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Personality Traits and Perception of Disability after Facial Palsy

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Abstract

Objective: The aim of this study was to determine and quantify how personality traits modulate the well-known relation between neuromuscular impairment and perception of physical and social disability in patients with facial palsy.

Methods: Sixty-one patients with facial palsy were evaluated through the Sunnybrook Facial Grading System (SFGS), the Facial Disability Index (FDI), the Beck depression Inventory (BDI) and the Temperament and Character Inventory (TCI). To estimate the effect of the personality traits on physical and social disability as regards neuromuscular impairment, two polynomial models were fitted and validated using specific personality variants and the SFGS composite score as explanatory variables.

Results: A role of personality traits in modulating perception of both functional and social/well-being disability was enlightened. A linear effect of the Self-Directedness and the Cooperativeness traits on the perception of functional disability as regards facial impairment was estimated, equal respectively to -0.21 points [CI 95 (-0.35; -0.07)] and +0.23 points [CI 95 (0.06; 0.39)] in FDI score for any level of deviation from the average of each personality trait. As regards social/well-being disability, a linear effect of Novelty Seeking and Persistence traits was estimated, equal respectively to +3.88 points [CI 95 (1.25; 6.49)] and +6.58 points [CI 95 (0.21; 13.17)] for any level of deviation from the average.

Conclusion: Personality traits differently influence the relation between disability perception and neuromuscular impairment in facial palsy. This issue might be useful to improve the relationship between physician and patient and to allow personalized therapeutic interventions.

Introduction

Many tools for assessing disability such as International Classification of Functioning and Disability (ICF) often omit personal factors even if they recognize a possible role of these variables in subjective perception of disability [1]. Facial palsy can result in aesthetic disfigurement and difficulties in performing several activities of daily life such as eating, drinking, and speaking [2]. Furthermore motor impairment may compromise the ability to express emotions, resulting in a communicative disorder which can impact on patients' psycho-social status [3]. Few studies report a high incidence of anxiety and depression among patients affected by facial palsy, which increases the functional and social disability associated with the neuromuscular impairment [4-7]. Nevertheless the level of individual and social distress is often not related to the severity of palsy and a considerable variability exists among psychological reactions of individuals with facial palsy [8]. Twersky supposed that factors preceding paralysis, such as personality traits, may influence the individual reaction to facial palsy [8]. Moreover Brach et al. suggested that factors such as coping strategies, mood, self-esteem and emotional traits could play a role in the perception of disability [9].

Human personality is composed by multiple dimensions of temperament and character that interact each other to regulate and adapt behavior, according to the environmental conditions [10,11]. Temperament traits mediate an emotional preconceptual response to events; on the contrary character dimensions determine a conscious response based on the symbolic meaning assigned to an event [12]. In a previous study on patients with facial palsy, Van Swearingen et al. [13] pointed out a relation between neuromuscular impairment and

disability and they hypothesized that personality traits could modulate this relation, but no study up has investigated this issue.

The aim of this study was to determine and quantify how personality traits modulate the well-known relation between neuromuscular impairment and perception of physical and social disability in patients with facial palsy.

Methods

Subjects

We included in the study patients with peripheral facial paralysis of different etiologies evaluated between January 2010 and March 2013 in our outpatient clinic of the Rehabilitation Unit, IRCCS Policlinico S. Matteo Foundation, Pavia, Italy. Patients unable to answer the questions for linguistic problems or cognitive impairment were excluded. Sixty-one patients agreed to take part to the study and gave their written informed consent. The study protocol was approved by Ethics Committee of our Institution. Patients had a mean age of 49.7 years, SD 13.92, 41 (67,2%) were females, 34 (55.7%) had right side affected.

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All patients underwent rehabilitation treatment, consisting in performing specific facial expression. Thirty-eight patients (62.3%) were treated with botulinum toxin type A injections to reduce facial synkinesis.

Clinical assessment

Patients were evaluated through the Italian versions of Sunnybrook Facial Grading System (SFGS) [14,15], Facial Disability Index (FDI) [16-18], Beck Depression Inventory (BDI) [19] and Temperament and Character Inventory questionnaire (TCI) [20,21].

