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Perceptual Learning Style Preference Questionnaire: A review of a language learning styles survey

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Abstract

This paper presents a critical review about the most widely used self-report for measuring learning styles in the field of language teaching: the *Perceptual Learning Style Preference Questionnaire* (*PLSPQ*), by Joy M. Reid (1987). The following issues have been addressed: 1) the description of the questionnaire, 2) its elaboration process, 3) its theoretical foundations, 4) its dissemination in the scientific community, 5) the translated versions, 6) the research fields in which it has been, used and 7) an analysis of its validity and reliability. The review is based on a corpus of 65 works that have used the *PLSPQ*. The main aim of this review is to provide data on the validity and reliability of the *PLSPQ*. In this regard, among the conclusions drawn from the review is the fact that the *PLSPQ* is presented as an instrument with no consistent levels of validity and reliability and therefore in need of profound improvement in this regard or, if not, its use is discouraged.

Key Words – *Perceptual Learning Style Preference Questionnaire*; learning styles; foreign languages learning; validity and reliability of questionnaires

1. Introduction

It is very difficult to determine when the concept of *learning style* emerged. One of the main reasons is that different expressions (*learning style, cognitive style, thinking style, intellectual style*, among others) have been used to refer to the same concept as well as to different concepts: «Defining the key terms in this area is not a straightforward task. The terms "learning style", "cognitive style" and "learning strategy" are – understandably – used imprecisely in theoretical and empirical accounts in the topic» (Cassidy 2004: 420). Nielsen (2012) carries out a historical review in which she looks for each of the expressions separately and verifies that the expression *cognitive style* appears documented for the first time in 1953 (in an article by Riley Gardner) while the expression *learning style* does not appear until the work of Riessman (1964). Therefore, it can be said that the concept of learning style emerges in the second half of the 20th century. Since then, learning styles have been widely accepted among teachers, as they have considered that adapting their way of teaching to their students' learning styles would benefit their performance, as shown by several researches (Dekker et al. 2012; Howard-Jones 2014; Domínguez et al. 2019).

Despite the great acceptance of learning styles, some authors question them mainly due to the poor validity and reliability of the surveys used to identify learning styles, as demonstrated by Coffield et al. (2004). This has led some authors to consider them a myth (Geake 2008; Kirschner 2017) or to deny their existence (Willingham et al. 2015; Macedonia 2015). In the field of language teaching, most of the questionnaires have been designed for pedagogical rather than research purposes, since their main aim is to make students aware of their learning preferences. For this reason, their validity and reliability must be questioned, since they have not been subjected to the necessary analyses to be validated from a psychometric point of view:

> The tests vary in how much reliability and validity data have been reported about them by the authors but it is fair to say that most of them have been developed for practical rather than research purposes, that is, to raise language learners' awareness of style issues in general and of their own style preferences in particular. Thus, these batteries have normally not been finetuned for scientific measurement purposes by submitting them to the kind of rigorous standardization process that is a requirement in psychology for an instrument to become admissible (Dörnyei 2003: 14).

Since any theory can only be sustained if it is based on valid and reliable measuring instruments, the aim of this paper is to provide data on the validity and reliability of the most widely used questionnaire in the field of language teaching: the *Perceptual Learning Style Preference Questionnaire* (henceforth, *PLSPQ*). To this end, a literature review has been carried out on the research that have used this survey and a corpus of 65 works has been obtained.

This work is structured in three parts. In the first one, the essential aspects of the *PLSPQ* are described: the description of the questionnaire (Section 2.1), the process of elaboration (Section 2.2), and its theoretical foundations (Section 2.3). The next section starts from the bibliographic corpus to analyse the impact that the questionnaire has had, and to this end it addresses these questions: its dissemination in the scientific community (Section 3.1), the translated versions (Section 3.2) and the fields of study in which it has been used (Section 3.3). The third part analyses the data on the validity and reliability of the questionnaire in the corpus (Section 4).

