Personality Traits of Children With Vocal Fold Nodules

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Summary: This is a case-control study investigating the personality profiles of children with vocal fold nodules (VFNs). Personality has been suggested as a contributing factor to VFN in adults and in children. However, previous studies in children have focused on psychopathologic traits and have reported contradictory findings. The aim of our study was to explore whether general, nonpathologic personality structure predicts the presence of VFN in children. Personality traits were measured in 34 children with VFN, aged 6.0−13.6, and 34 age- and sex-matched normophonic controls by means of a pediatric five-factor personality questionnaire. Children with VFN were found to be significantly more extroverted than controls ($P = 0.022$, $d = 0.61$), and a binary logistic regression showed that extraversion significantly predicted the presence of VFN in our population ($P = 0.027$). The clinical implications of the results are discussed.

Key Words: Vocal fold nodules−Children−Personality−Extraversion−Speech-language therapy.

CONTEXT

Vocal fold nodule (VFN) is the most common voice disorder in children.[1,2] VFN can lead to severe vocal degradation and physical discomfort and to negative functional and socioemotional impact,[3−5] as well as adversely affect academic performance.[3,6] Phonotraumatic behavior is recognized as one of the main etiologic factors in the pathophysiology of VFNs.[1,7] The repeated microtrauma generated by vocal abuse or misuse initiates an inflammatory process eventually leading to VFNs.[8,9] Treatment programs for VFN in children are usually based on the understanding that biomechanical factors are at the root of the disorder. Consequently, these treatment programs encompass behavioral approaches aiming at a reduction of vocal load, along with the acquisition of a healthy and more efficient vocal gesture.[10] Short-term efficacy of this type of treatment has been documented in several studies (see Reference 11 for a review of adult studies and Reference 12 for a review of child studies). However, studies on the long-term outcomes of VFN treatment are few, and observations of treatment inefficacy are reported, with some patients being resistant to treatment or experiencing a recurrence of the pathology.[13] For instance, in a long-term follow-up study, De Bodt et al[13] found that 56% of a group of adult patients who had VFN when they were children had abnormal organic laryngeal findings as young adults (VFN 29%, inflammation 15%, and scarring 12%) and that voice therapy was not a predictor of healthy vocal folds at that age.

Nonadherence to treatment recommendations outside the clinical setting has been suggested to jeopardize treatment efficacy.[14] Patients fail to apply the healthy vocal habits and gesture that they learn in therapy. Personality has been suggested as a possible factor influencing patients' vocal behavior and ability to comply with therapeutic recommendations in everyday life. In adults, personality traits, such as extraversion and neuroticism, have been suggested to be concomitant with or contribute to the development and maintenance of VFN.[15,16] Women with VFN have been found to have a more extraverted personality than voice healthy controls,[17] scoring significantly higher on novelty-seeking behaviors and lower on harm-avoidance behaviors compared with controls.[18] In a study by Abeida et al,[19] psychomotor acceleration, which relates to hyperactivity, lability, and pressure for action,[20] was significantly associated with the presence of VFN in adult women.

These particular traits could translate into motivationally driven abusive vocal behaviors and difficulty inhibiting those behaviors and thus make patients with VFN particularly resistant to treatment recommendations in behavioral voice treatment.[10] In children too, personality has been suggested to contribute to the development and maintenance of VFN, but contradictory results are found in the literature. Some early studies have described children with VFN as more anxious, vocally aggressive, disinhibited, and immature than normophonic (NP) peers, with acting-out behaviors and difficulties in coping adequately with stressful situations.[21−25] Others found no difference between children with VFN and voice healthy controls.[26] These early studies have been criticized for methodological biases, such as the use of poorly validated psychometric instruments and lack of control groups.[27] However, more recent studies addressing these biases also offer contradictory results. Roy et al[27] used the Child Behavior Checklist,[28] a highly validated instrument for the identification of psychopathology in children, in a case-control study including 26 children with VFN and 29 age- and sex-matched controls. Roy et al found no significant differences between the profiles of children with VFN and their peers, except that children with VFN were more socially competent. On the contrary, two studies focusing on symptoms associated with attention deficit and hyperactivity disorder, a common developmental