Sunnybrook facial grading system

Facial impairment was measured through the Italian version of Sunnybrook Facial Grading System (SGFS). This scale grades facial symmetry at rest (score from -20 to 0 points), symmetry during facial voluntary movement (score from 20 to 100) and post-paretic synkinesis (score from -15 to 0). Composite score derives from the algebraic sum of the other sub scores and ranges from 0=complete palsy to 100=normal facial function.

Facial disability index

Functional and social disability was assessed with the Italian version of Facial Disability Index (FDI). FDI is a brief questionnaire composed by two 5-item subscales. The first one investigates functional impairment during eating, drinking, speaking, lacrimation and oral hygiene. The second one analyzes the subjective perception of anxiety, irritation, isolation, sleeping disturbances and limitations in social participation. Each subscale ranges from 0 to 100, where 100 means unimpaired functional/social well-being status.

Beck depression inventory (BDI)

Beck Depression Inventory (BDI) was used to assess depression. The scale is a 21-question multiple-choice self-report inventory about how the subject has been feeling in the last week. Each question has a set of at least four possible answer choices, ranging in intensity. When the test is scored, a value of 0 to 3 is assigned for each answer and then the total score (range 0–63) indicates depression's severity (0–9=minimal depression, 10–18=mild depression, 19–29=moderate depression, 30–63=severe depression) [22]. BDI is considered one of the best screening tools for assessing depression in both psychiatric and medical settings [23] and a good instrument for screening depressive disorders in community surveys [24].

Temperament and character inventory

The Temperament and Character Inventory (TCI) is a self-evaluation questionnaire based on the psychobiological model of personality proposed by Cloninger [12]. This tool is able to outline individuals' emotional profile (temperament) and the cognitive processes regulating emotional conflicts (character) [20]. It includes four temperament dimensions [Novelty Seeking (NS), Harm Avoidance (HA), Reward Dependence (RD), Persistence (P)] and three character dimensions [Self-Directedness (SD), Cooperativeness (C), Self-Transcendence (ST)]. To obtain specific personality profiles, the score totalized in every dimension was related with cut off values which identify three categories, named respectively "Low", "Average" and "High" [20]. In particular, individuals who are high or low in a dimension are considered typical in a specific pattern of behavior (i.e., they are typical for a personality variant), whereas those who are near to average are specific and often atypical despite of the circumstances (i.e. they cannot be included in a personality variant) [21]. During data

analysis each dimension was considered separately. Average was rated as zero (0), deviations from the mean higher than average (High) as a value >0, equal to "score – cut-off value", while deviations from mean lower than average (Low) as a value <0, equal to "score – cut-off value".

Statistical analysis

Statistical analysis was performed using R 3.1.1 for Windows, Vienna, Austria. Kolmorow-Smirnow test was used to examine the distribution of the data. Data were processed by performing a descriptive analysis (means and standard deviation for normally distributed variables, median and interquantile range (IQR) for non-normally distributed ones and percentage for qualitative ones). Spearman coefficient assessed the association between facial impairment, disability and psychological distress. Then best fitting polynomial models were selected to explain IDF physical and social scores, using specific personality variants and the SFGS composite score as explanatory variables. All the assessed personality traits were tentatively included in the screened models. Plausible interactions between covariates were screened and retained, when useful, in the selected models. To control the over fitting fallacy, the selected models were cross-validated by the bootstrap procedure proposed by Harrell [25]. Ten-thousand training and test samples were simulated.

Results

The etiology of facial palsy in our sample included Bell's palsy (20 patients (32.8%)), Ramsay Hunt (6 patients (9.8%)), post-surgical paralysis after removal of acustic neuroma (29 patients (47.6%)) and post-traumatic paralysis (6 patients (9.8%)). Eleven patients (18%) underwent a surgical intervention of facial reanimation. The average time between the facial palsy onset and the clinical assessment was 20 ± 11.52 months.