2. The *Perceptual Learning Style Preference Questionnaire*

2.1. Description of the questionnaire

The *PLSPQ* is a self-administered questionnaire created by Joy M. Reid[1] (1987). It is composed of 30 Likert-type questions (Table 1). All questions consist of five items: strongly agree, agree, undecided, disagree and strongly disagree. Each of these response options is assigned a score (from 5 to 0, respectively), whose total sum must be multiplied by two to obtain the corresponding final score of each style, as a function of which Reid distinguishes three types of learning style preferences:

- Major (from 38 to 50 points): these are the styles through which you can learn optimally.
- Minor (from 25 to 37 points): although they are not preferred styles, you can also learn through them.
- Negligible (less than 25 points): these are styles with which it is difficult to learn.

Table 1. Distribution of the *PSLPQ* items

STYLES	**ITEMS**				
Visual	6	10	12	24	29
Auditory	1	7	9	17	20
Tactile	11	14	16	22	25
Kinesthetic	2	8	15	19	26
Group	3	4	5	21	23
Individual	13	18	27	28	30

The styles are encompassed in two dimensions: sensory and social. The first consists of the Visual, Auditory, Tactile and Kinesthetic styles, and the second, of the Individual and Group styles. Next, we present Reid's description (1995: 205-207) of the individuals who have each of these styles as preferential:

- **Visual style**: you learn well by reading either in books or on the blackboard. You remember and understand better the information and instructions if you read them. You do not need as much oral explanation as an auditory student, and you can often learn only with a book. You need to take notes of the oral explanations to remember the information.
- **Auditory style**: you learn better through oral explanations. You can remember the information by reading aloud or moving your lips while reading. It benefits you to listen to audios, debates and conversations with the teacher and the classmates.
- **Kinesthetic style**: you learn better if you are physically involved in classroom experiences. You remember the information well when you participate actively in activities, excursions and role-playing games. It benefits you to have different types of stimuli: audio combined with an activity.
- **Tactile style**: you learn better when you have the opportunity to do practical activities (experiments in a laboratory, build models, etc.). Participating physically in activities and taking notes can be beneficial to understand the new information and remember it, respectively.

[1] Joy M. Reid (b. 1942) has been a professor at the University of Wyoming (USA) for 15 years (1989-2004), where she has taught Linguistics, Writing Composition and Methodology of Teaching English as a Foreign Language. Her research interest has focused on the learning styles of second language learners, and her outreach work has consisted of the methodology of teaching English in general, and written expression in particular.

- **Group style**: you learn more easily when working with other classmates. You like group interaction and remember information better when working with two or three colleagues. The stimulation you get from group work helps you learn and understand new information.
- **Individual style**: you learn better alone. You understand the new material, remember it and progress better when working alone.

2.2. The elaboration process of the questionnaire

As indicated by Dörnyei (2003), the *PLSPQ* was the first test on learning styles created for the field of teaching/learning foreign languages, and it has been the most widely used by researchers and teachers. It began to take shape in the '80s of the 20th century almost by chance, as recounted by Reid (1990) in the article in which she explains the process of making the test and from which we can extract very illustrative information:

> I encountered almost by accident the CITE (Center for Innovative Teaching Experiences) Learning Styles Inventory […] a self-reporting instrument used by Kansas public schools to assist students —native speakers (NSs) of English— in identifying their preferred perceptual learning styles. […] My knowledge of learning styles was limited, but the idea of an instrument for such measuring, and for self-discovery, interested me. During the next several months, I investigated the available literature about learning styles; I found several additional survey instruments, and a wealth of information.
> As I grew more knowledgeable, I decided to initiate a small pilot project, using the CITE instrument with approximately 120 nonnative-speaking (NNS) students in intensive ESL programs in Colorado. […] As my interest in perceptual learning styles increased, I began recruiting volunteers-colleagues in English language programs across the country who agreed to administer a learning styles questionnaire to their ESL students (Reid 1990: 323-324).

As a result, she received a one-year research fellowship from the Colorado State University in 1982 to develop a valid and reliable questionnaire for L2 English students, administer it to about 1,300 informants and interpret the results. The progress of her work was presented at the TESOL conference in Colorado (1982) and at the Association of International Educators (NAFSA) in Baltimore (1983). A year later she finished the test and the results were published in 1987, but it would have to wait until 1995 (202-207) for Reid herself to publish the full version with the score scale, since in her 1987-article she only included in the appendix (110) the first page of the questionnaire, of which only the instructions could be read. This delay in the publication of the instrument did not prevent, however, that several researchers used the test before it was first published in 1995, due to the interest it had aroused in the lectures where Reid presented her work. However, the impact of the questionnaire increased after 1995 and, specially, since the 21st century. We consider that this lapse of about ten years between the first partial publication (1987) and the full version (1995) has been able to delay the dissemination of the instrument among the academic community within a decade.