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psychopathology in children,[29] found that children with VFN were significantly more impulsive, inattentive, hyperactive and oppositional than the controls.[30,31] The contradictory results found in the child literature might in part be explained by the fact that the tools used by the authors are not exploring the same personality construct. Roy et al[27] explored behavioral dimensions covering a large range of different psychopathologies, whereas D'Alatri et al[30] and Erdur et al[31] focused on traits relative to a narrower field of psychopathology, namely, attention deficit and hyperactivity disorder symptoms. We believe that the contradictory results from earlier studies might also be due to the fact that they focus on psychopathology. Psychopathologic traits might only be characteristic of a subpopulation of children with VFN, whereas a more general personality construct could be the underlying common factor to a larger population of children with VFN. Specific but nonpathologic personality traits, such as extraversion, which includes components of talkativeness, sociability, and dominance,[32] could be sufficient to drive vocal behaviors adversely affecting vocal health. In the present study, we aimed to explore the predictive power of general personality structure on the presence of VFN in a population of a sex- and age-matched dysphonic and NP children.

AIMS

The purpose of the present study was to examine the personality profiles of 34 children with VFN and 34 age-matched NP controls by means of a French general personality questionnaire for children, "Echelles bipolaires dérivées du Modèle à cinq facteurs" (EBMCF),[33] which is a pediatric questionnaire derived from the Big Five personality model.[34]

HYPOTHESES

We are expecting that levels of extraversion will be predictive of VFN in children. In adult and child studies, traits that are associated to extraversion, such as novelty-seeking and not novelty seeking behavior, psychomotor acceleration, social competence, and impulsivity,[35] have been reported as significantly differentiating groups with VFN from NP controls. Moreover, the personality dimension of extraversion contains subcomponents, such as talkativeness, sociability, and dominance, that are associated with high vocal doses,[36] because they are susceptible to drive frequent and lengthy vocal use[37] at elevated intensities.[38,39]

METHOD

Materials

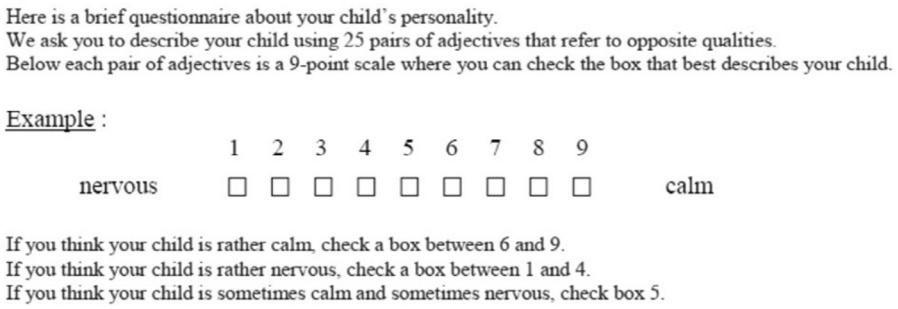
The pediatric five-factor personality questionnaire

The pediatric personality questionnaire that we used, the EBMCF,[33] is a five-factor personality questionnaire developed in French composed of 25 bipolar adjective scales representing the five-factor dimensions according to the McCrae and Costa model of personality.[40] The EBMCF was validated on a sample of 1196 mothers in Belgium and was found to be uncorrelated with social desirability. Examples of bipolar adjectives are as follows: for the dimension of extraversion: shy-outgoing, for agreeableness: cold-warm, for conscientiousness: imprecise-precise, for emotional stability: nervous-calm, and for openness: without ideas-creative. The scales are presented in the form of a nine-point Likert scale, and the highest points are attributed to the positive pole of the scale. The parents were asked to choose the point on the scale that corresponded best to their child's personality (see Figure 1 for an example). We chose the EBMCF because it is an instrument derived from one of the most recognized personality models to date: the Big Five.[34] This personality model underlies questionnaires in several languages adapted to different age categories, which allows for comparative studies across different age and linguistic populations. Further, the included personality dimensions are relevant to health behavior and treatment adherence in a variety of health behaviors.[41–44] Finally, the personality model is adapted to the measurement of personality variations within the realm of normality.

