



Screening school-aged children for risk of stuttering[☆]

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ABSTRACT

Objectives: Howell and Davis's (2011) model that predicts whether stuttering in eight-year old children will persist or recover by teenage was adapted for screening school-aged children for risk of stuttering. Stuttering-severity scores were used to predict whether children belonged to fluent or stuttering groups. Predicted group assignments were compared for models in which severity measures were made with whole-word repetitions excluded or included. The best model for distinguishing children who stutter (CWS) from fluent children was validated across a wide range of ages.

Design: Stuttering-severity scores from CWS (222 for development, and 272 for validation, of the models) and fluent children (103 for development, and 25 for validation, of the models) were employed. Models were developed that predicted prognosis and screened CWS and fluent children. All these analyses were conducted both with whole-word repetitions excluded and included in the stuttering-severity scores. The model that screened fluent children from all CWS which excluded whole-word repetitions was validated for children across a range of ages.

Results: All models achieved around 80% specificity and sensitivity. Models in which whole-word repetitions were excluded were always better than those which included them. Validation of the screening for fluency with whole-word repetitions excluded classified 84.4% of fluent children, and 88.0% of CWS, correctly. Some of these children differed in age from those used to develop the model.

Conclusion: Howell and Davis's risk factor model for predicting persistence/recovery can be extended to screen school-aged children for fluency.

Educational objectives: After reading this article, participants will be able to: (1) describe the difference between finding group differences and risk factor modeling in stuttering research; (2) summarize the strengths and weaknesses of stuttering severity instrument version three; (3) discuss how validation of diagnostic and screening models for fluency can be performed; (4) see how risk models have potential applications for screening for communication disorders in general.

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1. Introduction

The first contact a speech language pathologist usually has with a child who stutters (CWS) is when the child attends a clinic for confirmation of diagnosis of the disorder and to decide on a course of treatment. There has been a period prior to the child's appearance at clinic where the child and his or her family had little or no professional advice about

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stuttering. Early clinical intervention is constrained when there is such a delay between when the disorder started and consultation at the clinic. This is potentially a problem because early intervention is usually considered to be more effective than later intervention (Yairi & Ambrose, 2005). The delay would be reduced if there were convenient methods for screening large unselected groups of children in order to identify stuttering at key stages in development (e.g. at school entry). However, no such screening instrument is currently available. Research, that may aid development of a screening instrument, has shown that children diagnosed as stuttering differ in many ways from fluent children (Yairi & Ambrose, 2005). Any of the factors that show significant differences are potentially useful for screening children for stuttering. The success with which such a factor correctly classifies the two groups of children as stuttering or fluent can be established by a statistical procedure such as logistic regression (Reed & Wu, *in press*). A clinical cohort does not have a supply of fluent children, and this is one reason why screening procedures have not been developed to date.

A related question, that has been the focus of much research, is whether the prognosis of children in a clinical cohort (identification of CWS who will go on to recover or persist) can be predicted at their initial examination (Howell, 2010; Yairi & Ambrose, 2005). Children who subsequently recover differ from the CWS who persist on the majority of the same measures found to differ between fluent control children and CWS (Howell, 2010). To establish whether any of these factors plays a role in long-term prognosis for stuttering, first measures on factors at the initial examination where prognosis is not known need to be obtained. Then the status of stuttering at an age at which stuttering has resolved into its recovered or persistent form has to be established. Finally, measures on factors obtained at the initial examination need to be correlated with persistence or recovery established at the later age at which prognosis was determined (Howell & Davis, 2011). The risk factors that predict persistence of the disorder may provide valuable information that help clinicians target resources on those who are most susceptible to long-term fluency problems (Reilly et al., 2009, p. 271; Yairi, Ambrose, Paden, & Throneburg, 1996, p. 74).

There are two important implications of this discussion: first, just showing that two groups (fluent children versus CWS, or CWS who will persist versus CWS who will go on to recover) differ when some factor is measured, does not establish that what was measured is a risk factor for either stuttering in general or for its persistent form. In risk factor analysis a measure is taken (independent variable) and it is established how well it predicts group membership (dependent variable). When groups are tested to see whether they differ on some measure, the groups are selected (independent variable) and the measure is examined to see whether it differs between the groups (dependent variable). As Reed and Wu (*in press*) pointed out, relative to risk factor analysis, studies that look for differences between groups reverse “the relationship between the outcome and the predictor variables, making the outcome of interest into the independent variable, and the predictors into the dependent variable”; Second, measures that increase the risk of starting to stutter are not necessarily the same as those that increase the risk of persistence (Howell, 2010). Similarly, measures that predict onset or prognosis of stuttering may or may not apply to screening.

The current study developed and assessed models for screening for stuttering that can be administered to unselected cohorts of children at selected ages, such as when they start school. The screening can be done in different ways, all of which are suitable for different clinical purposes. First, the screen might require children to be classified as fluent, likely to recover, or likely to persist (*screen for stuttering types*). This would be used if there is graded health care provision (e.g. parents of fluent children do not need to do anything about their child’s fluency, parents monitor their child if he or she is considered likely to recover, whereas children likely to persist attend clinic). Second, the screen at the time of the first examination may need to separate the CWS who will go on to persist from fluent children and CWS who will later recover (*screen for persistence*). This may be appropriate if health services want to focus attention on children likely to have long-term fluency problems (i.e. the CWS who will persist). Third, the screen may be required to separate the children who are fluent from both those CWS who will go on to recover and those who will go on to persist (*screen for fluency*). This would be appropriate if health services want to examine all CWS irrespective of the expected path their stuttering will take. All three types of screen are addressed in this study.

The next question is what factor or factors to measure (the independent variables). As mentioned above, the risk factors that are successful when examining one topic (e.g. prognosis that has been worked on) may or may not be useful for other topics (here screening that has not been addressed previously). The factor that was examined as potentially useful for screening was that used by Howell and Davis (2011) in their investigation into prognosis in a heterogeneous sample of CWS who were followed up longitudinally between the ages of eight years and teenage. The essential detail about Howell and Davis’s study needed at this point (full details are given in Section 1.3) is that although they examined a wide range of risk factors that were obtained on CWS around the age of eight years, only one of them predicted whether the CWS would recover or persist at teenage (teenage is the age at which most childhood stuttering has resolved into recovered or persistent form). This was stuttering severity measured according to version three of Riley’s (1994) instrument, SSI-3 (see Appendix A for a description and an appraisal of SSI-3 and Section 1.1 for details about SSI-3 that are particularly pertinent for the current work). Consequently, SSI-3 was examined as the potential predictor factor for each form of screen in the study reported below. SSI-3 may be useful for screening for stuttering because it incorporates a measure of the symptoms of stuttering and these would be expected to be rarer in fluent children.

SSI-3 has a precise way of measuring severity. Probably the most notable aspect of SSI-3 is that it does not consider whole-word repetitions (WWR), as in “my, my, my friend”, to be symptoms of stuttering when percentage of syllables stuttered (%SS) are calculated. There is debate about whether WWR should or should not be included in %SS counts. In the work below,

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