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Development and validation of the Student Stroke Scale and examining its relation with academic motivation

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ABSTRACT

The present study was conducted first, to design and validate a measure of stroke grounded in Transactional Analysis theory and second, to examine its relationship with motivation. To do so, a total number of 348 individuals completed a stroke scale along with a motivation measure. Several statistical procedures were taken to validate the scale. First, uni-dimensionality of the scale was examined using Rasch analysis. Then, Exploratory Factor Analysis was used to determine the underlying factors of the scale. The results indicated that the scale can be best explained by a four-factor solution. Finally, these results were confirmed using Confirmatory Factor Analysis. Moreover, the relationship between stroke and motivation was explored. Findings indicated that stroke is positively related to extrinsic and intrinsic motivation and negatively related to amotivation. In the end, the results were discussed and implications of the scale were presented.

Introduction

The relationship between teachers and their students is of great importance in the educational settings. Positive relationship between teachers and their students supports students' learning, provides them with the opportunity to build the necessary interpersonal skills, reduces their anxiety, and enhances their motivation (Khajavy, 2012; Peng & Woodrow, 2010; Pierson, 2003).

One of the main approaches toward examining interpersonal relationships is Transactional Analysis (TA) proposed by Eric Berne. "TA is a theory of personality and systematic psychotherapy for personal growth and personal change" (Stewart & Joines, 1987, p. 3). This method has been extensively used in psychology, communication, education, and counseling (Barrow, 2007; Solomon, 2003). TA is used in educational settings to help teachers and learners have a clear communication and avoid setting up unproductive confrontations (Stewart & Joines, 1987). The TA approach is comprised of six components: ego states, transactions, life scenario, life positions, time structures, and strokes (Berne, 1988; Shirai, 2006).

Stroke is defined as every action to acknowledge other's presence and values (Shirai, 2006). It is a unit of human recognition. Strokes are visible interpersonal contacts that satisfy emotional need. Berne (1988) used the term "recognition-hunger" to describe this need. There are different types of strokes: verbal or non-verbal, positive or negative, conditional or unconditional. Verbal strokes may range from saying hello to a lengthy conversation. Non-verbal strokes refer to smiling, nodding, shaking hands, and so forth. Positive strokes are experiences that receiver perceives as pleasant and satisfactory, while negative strokes are unpleasant experiences. Conditional strokes refer to what people do, while unconditional strokes refer to what people are (Stewart & Joines, 1987).

Stewart and Joines (1987, p. 74) provided the following examples for different types of strokes:

Positive conditional: 'That was a good piece of work you did.'
Positive unconditional: 'You're lovely to have around.'
Negative conditional: 'I don't like it when you wear those socks.'
Negative unconditional: 'I hate you.'

It has been suggested that any kind of stroke is better than no stroke at all (Stewart & Joines, 1987). If people do not receive positive strokes to satisfy their needs for stroking, they look for negative strokes. However, positive strokes are more advantageous for healthy mental development and psychological well-being (Wachtel, 1980). Barrow (2007) stated that "strokes are given and received unconsciously and continuously" (p. 21). When

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a behavior receives stroke, it is possible to repeat that behavior in the future. In other words, stroking reinforces the behavior which is stroked (Stewart & Joines, 1987).

Concept of stroke can contribute more to our understanding of the notions of teacher praise and feedback in educational psychology (Rathel, Drasgow, Brown, & Marshall, in press; Wright, Ellis, & Baxter, 2012). Teacher praise refers to affective positive words toward students' behavior and performance (Burnett & Mandel, 2010). The notion of feedback is also related to praise and stroke. Hattie and Timperley (2007) identified four levels of feedback, including feedback about the task, about the processing of the task, about self-regulation, and about the self as a person. Among these four levels, feedback about the self as a person is quite related to the concept of stroke, as it is at the personal level and is directed to the self. It conveys positive and negative evaluations about the student such as "You are a great student" and "That's an intelligent response, well done" (Hattie & Timperley, 2007). However, it is different from stroke as stroke is the recognition of a person by other people (here, the recognition of the student by the teacher), while feedback is a kind of reaction to others' actions. Feedback is also different from praise in a sense that feedback is used by the teachers to help students improve their performance by giving information about the students' successful or unsuccessful behavior (Burnett & Mandel, 2010). Previous research has indicated that praise and feedback can be used to enhance students' motivation in the classroom (Baadte & Schnotz, 2013; Beckmann, Beckmann, & Elliott, 2009; Harks, Rakoczy, Hattie, Besser, & Kliemea, 2013). Therefore, it can be implied that stroke can also in the same line affect motivation.