Subjects

The dysphonic children were recruited in 2011 at the ENT service of the Center for Audio-phonology at the University Clinic Saint-Luc in Brussels. The inclusion criterion for the dysphonic children was experience of bilateral VFNs, as diagnosed by a laryngoscopic examination. The children should not have had vocal therapy or other treatments for their dysphonia at the time of the study. None of the children suffered from any other known health condition or cognitive disorder at the time of the study, as reported by the parents. No formal hearing test or cognitive test was performed to verify the parental reports.

The NP children were recruited from seven different schools, which participated in a parallel study concerning


Here is a brief questionnaire about your child's personality.
We ask you to describe your child using 25 pairs of adjectives that refer to opposite qualities.
Below each pair of adjectives is a 9-point scale where you can check the box that best describes your child.

Example :

	1	2	3	4	5	6	7	8	9	
nervous	☐	☐	☐	☐	☐	☐	☐	☐	☐	calm

If you think your child is rather calm, check a box between 6 and 9.
If you think your child is rather nervous, check a box between 1 and 4.
If you think your child is sometimes calm and sometimes nervous, check box 5.

FIGURE 1. Sample from the instructions of the EBMCF, freely translated to English by the authors of this article.

the elaboration of a voice symptom questionnaire for children.[4] Inclusion criteria for the NP children were the same as those for the children with VFN except that they should never have consulted for voice problems before or have had any vocal complaints. Also, all NP children were recorded on sustained vowels and continuous speech, and their voices were audioperceptually evaluated by three voice-experienced speech-language pathologists (SLPs) to exclude the presence of dysphonia. Any NP child receiving a score different from 0 at the G of the GRBAS (Grade, Roughness, Breathiness, Asthenia, Strain) scale[45] by at least one of the SLPs was excluded from the study. The detailed procedure was accounted for in Verduyckt et al.[4] Health and cognitive status in both dysphonic and NP children were accounted for by parental report, and no formal testing was done.

A total of 34 children with VFN and 34 age- and sex-matched NP children corresponding to the inclusion criteria were enrolled in the study. All children could be age matched within a 6-month interval with the exception of one girl pair and one boy pair, who were matched within a 13-month difference.

The study was approved by the Ethical committee of the University Clinic of Saint-Luc, Brussels, Belgium. Informed consent forms were obtained from all the parents before the testing. Only the mothers filled out the questionnaires for all the children of both groups.

Analysis of the data

Our hypothesis was that general personality structure, and specifically the trait of extraversion, could significantly predict the presence of VFN in children. This hypothesis was tested with a model-fitting technique known as binary logistic regression. This statistical method allowed computation of continuous and nominal independent variables' to predict a dependent dichotomic variable, VFN versus NP in our case. The five personality dimensions and age were inserted in the model as continuous predictors and sex was inserted as a nominal predictor. As we used a design where the sex-to-age ratio was the same in the pathologic and the control groups, we did not expect to see a direct effect of age or sex on VFN. Age and sex were nevertheless kept as predictors to test for their potential interactions with personality traits. Intercorrelation of the continuous predictors was controlled for by a Pearson correlation analysis, and correlation coefficients were found to be sufficiently low to meet the assumption of noncollinearity (r <0.573) required by binary logistic regressions.[46] A forward selection method was used, which started with an empty model and added the most significant term for each step. We set an alpha value of 0.05 as the limit over which no further predictors would enter the model. Before the binary logistic regression, group differences in age and EBMCF scores were explored by means of independent samples t tests. The results of these analyses were presented as descriptive statistics and were not part of the hypothesis testing. All analyses were performed with *SPSS 19* (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp).[47]

RESULTS

Participants

There were 17 boys (mean age: 10.1, minimum: 6.8, maximum: 13.6, standard deviation [SD]: 1.7) and 17 girls (mean age: 10, minimum: 6, maximum: 12.8, SD: 2.1) in the dysphonic group. There were 17 boys (mean age: 10, minimum: 6.5, maximum: 12.1, SD: 1.6) and 17 girls (mean age: 9.9, minimum: 5.9, maximum: 11.8, SD: 1.9) in the NP group. An independent samples t test was conducted to analyze age differences between the NP and the dysphonic groups. No significant difference was noted ($t(66) = 0.210$, $P = 0.834$). Age differences between the girls and the boys were also tested for by means of an independent samples t test. No significant difference was noted ($t(66) = 0.324$, $P = 0.747$).