2.3. Theoretical foundations of the questionnaire

As indicated by Reid (1987: 92), her questionnaire is the result of consultations with experts and English learners about other existing instruments: «A self-reporting questionnaire was developed on the basis of existing learning style instruments, with modifications suggested by NNS informants and US consultants in the fields of linguistics, education, and cross-cultural studies». One of these instruments is the *Learning Styles Model* by Dunn et al. (1975), on which she essentially bases her proposal, although in a much more simplified way, since she only takes into account two of their five dimensions: the physiological and the sociological one. Reid discards three elements from the first dimension (intake, time of day and mobility) and she only keeps the perceptual styles. From the

second, she reduces the six types of grouping (individual, by pairs, in trios, in groups, with the teacher and variety in the groupings) to the Individual and Group modality (in the latter, apart from the group organization, she also includes work in pairs and in a trio).

Her construct is also characterized by differentiating diverse degrees of preference for learning styles: from those that favor them to those that hinder them. This concept of preferred styles is taken from Farr (1971), which is closely related to the *Matching Hypothesis*[2], endorsed by Domino (1970) and Keefe (1979). Therefore, learning styles are for Reid the preferences that students have for any of the perceptive modalities and for the types of grouping, and if teachers take them into account they will achieve that their students learn in a more efficient way.

In short, the *PLSPQ* is based on three simple theoretical bases. The first of them holds that learning styles are composed of a perceptive and a sociological dimension. Secondly, styles manifest as preferences by students, to a greater or lesser degree, towards one of the perceptual modalities and forms of grouping. Finally, to the extent that the teacher teaches her/his students according to their preferred styles (*Matching Hypothesis*), they can get a better performance from them. This last observation has important didactic implications, since Reid suggests that if students' styles are identified and they are taught according to them, they will learn better.

3. The impact of the *PLSPQ*

3.1. Dissemination of the *PLSPQ* to the scientific community

As it can be seen in Table 2, the *PSLPQ* has had a great reception worldwide because it has been used in more than twenty countries. It is present in all continents, although more prominently in the Middle East and Asia, as the countries with the largest number of publications are Iran (13) and China (11), followed by the United States (9).

Table 2. Impact of the *PLSPQ*

Authors	Country	Survey language	N	L1	Subject	Validity	Reliability
Eliason (1989)	USA	English Japanese	31 22	English Japanese	French L2 English L2	Reid (1987)	
Rossi-Le (1989)	USA	English	147	Various	English L2	X	X
Liu and Tseng (1992)	China (Taiwan)	English	333	Chinese	English L2	X	X
Hyland (1994)	Japan New Zealand	Japanese English	405	Japanese	English L2	Reid (1987)	
Itzen (1995)	USA	English	92	Japanese	English L2	X	✓
Yamashita (1995)	Japan	Japanese	585	Japanese	English L2	X	✓
Gorevanova (2000)	Turkey	English	57	Turkish	English L2	Reid (1987)	
Wintergerst et al. (2001)	USA	English	100	Various	English L2	✓	✓
Peacock (2001)	China	English	206 46[a]	Chinese	English L2	X	X
Mohd Rawian (2002)	Malaysia	English	314	Malay	English L2	See note b	
Isemonger and Sheppard (2003)	South Korea	English	710	Korean	English L2	X	X
Petrakis (2003)	USA	English	22	English	Firefighters	X	X
Tabanlioğlu (2003)	Turkey	Turkish	60	Turkish	English FA	Reid (1987)	✓
DeCapua and Wintergerst (2005)	USA	English	34	Various	English L2	✓	✓
Chen (2006)	USA	English	390	Chinese	French L2	X	X
Isemonger and Sheppard (2007)	Japan	Korean	691	Korean	English L2	✓	✓
Peters et al. (2008)	UK	English	338	English	Physical Education	✓	✓
Renou (2008)	Puerto Rico	English	82	Spanish	French L2	See note c	
Naserieh (2009)	Iran	Persian	138	Persian	Various	Reid (1987)	
Deakins (2009)	New Zealand	English	11	Various	Management	X	X

[2] The *Matching Hypothesis* holds that students perform better when the way of teaching is adapted to their preferred learning styles.