Stroke can be directly related to motivation (Francis & Woodcock, 1996). Based on this theory, motivating others can be fulfilled by two methods. The first one, which is called *positive reinforcement*, refers to giving positive strokes to reinforce the positive and constructive behavior. The second method, which is called *negative reinforcement*, is based on giving negative strokes to decrease the errors and to stimulate better performance (Francis & Woodcock, 1996). People should both give and receive enough strokes to maintain their motivation and also stimulate other people's motivation (Freedman, 1993; Kusluvan, 2003). According to Freedman (1993), individuals achieve higher levels of performance in stroke-rich environments. Therefore, stroking can distinguish between successful and unsuccessful learners.

All of this shows the importance of positive stroke in educational settings. Teachers can be aware of the way they give positive strokes to their students and in this way they can increase students' motivation. Students can achieve higher levels of performance. However, to our best knowledge, there is no scale which is designed for assessing the stroke students receive in the classroom. For this reason, the major aim of the present study is to design a scale for assessing the strokes students receive in educational settings, especially inside the classroom, regardless of their majors. As the relation between stroke and motivation is investigated in the present study, a brief introduction to academic motivation is provided in the following section.

One of the main theories of motivation which has taken into account the cognitive factors is called self-determination theory (SDT, Deci & Ryan, 1985). SDT explains that human beings have three innate psychological needs: autonomy, competence, and relatedness. Autonomy refers to the sense of unpressured willingness to perform an action; competence is the need for showing one's capacities; and relatedness is the need that a person feels he or she belongs with and is connected with significant others. They explained that feelings of autonomy, competence, and relatedness are essential for optimal functioning in different contexts (Deci & Ryan, 2008). Based on this, they distinguished between two types of motivation, intrinsic and extrinsic. Intrinsically motivated learners have an internal locus of control, and the learner does it to achieve internal awards like enjoyment; extrinsically motivated learners have an external locus of control, and the learner does it to achieve external awards or to avoid punishment (Deci & Ryan, 2008).

This theory was later applied in the field of language learning by Noels, Pelletier, Clement, and Vallerand (2000). Following the educational psychologists, they also distinguished among three types of intrinsic motivation, three types of extrinsic motivation, and amotivation. Intrinsic motivation includes knowledge (motivation to increase your knowledge for exploring new ideas), accomplishment (sensations for achieving a goal or a task), and stimulation (fun and excitement stimulated by doing a task). Extrinsic motivation includes external regulation (activities that are external to the learner, such as tangible benefits and punishments), introjected regulation (performing an activity due to some kind of internal pressure, such as avoiding guilt or ego-enhancement), and identified regulation (carrying out an action due to personally related reasons and attaining a valued goal such as the desire to speak more than one language; see Ardasheva, Tong, & Tretter, 2012). Noels et al. (2000) stated that when language learners have no reason, either intrinsic or extrinsic, to learn a language they are amotivated and they do not care about language learning and they leave it soon.

Purpose of the study

The present study is aimed at designing and validating a scale for assessing the strokes students receive within classrooms. The scale was designed based on the TA theory and other studies (e.g. Churches & Terry, 2007; Stewart & Joines, 1987). Then its validity and reliability are assessed using advanced statistical procedures. Both Classical Test Theory (CTT), including Principal Component Analysis (PCA) and Confirmatory Factor Analysis (CFA), along with Item Response Theory (IRT) were utilized to have a better understanding of the scale. Moreover, the relations between stroke scale and motivation is examined to shed more light on the nature of Student Stroke Scale (SSS).

Method

Participants

A total of 348 English language learners participated in the present study. They included 194 language learners (66 females, 108 males, 20 missing) from different private language institutes in which they were learning English for conversation purposes. The students were intermediate level language learners. Moreover, 154 non-English major university students (88 females, 53 males, 13 missing) who were taking English as a compulsory course at Ferdowsi university of Mashhad, the largest state university in the eastern part of Iran, also participated in the study. The students were selected based on their willingness to participate. The reason students from both university and language institutes were chosen was to increase the probability of generalization. The mean age of the sample was 19.34 (SD = 4.34).