EBMCF scores and group differences

Descriptive statistics of the EBMCF scores on the five dimensions are plotted in Table 1. t Values, P values, and effect sizes were reported for the t tests exploring differences between the VFN and the NP groups. Children with VFN scored significantly higher than the NP children on the extraversion scale ($t(66) = 2.345$, $P = 0.022$) with a medium size effect ($d = 0.57$). No other dimensions significantly differentiated the two groups.

TABLE 1.
Comparative Results for the NP (N = 34) and Dysphonic (N = 34) Children's Scores on the Five EBMCF Dimensions Accompanied by the Results of the *t* Tests and Their Significance Levels, as well as the Effect Size

	VFN		NP					
	M	SD	M	SD	*t*	df	*P*	*d*
Extraversion	33.53	5.96	30.15	5.93	2.345	66	0.022	0.57
Agreeableness	37.44	4.43	35.12	7.27	1.589	66	0.117	0.39
Conscientiousness	31.32	8.59	30.91	8.89	0.194	66	0.886	0.05
Emotional stability	26.21	7.57	26.00	6.45	0.121	66	0.904	0.03
Openness	39.76	3.55	37.74	5.07	1.912	66	0.060	0.46

Abbreviations: M, mean; *d*, Cohen *d*.

TABLE 2.
Predictive Power of Extraversion on Voice Status: Results from the Binary Logistic Regression Analyses

Variable	Model 1		
	Wald	*P*	OR
Constant	4.743	0.029	0.046
Extraversion	4.919	0.027	1.102
−2 Log likelihood		88.873	
	$\chi^2 = 5.395$, df = 1, $P = 0.020$		
Nagelkerke R^2		.102	
Hosmer and Lemeshow test	$P = 0.667$		
Classification accuracy (%)	66.2		

Abbreviation: OR, odds ratio.

Predictive power of personality on voice status

The best-fit model resulting from the binary logistic regression included only the extraversion score as a significant predictor of VFN. No significant interactions with gender or age were found. The results, with the empty model and the best-fit model, are plotted in Table 2. The goodness of fit of the model was confirmed by a nonsignificant Hosmer and Lemeshow test and a significant chi-square test ($\chi^2 = 5.395$, df = 1, $P = 0.020$). The significant chi-square test confirmed that the model including extraversion explained significantly more of the variance than the no-model solution.

The classification accuracy of the best-fit model increased at 16.2% compared with the no-model solution. Note that because our sample population is a matched sample with equal numbers of subjects in either voice condition, the initial no-model solution has a classification accuracy of 50%. Thus, the final classification accuracy is 66.2% (Table 3), meaning that by including extraversion in our model, we are able to classify 66.2% of the children into the correct group. The odds ratio of extraversion is 1.102 ($P = 0.027$), meaning that an increase of 1 SD in the extraversion level increases the chance of having VFN by 110.2%.