Patients demonstrated moderate-to-severe levels of facial impairment with a median composite score of 48.4 (39-63.8) at SFGS evaluation and moderate disability in physical and social functions at FDI (physical function 70 (54.1-80); social/well-being function 76 (64.4-86.8)). Measures of psychological distress indicated low incidence of depression in our sample (BDI median score of 5 (2.1-8.9)). Based on BDI (cut off=10), 12 patients (20.6%) had mild depression and 51 patients (79.4%) were no depressed.

Table 1 reports the data about facial impairment (SFGS partial and composite scores), facial disability (physical and social FDI scores) and psychological distress (BDI scores) of the 61 patients included in this study.

In Table 2 we reported the distribution of patients among TCI categories of the seven dimensions and level of deviation from the average. As noted in Table 2, most of patients belonged to the average category for NS (70.5%), HA (70.47%), RD (75.41%), P (45.88%) and ST (65.57%) dimensions and to the high category for SD (54.1%) and C (63.94%) personality traits.

The degree of facial impairment, evaluated with SFGS, was positively correlated with FDI physical function measurement. In addition FDI physical function was positively correlated with FDI social/well-being function. Psychological distress was highly correlated with social disability (Table 3).

Polynomial regression analyses were performed to determine the extent to which selected variables predicted physical and social disability as regards neuromuscular impairment. Self-Directedness and Cooperativeness resulted the only independent predictors of

	Impairment				Disability		Psychological distress
	SFGS resting symmetry	SFGS voluntary movement	SFGS synkinesis	SFGS composite score	FDI physical	FDI social	BDI
Possible score	-20-0	20-80	-15-0	0-100	0-100	0-100	0-63
Mean	9.0	63.5	5.7	50.6	67.4	74.6	5.8
SD	8.6	18.8	3.6	19.3	16.3	14.4	4.3
Median	8.3	64	6	48.4	70	76	5
IQR	5-11	54.6-73.3	3.1-8.7	39-63.8	54.1-80	64.4-86.8	2.1-8.9

Abbreviations: SFGS, Sunnybrook Facial Grading System; FDI, Facial Disability Index; BDI, Beck Depression Inventory.

Table 1: Sample description: Impairment, disability and psychological distress of patients with facial palsy.

		TCI categories						
		Low			Average	High		
TCI dimensions and range of score		-3 or less	-2	-1	0	+1	+2	+3 or more
Temperament	**NS (0-40)**	6 (9.83%)	3 (4.92%)	6 (9.83%)	**43 (70.5%)**	1 (1.64%)	1 (1.64%)	1 (1.64%)
	HA (0-35)	5 (8.20%)	3 (4.92%)	2 (3.29%)	**39 (70.47%)**	0	2 (3.29%)	6 (9.83%)
	RD (0-24)	0	1 (1.64%)	0	**46 (75.41%)**	4 (6.56%)	4 (6.56%)	6 (9.83%)
	P (0-8)	1 (1.64%)	2 (3.29%)	4 (6.56%)	**28 (45.88%)**	11 (18.03%)	10 (16.4%)	5 (8.20%)
Character	**SD (0-44)**	0	0	0	22 (36.06%)	3 (4.92%)	3 (4.92%)	**33 (54.1%)**
	C (0-42)	0	0	0	16 (26.22%)	3 (4.92%)	3 (4.92%)	**39 (63.94%)**
	ST (0-33)	1 (18.03%)	1 (1.64%)	1 (1.64%)	**40 (65.57%)**	3 (4.92%)	1 (1.64%)	4 (6.56%)

Abbreviations: NS=Novelty Seeking; HA=Harm Avoidance; RD=Reward Dependence P=Persistence SD=Self-Directedness; C=Cooperativeness; ST=Self-Transcendence.
Cut off values were considered as follows: NS=14-27, HA=12-24, RD=8-17, P=3-6, SD=15-30, C=14-29, ST=11-23

Table 2: TCI categories: Distribution of patients among TCI categories of the seven dimensions and level of deviation from the average.