Instrumentation

Student Stroke Scale (SSS)

The authors developed and designed a scale (in Persian) based on stroke. According to the theory of stroke, 20 items, which can be indicators of different types of stroke, were written. Writing the items included three steps. First, a comprehensive review of the

literature was done by the authors and the key characteristics of the stroke were specified to assure the content validity of the scale. The key characteristics of the stroke are recognition by other people and also providing feedback for other people. The recognition and providing feedback for other people can be verbal or non-verbal, positive or negative. Based on these features, items addressing positive, negative, verbal, and non-verbal stroke were written. Then, these features were operationalized and modified for the educational settings. Items refer to different situations that the teacher provides the students with stroke (e.g. teacher encourages me in the classroom). Students responded to the items on a 5 point Likert-type scale ranging from 1 (never) to 5 (always). Finally, the SSS was piloted with 5 students. Then the reliability of the scale and appropriateness of the content were checked. After completing the questionnaire, the students were asked to talk about the content of the scale, and whether it is comprehensible for them. Based on this, some modifications and rewordings were done in those items. Following this, the scale was administrated to another group of students ($n = 46$) to check the internal consistency of the scale. Cronbach's alpha calculated for this sample was .88. This assured the researchers that they can proceed with data gathering to assess the students' stroke. The reliability and validity of the scale for the main study are reported in the results section.

Language Learning Orientations Scale (LLOS)

In order to assess the students' motivation, LLOS, which was developed by Noels et al. (2000), was used. This scale is based on Deci and Ryan's (1985) theory. It consists of 21 items which measures Intrinsic motivation, Extrinsic motivation, and Amotivation on a 5 point Likert-type scale ranging from 1 (completely disagree) to 5 (completely agree). The scale has 7 sub-constructs (amotivation, external regulation, introjected regulation, identified regulation, knowledge, accomplishment, and stimulation), each of which includes three items. In this study, the Persian version of the scale was used, which was translated into Persian and validated via factor analysis by Khodadady and Khajavy (2013). Cronbach's α internal consistency reliability coefficients were calculated for the 7 subscales in the present study (ranging from .68 to .83).

Procedure

Both scales were given to the students from different private language institutes and also university students. After gaining teachers' permission, the scales were distributed in the classroom. Participants were informed that filling the scales was voluntary. As Persian was the first language of all the participants, both scales were in Persian. The reason for giving Persian questionnaires was to assure that participants can understand correctly the content and to increase their response rate. Researchers were present during the data gathering. It took about 15 minutes to complete the scales.

First, Rasch anaysis was used to confirm the uni-dimesionality of the scale. To run Rasch, WINSTEPS (Version 3.63.0) was employed. Validation procedure was done by randomly splitting the total sample into Sample A ($n = 174$) for Exploratory Factor Analysis (EFA) and Sample B ($n = 174$) for CFA. Second, to determine the number of factors underlying the scale, using SPSS (Version 18) EFA was run. Finally, to confirm the number of factors, CFA was conducted using Amos (Version 8).

To clarify the statistical procedures utilized here, it should be mentioned that since Rasch measurement reveals the major trait, it is unable to detect the fuzzy dimensions (sub-components), EFA was used to reveal the sub-components of the major trait. CFA was also used to confirm the results obtained via EFA.

Table 1
Descriptive statistics for SSS and LLOS.

	N	Mean	Standard deviation
SSS			
Verbal	348	3.62	.79
Non-verbal	348	3.34	.72
Valuing	348	3.93	.98
Classroom activities	348	2.98	.67
LLOS			
Extrinsic	348	3.42	.48
Intrinsic	348	3.89	.63
Amotivation	348	2.91	.98

Results

This study was conducted, first to construct and validate a stroke scale, and second to examine its relationship with the motivation scale. To start with, Table 1 shows the descriptive statistics of the factors related to the two administered instruments: SSS and LLOS.

Rasch analysis

To confirm the uni-dimensionality of the scale, Rasch measurement was applied employing WINSTEPS software (Linacre, 2009). The overall analysis of the items yielded an item separation index of 3.07 with an item reliability of .91, and a person separation index of 2.22 with a person reliability of .88, which indicates quite precise measurement.

As the results of fit statistics showed (Table 2), except for two items, all items fitted the Rasch model following the criteria suggested by Bond and Fox (2007). Items which do not fit the Rasch model have infit mean square (MNSQ) indices outside the acceptable range of 0.70–1.30. Misfitting items are signs of multi-dimensionality and model deviance. Two of the items were found to have an infit MNSQ index outside the acceptable boundary. The two items were 11 (Teacher answers my emails and telephone calls.) and 20 (Teacher answers my questions.).