Chen (2009)	China (Taiwan)	English	390	Chinese	English L2	Reid (1987)	
Mulalic et al. (2009)	Malaysia	English	160	Various	English FA	Peacock (2001)	
Abdollahzadeh and Amiri-Vardani (2010)	Iran	English	196	Persian	English L2	Peacock (2001) and Wintergerst et al. (2001)	
Tzuching Chen et al. (2010)	China (Taiwan)	Chinese	236	Chinese	English L2	X	X
Shen (2010)	China (Taiwan)	English	145	Chinese	English L2	Peacock (2001)	X
Kaur Dhillon (2011)	Malaysia	English	137	Malay	Various	X	X
Tuan (2011)	China	English	172	Chinese	English L2	X	X
Alkhatnai (2011)	USA	English	100	Arabic	English L2	Reid (1987)	
Zokaee et al. (2012)	Iran	English	54	Persian	English L2	X	X
Teshome (2012)	Ethiopia	English	70	-	English L2	✓	✓
Khmakhien (2012)	Thailand	English	262	Thai	English L2	X	✓
Obralić and Akbarov (2012)	Bosnia	English	32	Turkish Bosnian	English L2	X	X
Vaseghi et al. (2012)	Malaysia	-	-	-	-	X	X
Brahim (2012)	Algeria	English	23	Arabic	English FA	X	X
Nematipour (2012)	Iran	English	200	Persian	English L2	X	X
Jowkar (2012)	Iran	English	95	Persian	English L2	X	X
Vaseghi et al. (2013)	Malaysia	English Persian	75	Persian	English L2	Peacock (2001)	✓
Muniandy (2013)	Malasia	English	92	Various	English L2	Peacock (2001	
Gómez Villa (2013)	UK	English	31	English	Spanish L2	X	X
Naserieh and Anani Sarab (2013)	Iran	Persian[d]	138	Persian	Various	X	✓
Tai (2013)	China (Taiwan)	Adapted[e]	165	Chinese	English L2	X	X
Karthigeyan and Nirmala (2013)	India	Adapted[f]	582	-	English L2	X	✓
Chu (2013)	China	English	174	Chinese	Various	X	X
Viriya and Sapsirin (2014)	Thailand	English	150	Thai	ICT	Reid (1998)	
Farajolahi and Nimravi (2014)	Iran	English	140	Persian	English L2	X	X
Nuraeni Muhtar (2014)	Indonesia	English	129	Indonesian	English L2	X	X
Ghezlou et al. (2014)	Iran	Persian	127	Persian	English L2	X	X
San and Ye (2014)	Myanmar	English	70	Burmese	Burmese	Reid (1987)	✓
Mpholo and Suping Shana (2014)	Lesotho	English	¿?[g]	Various	English L2	Naserieh and Sarab (2013)	
Pourghasemian et al. (2014)	Iran	English	142	Persian	English L2	X	✓
Baleghizadeh and Shayeghi (2014)	Iran	Persian[h]	207	Persian	English L2	Reid (1987)	Naserieh (2009)
Banisaeid and Huang (2015)	China	English	204	Persian	English L2	X	X
Balachandran (2015)	Canada	English	5	English	Maths	X	X
Zhang (2015)	China	Chinese	245	Chinese	English L2	✓	✓
Vaezi and Sharoosvand (2015)	Iran	English	52	Persian	English L2	Tai (1999)[i]	
Merç (2015)	Turkey	Turkish[j]	240	Turkish	English L2	Tabanlıoğlu (2003)	
Vakilifard and Mortazavi (2016)	Iran	English	131	Various	Persian L2	✓	✓
Asadipiran (2016)	Iran	Persian[k]	60	Persian	English L2	Reid (1987)	X
Mubarok et al. (2016)	Indonesia	English	1	Indonesian	English L2	X	X
Da Lio (2016)	Italy	English	25	Italian	English L2	X	X
Saleh Alkahtani (2016)	USA	Arabic	667	Arabic	English L2	Reid (1987)	✓
Russo and da Silva (2016)	Brasil	Portuguese	150	Portuguese	Engineering	X	X
Rivera Lorenzo (2016)	Spain	English Spanish	100	Spanish	English L2	X	X
Asrining Tyas and Safitri (2017)	Indonesia	Indonesian	100	Indonesian	English L2	X	X
Sun and Teng (2017)	China	Chinese	224	Various	Chinese L2	✓	✓