	BDI	FDI physical	FDI social
BDI	-		
FDI physical	-0.28[†]	-	
FDI social	-0.64[‡]	0,41[‡]	-
SFGS composite score	-0.05	0.54[‡]	0.07

* p ≤ 0.01
[†] p ≤ 0.05
[‡] p ≤ 0.001

Table 3: Correlation table: Correlations between facial impairment, disability and psychological distress (Spearman's coefficient of rank correlation).

physical disability in facial palsy, while Novelty Seeking, Persistence and the interaction between Novelty Seeking and Persistence made significant contributions to the prediction of social disability. Two polynomial models for physical disability and social disability were fitted and validate including only these significant factors. In both models, predictors' coefficients provide a measure of the magnitude of each variable's predictive power (Tables 4 and 5).

In Figure 1 we presented the polynomial regression fitted to physical disability. When SD and C traits are average (equal to zero) the trend of the IDF physical function scores as regards SFGS composite score is predicted by the solid line. When SD trait is higher than average people overestimated levels of physical disability (-0.21 points [CI 95 (-0.35; -0.07)] at FDI physical for any level of deviation from the average) (dashed line). When C trait is higher than average people underestimate levels of social disability (+0.23 points [CI 95 (0.06; 0.39)] for any level of deviation from the average) (dotted line).

In Figure 2 we presented the polynomial regression fitted to social

disability. When NS and P traits are average (equal to zero) the trend of the IDF social/well-being score as regards SFGS composite score is predicted by the dash dot line. When NS trait is higher than average and P trait is average people perceived +3.88 points [CI 95 (1.25; 6.49)] at FDI social for any level of deviation from the average (dashed line). Instead when P trait is higher than average and NS is average people perceived lower levels of social/well-being disability than expected, estimated equal to +6.58 points [CI 95 (0.21; 13.17)] at FDI social for any level of deviation from the average (dotted line). When both NS and P are different from zero the linear effect is less than the amount of the two single effects (solid line). Whereas estimable, the effect of the two variants is equal both for positive values and for negative ones.

Discussion

A numbers of researchers hypothesized that personality trait might influence the individual reaction to facial palsy without quantify the impact they could have. In particular, Swearingen et al. [13] pointed out a relation between neuromuscular impairment and disability and they supposed that personality traits could modulate this relation. The present findings demonstrate that personality traits differentially affect the relation of facial impairment with physical and social disability. Self-Directedness mediated and Cooperativeness moderated the relation between facial impairment and physical disability. Individuals with comparable facial impairment, but high score in SD, exhibited greater severity of physical disability. On the contrary, individuals high in C showed lower levels of physical disability. Self-Directedness includes cognitive functions such as self-acceptance and self-esteem [20]. It describes the individual ability to regulate, adapt and control their own behavior according to personal values and chosen goals

Predictors	Coefficient	Standard Error	t value	p-value
SD	-0.923	0.333	-2.77	0.007
C	1.328	0.465	2.86	0.005
SFGS total	0.437	0.088	4.96	$6.82 * e^{-6}$

Table 4: Polynomial regression model predicting physical disability.

Predictors	Coefficient	Standard Error	t value	p-value
NS	3.867	1.309	2.95	0.004
P	6.690	3.240	2.06	0.04
NS*P	-4.384	1.548	-2.83	0.006
SFGS total	-0.859	0.326	-2.63	0.01
SFGS total^2	0.010	0.003	2.99	0.004