Exploratory Factor Analysis

Kaiser–Meyer–Olkin test of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity were utilized to measure the

Table 2
Item statistics and fit statistics.

Item	Estimate	Error	Infit MNSQ
1	1.98	.07	.87
2	−1.17	.07	.80
3	.47	.07	.74
4	.91	.07	.89
5	.22	.07	1.17
6	−.39	.07	.92
7	−.61	.07	1.30
8	−.98	.07	1.02
9	−.28	.07	1.17
10	1.20	.07	1.17
11	**4.2**	**.09**	**1.80**
12	−.67	.07	.99
13	−.17	.07	1.13
14	−.24	.07	1.08
15	.27	.07	1.30
16	.47	.07	.77
17	−.02	.07	.86
18	.43	.07	1.08
19	.38	.07	1.12
20	**−.35**	**.09**	**.33**

Table 3
Rotated component matrix.

	Component			
	1	2	3	4
Teacher blames me	.719			
Teacher encourages me	.716			
Teacher knows my name	.705			
Teacher asks me questions	.666			
Teacher mentions my name in the classroom	.579			
Teacher compliments me in front of the others	.517			
Teacher smiles at me in the classroom		.714		
Teacher pays attention to me		.659		
Teacher frowns at me		.658		
Teacher looks at me		.650		
Teacher devotes enough time to me in the classroom			.602	
Teacher devotes enough time to me outside the classroom			.622	
Teacher uses my personal experience in the classroom			.813	
Teacher uses my scientific knowledge in the classroom			.768	
Teacher lets me ask questions				.623
Teacher uses me in class discussions				.568
Teacher pays attention to my homework				.862
Teacher uses me for doing the exercises				.684

factorability of the inter-correlation matrix. The results of these tests showed that the factor model was appropriate.

The construct validity of the questionnaire was examined through EFA. PCA extracted 5 factors with eigenvalues greater than 1.0. The results obtained from the Scree test indicated that a four-factor solution might provide a more suitable grouping of the items in the questionnaire. The results indicated that factors 1, 2, 3, and 4 consisted of 6, 4, 4, and 4 items respectively. These factors accounted for 65% of the variance of the scale (see Table 3). Alpha estimated the reliability of the whole items as 0.88. All of the four factors yielded good reliability estimates ranging from 0.75 to 0.89.

Finally, the researchers analyzed the items comprising each factor and named the four factors as, *Verbal stroke* (*items:* 5, 6, 7, 8, 14, and 18), *Non-verbal stroke* (*items:* 1, 2, 3, and 4), *Valuing* (*items:* 9, 10, 12, and13), and *Classroom activities* (*items:* 15, 16, 17, and 19).

Confirmatory Factor Analysis

To confirm the factor structure of the SSS found in EFA, CFA was utilized. It is a special technique in Structural Equation Modeling (SEM) which takes a confirmatory hypothesis testing (Kline, 2011). Based on the results of the EFA, a four-factor model of SSS with 18 items was specified (Fig. 1). To see whether the model fits the data