[a] They are teachers.
[b] Although I know that there are data on the validity and reliability of the test, it has been impossible for me to access them since I have not received a response to the request for information sent to the author.
[c] Although it does not provide any evidence of validity or reliability of the *PLSPQ*, they mention the works of DeCapua and Wintergerst (2005) and Isemonger and Sheppard (2007), in which the instrument is questioned.
[d] This is the version by Naserieh (2009).
[e] Ten more questions are added for a new style: computer learning.
[f] He says that it is an adapted version but does not indicate what it was.
[g] Does not indicate the number of informants that constitute the sample.
[h] This is the version of Naserieh (2009).
[i] The work of Tai (1999) is an unpublished doctoral thesis that has been impossible for me to access.
[j] This is the version of Tabanlıoğlu (2003).
[k] This is the version of Naserieh (2009).

The *PLSPQ* is the most widely used instrument in the field of language teaching. This fact could be understandable if we consider that it was created 30 years ago, time enough that would justify by itself the high number of works that cite it. However, it seems that the widespread dissemination of the *PLSPQ* has not always been viewed with good eyes by all, such as Vaseghi et al. (2012), who consider worrying to have used and placed so much trust in such an old instrument:

> One important point that is worth discussing is that in most of the research reviewed in the past studies, the researchers have employed the Reid's *PLSPQ*. Too much reliance on one single instrument and the overuse of this rather old instrument can be a cause for concern among those working in this area of research (Vaseghi et al. 2012: 449).

However, neither these criticisms nor the pass of time seem to have limited the scope of the *PLSPQ*, because since 2000 to the present there is no year (except 2004) in which we have not documented any work that makes use of it (Table 2). Among them, apart from half a hundred research articles, I have documented two Final Degree Projects (Rivera Lorenzo 2016; Da Lio 2016), five Master thesis (Gorevanova 2000; Tabanlioğlu 2003; Naserieh 2009; Brahim 2012; and Balachandran 2015) and seven Doctoral thesis (Rossi-Le 1989; Mohd Rawian 2002; Chen 2006; Alkhatnai 2011; Balachandran 2015; Zhang 2015; and Saleh Alkahtani 2016). It seems that all these works are the result of the request made by Reid (1987) to keep researching the subject and translating her instrument:

> Additional refinement of student variables and subgroups, as well as the addition of new variables, would extend the research. Translation of the questionnaire into students' native languages so that it can be administered to NNSs whose English is at an elementary level would provide baseline data for a longitudinal study of those students' learning style preferences (Reid 1987: 103).

3.2. Translated versions of the *PLSQ*

With regard to translations, the words of Reid (1987) do not seem to have had the same propagating effect, since most of the works have used the original version. Although this may be due to the fact that the bulk of the research has been conducted on English as a second language, it is no less true that in most cases the informants have been non-native speakers of this language, and this circumstance has made difficult, in some cases, the proper interpretation of the questions. Apart from the original version, the *PLSPQ* has been translated into nine languages: Japanese, Turkish, Korean, Persian, Chinese, Arabic, Portuguese, Spanish and Indonesian. The dates of the last translated versions (Arabic, Portuguese and Spanish in 2016 and Indonesian in 2017) point out that the *PLSPQ* is an up-to-date instrument although it was created 30 years ago.