Table 5: Polynomial regression model predicting social/well-being disability.
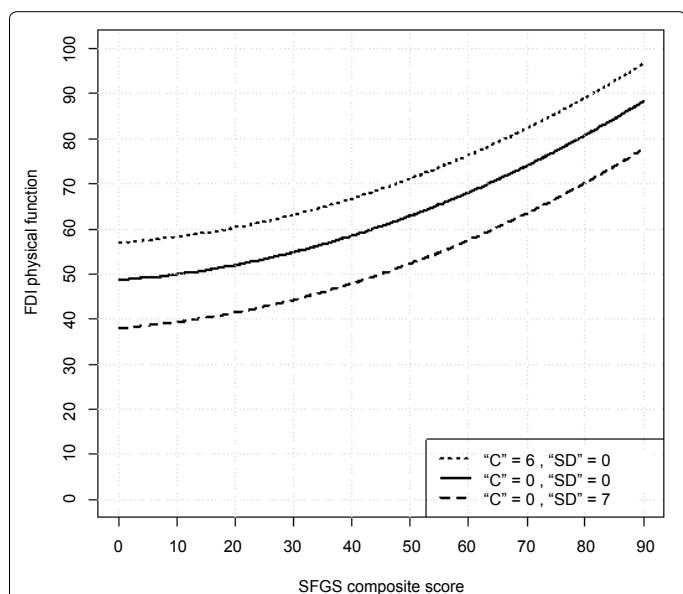

Figure 1: Predicted trend of FDI physical function score as regards SFGS composite score according to the variation of SD and C personality traits. Abbreviations: SD=Self-Directedness; C=Cooperativeness.

[12]. Individuals high in SD show a great self-confidence; they are well organized, mature and they accept themselves. They appear able to feel their lives meaningful and purposeful [26]. Cloninger et al. and Josefsson et al. [27,28] highlighted how individuals high in SD recover easily from diseases. In our study paradoxically high SD seemed to be a negative prognostic factor of physical disability perception. Patients showing severe levels of facial impairment unlikely reached a complete functional recovery. We supposed that in this condition the ability in pursuing aims could hesitate in frustration throughout time, especially if the investment of resources for the rehabilitation treatment was great.

Cooperativeness is a measure of an individual's social tolerance, empathy and helpfulness. It is strongly associated with the perception of social support, well-being and the reduction of negative emotions) [28]. Physical disability examined the capability to eat, to drink from a cup and to pronounce specific sounds. An alteration of these abilities brings to a communicative disorder as pointed out by Dobel et al. and Coulson et al. [4,29]. We hypothesized that individuals high in C perceive less physical disability because best social support perception could reduce psychological distress connected with lower expressive skills.

Novelty Seeking and Persistence seemed to moderate the relation between facial impairment and social disability in patients with facial

paralysis. Novelty Seeking represents the tendency to constantly look for novel cues and strongly respond to them. Individuals high in NS are unpredictable hostile, impulsive, interested in carrying on an incessant experimentation. On the contrary, people who are low in NS are often reserved, orderly and meticulous. A series of reports indicated that NS is related with hypothalamic-pituitary-adrenal (HPA) axis activity [30]. In particular NS is inversely related to plasma cortisol concentration. Cortisol is a hormone traditionally related with stress. Individuals who choose avoidant coping strategies have more chance to experience stress [30]. Chronic stress can deteriorate health conditions, increasing the vulnerability to psychological disorders [31]. The close association between high NS and stress coping behavior could play a role in the reduction of social problems' perception in people affected by facial palsy. The ability to produce positive responses to new stimuli and situations probably protects from the development of social disability because the more efficacious adaptive strategies reduce the incidence of psychological distress.