DISCUSSION

The purpose of the present study was to examine if general personality structure could predict the presence of VFN in children. The literature, to date, has presented contradictory data concerning the link between personality and VFN in children, and we suggest that this finding could in part be due to the fact that researchers have been looking for differences in psychopathologic traits rather than general personality traits. We hypothesized that the dimension of extraversion would be specifically significant in predicting VFN in children. Our results confirm that hypothesis. Indeed, higher extraversion levels significantly increased the probability of having VFN in the children participating in our study. Classification accuracy is increased by 16.2% when extraversion is included in a model predicting the presence of VFN. The prevalence of VFN is known to be higher in boys than in girls. Male-to-female ratios ranging between 2:1 and 3:1 have been reported.[25,48] The absence of results regarding the direct impact of sex in our study was expected because we used a design where the sex ratio was equal in the two groups. We tested for possible interactions between sex and personality traits, but no significant results were found. The same applies to age. Because age was equally distributed across sex in both groups, no direct effect of age or interaction between age and sex was expected. An interaction between age and personality traits was tested for but gave no significant results. This finding means that extraversion had the same impact in all children regardless of sex or age. Our results should not be interpreted as meaning that sex has no role in pediatric VFN. Extraversion is a personality trait with several subcomponents that have the potential to affect vocal behavior. Talkativeness, sociability, impulsivity, and dominance are among the core subcomponents of extraversion.[32] These subtraits are favoring a high vocal dose in children by driving frequent and lengthy voice use at loud levels, as well as a difficulty to refrain from talking or engaging in vocally abusive behaviors, such as screaming. Our study supports the view that vocally abusive behaviors underlying the development and maintenance of VFN not only might be incidental but also might be a result of a specific personality construct. This finding should encourage speech-language therapists to anchor their treatments in a more profound understanding of how personality can drive specific behaviors and how these can be modified. McCabe and Fleeson[32] proposed an interesting perspective on extraversion that could inform SLP approaches in the treatment of VFN. McCabe and Fleeson observed that personality traits are not constant across all our occupations and that even an extravert can act more or less extraverted, depending on the specific goals he or she is pursuing at the moment. Adults, for instance, adopt extraverted behaviors when they try to achieve goals, such as "entertaining someone," "being at the center of attention," and "trying to stir things up." In the case of VFN, a goal-achievement perspective on extraverted behavior suggests that identifying the goals a child intends to achieve by engaging in talkative or vocally abusive behavior and helping him or her to find alternative solutions for achieving these goals would support therapeutic efforts to minimize those kinds of behaviors. More generally, considering that personality is driving the behaviors contributing to the development of VFN, a cognitive behavioral approach to treatment should be of interest. Cognitive-behavioral therapy (CBT) was first developed to address

TABLE 3.
Classification Accuracy of Model 1 Including Extraversion as a Predictor to VFN

		Predicted		
		NP	VFN	Correct (%)
Observed	NP	22	12	64.7
	VFN	11	23	67.6
	Global (%)			66.2

functional and psychosomatic disorders in patients with personality traits favoring negative affect,[49] such as those found in patients with functional voice disorders, and improved access to those therapies for patients with functional dysphonia is recommended.[50] The profiles observed in the children with VFN in our study are different, because extraversion is linked to positive affect.[51] Nevertheless, CBT has evolved since its beginnings to successfully address a multitude of behavioral and psychological issues. The central aim of CBT is to equip the patient with a set of skills enabling them to modify their cognition and behaviors regardless of their emotional valence.[49] In this regard, CBT appears as a valid approach to the treatment of VFN as well. The personality of the children with VFN in our study falls within normal limits. Therefore, we do not think that children with VFN should be automatically referred to a psychologist for treatment. Rather, we are suggesting that SLPs, if properly trained, should consider implementing elements from CBT in their VFN therapy. We also believe that our results reinforce the view that multidisciplinary teams including a psychologist should be encouraged when addressing patients with voice disorders.

Our results confirmed the hypothesis that extraversion significantly predicts the presence of VFN, but it should be stressed that extraversion is not sufficient on its own to predict the development of VFN. Other factors that are known or suggested to contribute to the development and the maintenance of VFN were not controlled for in the present study. These can be factors favoring vocal abuse in parallel to, or in interaction with, the child's personality, such as the family constitution, for instance. Tuzuner et al,[52] for instance, found that the presence of younger siblings is associated with the use of higher vocal volume at home. Other factors independent of personality are also suggested as causally linked to VFN, such as gastroesophageal reflux, allergies, and extracurricular activities such as sports.[27,53,54] These factors have not been measured in our study and their contributing role in the prediction of VFN in our population is therefore unknown. Our results should not be interpreted as meaning that these factors are not important in predisposing children to VFN. However, our results show that nonpathologic personality profiles with high levels of extraversion might be a predisposing factor to the development of VFN in children. We believe that our results support narrowing the measurement of personality traits to subcomponents of extraversion in future studies that will conjointly explore the importance of physical, social, and personality-related factors on the presence of VFN in children.

CONCLUSION

Our study aimed to explore whether general personality structure could predict the presence of VFN in a group of children aged 6.0−13.6. Former studies in children have focused on differences in psychopathologic traits with discordant results. Our results show that the personality dimension of extraversion significantly predicts the presence of VFN in both boys and girls. Our study adds to the understanding of the link between personality and development and maintenance of VFN in children. The present study also points to the importance of addressing personality as a driving factor to vocal behavior in our therapeutic efforts to modify those behaviors.

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