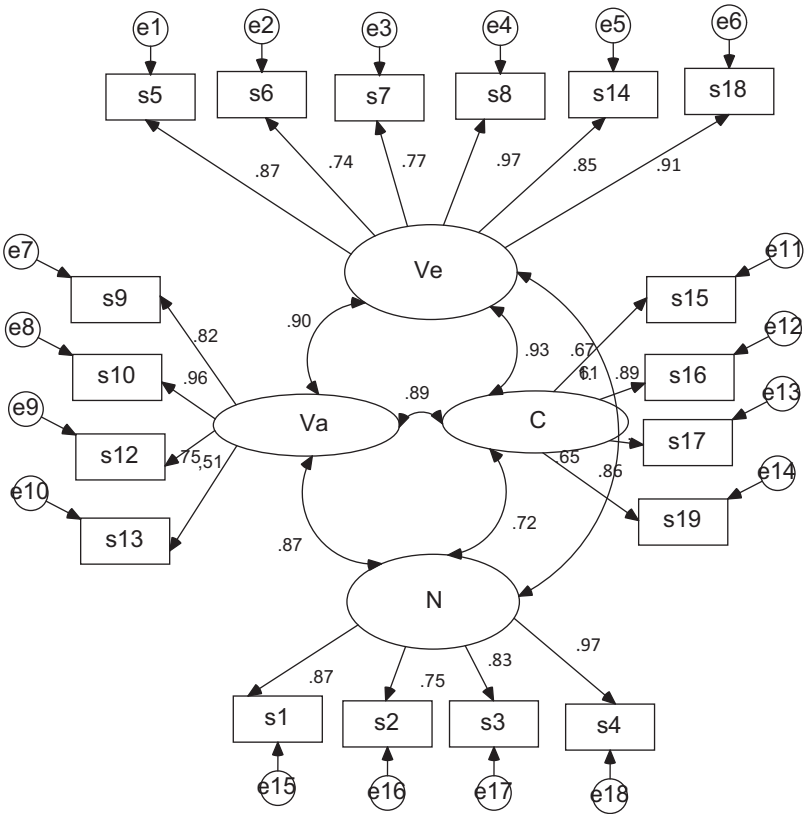

Fig. 1. The results of CFA.

Table 4
Goodness-of-fit indices.

Fit index	χ^2/df	AGFI	IFI	TLI	CFI	RMSEA
Acceptable range	<3	>.90				<0.08
	2.41	**0.91**	**0.90**	**0.91**	**0.94**	**0.05**

adequately, goodness of fit indices in Amos was used. For the present study, χ^2/df (chi-square divided by degree of freedom), Adjusted Goodness of Fit Index (AGFI), Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) were used. To have an acceptable fit model, χ^2/df should be less than 3, AGFI, IFI, TLI, and CFI should be above .90, and RMSEA should be less than .08 (MacCallum, Browne, & Sugawara, 1996). Results of the CFA indicated that all the goodness-of-fit indices were above the cutoff points (see Table 4). Therefore, the CFA confirmed the factor structure of SSS which was already produced by EFA.

Correlation

To examine the relationship between stroke and motivation, a series of correlation were performed. The results of the correlations are shown in Table 5.

As can be seen in Table 5, significant relationships were found between stroke subscales and different subscales of motivation and amotivation. First, significant and negative correlations were found between all the subscales of stroke and amotivation (ranging from −.14 to −.25). Moreover, significant and positive correlations were found between different stroke subscales and also subscales of intrinsic (ranging from .13 to .66) and extrinsic motivation (ranging from .10 to .80). Valuing subscale had the highest correlation with both intrinsic and extrinsic motivation, and also had the least correlation with amotivation. Verbal subscale had the lowest correlation with both extrinsic and intrinsic motivation. Classroom activities had the highest correlation with amotivation.

Discussion

Since the introduction of TA, many studies have been conducted to examine it in different areas such as psychology and education (e.g. Barrow, 2007). As already mentioned, one of the main components of TA is stroke. Although it is considered as an important part of TA theory, no validated scale has been designed for its measurement in educational settings. With that in mind, this study attempted, first to design and validate a scale of stroke for educational purposes, and second to explore the relationship between stroke and motivation.

With respect to the first goal of the study, the stroke scale was validated in three steps: (1) using Rasch analysis to examine the uni-dimensionality of the scale, (2) performing EFA to determine the number of factors, (3) conducting CFA to examine the underlying factors of the scale.

The results of Rasch analysis showed that by removing two items, the scale becomes uni-dimensional. The two items which were found to misfit the major construct of the scale were 11 and 20. Item 11 deals with teacher 's attention to answering emails and telephone calls. One possible line of explanation for this might be that in Iran there is a formal and de-personalized relationship between teachers and students, and also some students are not familiar with technology. Thus students do not expect their teachers to respond to their mails or calls. Moreover, item 20 which refers to answering questions might have some overlapping with items 18 and 19, which refer to questions.

Then, the results of the EFA indicated that the scale can be best explained by four factors with 18 items. The four-factor model accounted for 65% of the variance. The four factors were named as Verbal, Non-verbal, Valuing, and Classroom activities. Verbal stroke is the label for the first factor which consists of 6 items. Items 5 and 6 refer to naming, which can be an important component of recognition (Churches & Terry, 2007). Items 7, 8, and 14 refer to encouraging, blaming, and complimenting, which show the amount of teacher's attention to his/her students, and item 18 deals with asking questions. The second factor is called Non-verbal stroke, which refers to the types of non-verbal recognition, teachers give in the class. This factor consists of 4 items (1, 2, 3, and 4) dealing with smiling, frowning, looking, and paying attention. Factor 3 which is known as Valuing comprises 4 items. Items 9 and 10 deal with the amount of time teacher devotes to his/her students and items 12 and 13 measure the amount of students' personal experience and scientific knowledge teacher employs in the class. These four items show that the teacher values his/her students. And the last factor is called Classroom activities consisting of 4 items (15, 16, 17, and 19). All these items focus on classroom activities and tasks, including doing homework, exercise, participating in class discussions, and asking questions. It is fair to say that all these factors were somehow consistent with the stroke theory (Stewart & Joines, 1987).