Both high and low Persistence appears to be associated to less social disability. Cloninger refers to P as "a basic dimension of temperament characterized by the extent to continue to expect and seek rewards even when the expected outcome is only rarely successful" [12]. Individuals high in P are conscientious, resolute and ambitious. They often achieve successful occupational roles because of their enthusiasm and perseverance in work. In a previous study, Cloninger evaluated the benefit of being highly persistent [32]. He pointed out that high P was associated with less psychological distress and depressive symptoms because this condition appeared enlarging the perception of positive emotions, health and happiness. A correlation between psychological distress and perception of social disability in patients with facial palsy is well-known [13]. Our results suggest that the amplification of positive emotions, due to high P, could play a role in the reduction of the perception of social disability, since only the well-being component would be promoted. In contrast people low in P is usually changeable, irresolute and easily disheartened [33]. Nevertheless, in unstable situations, they show better adaptability than individuals highly persistent, because they are not influenced by past
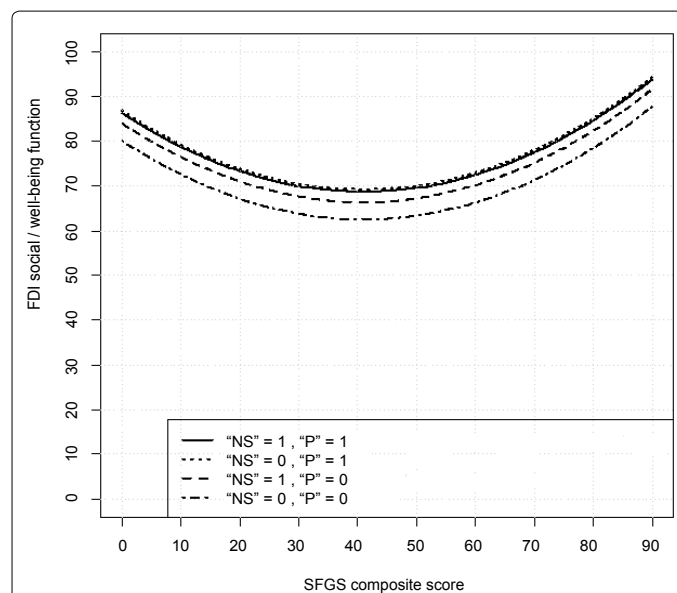

Figure 2: Predicted trend of FDI social/well-being function score as regards SFGS composite score according to the variation of NS and P personality traits. Abbreviations: NS=Novelty Seeking, P=Persistence.

conditions. This could be a predictor of good long-term outcome, justifying the reduced social disability perceived by individuals with low Persistence [33]. In fact facial paralysis is a condition evolving throughout time. In case of temporary or incomplete impairment of the facial nerve (i.e., Bell's palsy, Ramsay-Hunt, partial nerve's damage caused by surgical or traumatic events), during the months after the onset of paralysis a progressive and spontaneous functional recovery occurs. It often appears incomplete and synkinetic, characterized by the loss of selectivity during the activation of certain mimic muscles, due to an irregular regeneration of nervous fibers [34]. At the end of the regeneration process, specific muscular re-training [35] and the use of botulinum toxin type A [36-38] can further modify the degree of facial symmetry at rest and the level of selectivity of the voluntary movement. If the regeneration process does not appear in a reasonable period of time after palsy, thus suggesting a complete nerve interruption, the patient may also undergo a surgical intervention of nerve reanimation [39], with possible further implication in psychological reaction. The role played by rehabilitation treatment in physical and social disability perception remains unclear [40]. Heymans and Beurskens suggested that the amelioration of facial asymmetry and the recovery of expressive qualities are involved in the reduction of disability and depressive symptoms in patients undergone to Mime Therapy [41]. Researching of rest symmetry and symmetry during facial movements, exercises target, could have exerted an analogue effect.

Study Limitations

Personality variables within the multivariate models were not robust physical and social disability predictors. In fact the overall predictive accuracy of our multivariate physical and social disability models was respectively 43% and 30%. Of these the component due to overfitting is estimated to be respectively 0.06 and 0.11. A specific limitation of the current study is that measures of psychological distress were not included in the model. Previous researches in facial palsy and the current one have shown that depressive symptoms derived from psychiatric test scores, such as BDI, were associated with social/well-being disability. Other potential limitations of the current study were the heterogeneity of our sample as regards the time from facial palsy onset and the etiology of facial paralysis. Moreover life events as contributory causes in disability development have not been contemplated in this study.

Conclusion

Personality traits differentially modulate the relation between disability and impairment in patients with facial palsy. Self-Directedness appears too mediated and Cooperativeness to moderated the relation between facial impairment and physical disability, while Novelty Seeking and Persistence seem to moderate the relation between facial impairment and social disability. Of course they are not the only predictors of physical and social disability. Nevertheless understanding how personality traits influence disability perception can be useful to improve the relationship between physician and patient and to allow personalized and efficacious therapeutic interventions.

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