by the author at the University of Antwerp, Faculty of Medicine.
Promotor: Paul Van de Heyning. Co-promotors: Marc De Bodt, Floris Wuyts, Louis Heylen.

Boey, R. (2008) *Stuttering. An epidemiological and phenomenological study. Effects of a social-cognitive behaviour therapy.* Antwerpen: Universiteit Antwerpen Faculteit Geneeskunde.

Participants

A group of 437 young stuttering children participated. The mean age is 49.9 months i.e. 4 years 2 months (*SD* = 13.3; range 1;11-7;3 years).

Descriptive data of the onset of stuttering

Age at onset

- mean age is 39 months [3 years 3 months]
- median is 36 months [3 years 0 months]

Time since onset

- 0-3 months *n* = 251
- 4-9 months *n* = 254
- 10-19 months *n* = 268
- > 20 months *n* = 249

Manner of onset

- gradual: 63% of the children
- sudden: 37% of the children

Factors near onset

- more reported factors near onset in case of (a) sudden onset compared with gradual onset (*p* < .000), (b) shorter time since onset (*p* < .01), (c) parents evaluated as being very concerned (*p* = .009), (d) a higher stuttering frequency at intake (*p* < .000)
- principal reported factors are emotional/behavioural (ref. classification of Johnson and associates, 1959) or emotional (ref. Yairi and Ambrose, 2005)

Onset-related variables

Gender

- age of onset 2 months later for boys (*M* = 39.9 months, *SD* = 12.1, *N* = 546) than for girls (*M* = 37.7 months, *SD* = 10.1), (*p* = .03)
- females have more often a sudden manner of onset than males, (*p* = .02)
- females have been seen closer to the onset of their stuttering (*M* = 10.1, *SD* 10.2) than males (*M* = 12.9, *SD* = 10.9), (*p* < .000)
- a significant gender effect has been found for the tempo of speech/language development related to the onset of stuttering, (*p* = .03)
- more boys (31%) than girls (22%) have been classified with a delayed tempo of speech/language development
- boys (39%) and girls (40%) are almost equally represented within the group of normal tempo of speech/language development
- more girls (38%) than boys (30%) have a precocious tempo of speech/language development

Temperament

- a sudden onset of stuttering is more often associated with high temperamental children compared with low temperamental peers (53% versus 38.5%) than gradual onset (47% versus 62%)
- factors near onset of stuttering have been reported more frequently for high temperamental children compared with low temperamental, (*p* = .027)
- high temperamental children obtained a significantly higher stuttering severity than the low temperamental children, (*p* < .000)
- delayed tempo of speech/language development is less associated with high temperamental children, and precocious tempo of speech/language development is more often associated, (*p* = .01)

Tempo of speech/language development

- children with a precocious tempo of speech/language development have a younger age at onset; overall 2.3 months earlier, (*p* < .000) and have been seen closer to onset of stuttering, (*p* < .000)
- children with a delayed tempo of speech/language development have been classified more frequently with a gradual onset than the children with a normal or precocious speech/language development (*p* < .000)

Stuttering severity

- more often a sudden onset of stuttering has been reported for children with a higher stuttering severity (*p* = .009)
- children with a higher stuttering severity have obtained a longer time since onset (*p* = .016); this suggests that a part of the older children obtained a higher stuttering severity post onset as a result of the development of their stuttering

Reading the structural equation model

- The model counts 12 variables, 7 exogenous and 5 endogenous. Exogenous variables (i.e., predictor variables) are gender and temperament. Endogenous variables (i.e., response variables) are stuttering severity, tempo of speech/language development, age at onset, manner of onset and times since onset.
- Variables are drawn in rectangles and variable names are typed within. The arrows between rectangles indicate the relationship between two variables and the direction of it. The circles above some of the rectangles (e.g., e1, e2) show unobserved or unexplained variances related to a variable.
- *Temperament* is coded as low (= 0) or high temperamental (= 1). An increase of 1 unit (i.e., from low to high temperamental), makes an increase of 2.46 points of the total score on stuttering severity (measured by use of the SPI, Riley 1981). An increase of temperament stimulates a shift in the manner of onset from gradual to sudden. This indicates that temperament and sudden onset are significantly related. No arrows have been drawn from temperament to e.g. age at onset or time since onset indicating that no significant relationship between temperament and those variables of onset have been found.
- *Tempo of speech/language development* has been coded as delayed (= 1), normal (= 2) or precocious (= 3). The relation between tempo of speech/language development and age at onset has an unstandardised weight of -2.305. This signifies that an increase for tempo of speech/language development (e.g., from normal to precocious) leads to a decrease of age at onset of stuttering with 2.305 months. A precocious tempo of speech/language development is associated significantly with a younger age at onset. The difference between delayed and a precocious speech/language development, effects the age at onset with 4.61 months, a meaningful difference at such a young age at which stuttering begins (average 3 year 3 months). Further, an increase of tempo of speech/language development with one unit, tends to shift the manner of onset from gradual to sudden. More often a precocious speech/language development is significantly more often related to a sudden onset of stuttering.
- *Gender* has been coded as male (= 1) or female (= 2). An increase of one unit in gender (i.e., from male to female) is related with an augmentation of the tempo of speech/language development (from delayed to normal, from normal to precocious) with a factor 0.279. Females are more often related with normal or precocious speech/language development than males. Gender has also a significant effect on time since onset with an estimated unstandardised weight of minus 0.121. An increase of one unit in gender (male to female) decreases the time since onset. Girls have been seen closer to onset of stuttering.
- *Stuttering severity* (i.e., the total score on SPI) has a significant, but minor effect on log10 transformed time since onset (unstandardised weight of 0.006 i.e. one month). No other significant related association has been found. Stuttering severity itself is influenced by the presence or absence of temperament in stuttering children, as discussed before.
- Finally, a significant relationship has been found between the manner of onset and the time since onset. An increase of one unit in manner of onset (i.e., from gradual to sudden) decreases the log10 transformed time since onset with a factor of -0.292 or 1 month 2 days. Children with a sudden onset of stuttering have been seen more close to the onset of their stuttering compared to children with a gradual onset. Age at onset has a minor effect on time since onset, indicating that with increasing age at onset of 1 month, the log10 transformed time since onset is shortened with 0.006 or 1 month 4 days.