Moreover, to confirm the four-factor model in EFA, CFA was run. The results of the EFA were confirmed by CFA in Sample B. To boot, this study used both CTT and IRT for validating a stroke scale in educational settings. Therefore, the validation procedure was a combination of two different statistical procedures that made the validation a sound process.

Regarding the second objective of the study, the outcomes of the correlation between stroke subscales and motivation suggested that this construct has a strong relationship with motivation (Francis & Woodcock, 1996). First, all the subscales of the stroke had a negative relationship with amotivation in language learning settings. It shows the importance of stroke rich environments in educational settings (Freedman, 1993; Kusluvan, 2003). Students' level of amotivation decreases by providing more stroke for the learners. Teachers should be aware of the way they recognize their learners' presence in the classroom. All the single items in the scale can be taken as the situations that teachers should be aware of them and the ways that can be used to improve the stroke. Here are some examples which can be used for

Table 5
Correlations among stroke and motivation subscales.

	Extrinsic motivation			Total	Intrinsic motivation			Total	Amotivation
	Ext	Introj	Ident		Know	Accom	Stim		
Verbal	.08	.07	.08	.10*	.18**	.19**	.13*	.19**	−.17**
Non-verbal	.10*	.15**	.16**	.18**	.18**	.15**	.18**	.20**	−.20**
Valuing	.33**	.63**	.80**	.78**	.66**	.52**	.57**	.71**	−.14**
Classroom activities	.13*	.14**	.26**	.23**	.21**	.16**	.19**	.23**	−.25**

* $p < .05$.
** $p < .01$.

increasing the stroke: knowing students' names, letting them express themselves, providing them with feedback, and encouraging them. Among the stroke subscales, classroom activities had the lowest level of amotivation. It implies that using students' experience and knowledge in the classroom considerably decreases amotivation. Furthermore, it was found that not only providing stroke decreases amotivation, but also it improves the learners' motivation. This finding was supported by the significant correlations found between stroke subscales and intrinsic and extrinsic motivation. When students receive high levels of positive stroke, they are more motivated to learn English language. Among the subscales of the stroke, Valuing had the highest correlation with both intrinsic and extrinsic motivation. It shows that when the teacher pays attention to the students and ask them to participate in the classroom activities, students are in the highest level of motivation. Also, among the intrinsic and extrinsic subscales, Valuing had the highest correlation with identified regulation, which is carrying out an action due to personally related reasons and attaining a valued goal. Consequently, Valuing substantially affects the important goals students have in the classroom and help students achieve their goals.

Conclusions

On the whole, this study sought to construct and validate a scale of stroke and examine its association with L2 motivation. A number of statistics including, Rasch, EFA, and CFA were applied to substantiate the construct validity of the scale. All these statistics revealed that the underlying sub-constructs of the scale consist of Verbal, Non-verbal, Valuing, and Classroom activities. Moreover, further analysis of the results demonstrated that the subcomponents of stroke are in association with different subscales of motivation and amotivation.

There were some limitations in the present study. Researchers used only language learners as the sample. Therefore, the application of the SSS in other areas may clarify its construct better. Moreover, this study used only correlational procedures to examine the relations between stroke and motivation. Future research can perform experimental studies to examine the effect of specific techniques to improve stroke and in turn achievement in the classroom. As the statistical procedures confirmed the SSS as a valid measure of stroke, the scale can be used extensively in all the educational settings. Also, the procedure used in this study for validation can be taken as a good example for future research. In other words, using both CTT and IRT for validation can be used by other researchers for validating the personality measurements. Future research can also focus on the predictability of the stroke on achievement. Researchers can use advanced statistical procedures like SEM to examine the inter-relationships between stroke and other individual differences variables as predictors of achievement in different subject areas. It also can shed light on the predictability power of stroke in relation to other individual difference variables.

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