We can distinguish three different ways of using the translations. One of them is to use both the original version and a translation into the mother tongue of the informants, as Eliason (1989) or Hyland (1994), among others do. Another alternative way has been to use only the translation to the L1 of the students, but resorting to it to an existing version, as it has happened with the Turkish and the Persian ones. In the first case, Merç (2015) uses the translation of Tabanlioğlu (2003), while Baleghizadeh and Shayeghi (2014) and Asadipiran (2016) reuse the Persian translation made by Naserieh (2009) for his Master thesis. However, there are also authors who have rejected the existing translations and have chosen to do their own, as it happens with the Japanese versions (Eliason 1989; Hyland 1994; and Yamashita 1995) the Chinese ones (Tzuching Chen et al. 2010; Zhang 2015; Sun and Teng 2017) and the two from Persian (Naserieh 2009; Vaseghi et al. 2013). I consider that this last alternative does not contribute to the advancement of the research on the subject, because when an existing translation is discarded for a study, it is impossible to perform contrastive analysis (meta-analysis) because the measuring instruments are not the same.

3.3. Fields of use of the *PLSPQ*

Conceived as a tool for the field of second language teaching, it has been applied almost exclusively in studies on English as a foreign language, including some works about English for academic purposes (Tabanlioğlu 2003; Mulalic et al. 2009; Brahim, 2012). It has also been used to investigate the teaching of other languages as L2, although in a very limited way compared to English: French (Eliason 1989; Chen 2006; Renou 2008), Spanish (Gómez Villa 2013), Persian (Vakilifard 2016) and Chinese (Sun and Teng 2017).

However, it is striking that the survey has also been used in contexts other than language teaching, such as Management (Deakins 2009), Physical Education (Peters et al. 2008), New Technologies (Viriya and Sapsirin 2014) Mathematics (Balachandran 2015), Engineering (Russo and da Silva 2016) or even training for firefighters (Petrakis 2003). Far from interpreting this fact as an achievement of the *PLSPQ*, it might be due to two explanations that are not very positive: on the one hand, taking into account that none of the authors (except Peters et al. 2008) provides evidence on the validity or reliability of the questionnaire, their work lacks methodological rigor; on the other hand, if the *PLSPQ* can be used in areas as diverse as those mentioned above, it would be difficult to find evidence of content validity.

4. Studies about the validity and reliability of the *PLSPQ*

As shown in Table 2[3], it is striking that many of the papers (29/44,6 %) do not provide their own evidence of the validity and reliability of the questionnaire, a fact that does not go unnoticed by Isemonger and Sheppard (2007: 358): «Researchers who have used the instrument to profile learning styles for various research objectives have routinely neglected to validate the scores obtained in their samples». Quite a few of these studies simply resolve the issue by referring to other authors, among them a frequent reference to Reid (1987). Although her work cannot be deprived of merit, as a result of analysing the responses of 1,234 informants from 98 different countries and with 52 different languages, Reid's (1987) priority was not to present accurate data on the validity and reliability of her instrument, but to describe for the first time the perceptive learning styles of L2 English learners:

> There is no published research that describes the perceptual learning style preferences of NNSs. […] The study reported in this article was designed to provide baseline data for future research on the perceptual learning style preferences of NNSs and to provide insights for the ESL classroom (Reid 1987: 91).

It is therefore understood that the only information provided by Reid (1987) is that she used the split-half method and a correlation analysis of the 60 statements she initially proposed to the participants: «Validation of the questionnaire was done by the split-half method. Correlation analysis of an original set of 60 statements (10 per learning style) determined which 5 statements should remain within each subset» (Reid 1987: 92).

However, while Reid's (1987) purpose is laudable, she unfortunately fails to get the methodology right for several reasons. First, she says she used the split-half method to validate the questionnaire, but this method is not used to test the validity of a test but its reliability. On the other hand, this method is only

[3] In Table 2 the data on validity and reliability have been indicated in the following way: the capital letter X is used when the corresponding author does not provide any information; the symbol ✓ is used when the author of the research is the one who carries out the validity or reliability analysis; the names of the authors who have been used to check both validity and reliability are placed between both columns.

recommended with instruments composed of a minimum of 100 items and measuring a single dimension, such as a vocabulary test, for example; however, Reid uses it to measure six styles (=dimensions), and her questionnaire is short, as it consists of 60 questions, a lack of which she herself was later aware: «The longer the test, the greater its reliability – unfortunately, each of my constructs had to be correlated as a separate test, and each of those constructs was very short» (Reid 1990: 331). Finally, since the test used by Reid to prove the validity of the *PLSPQ* does not serve this purpose, we lack evidence of its validity based on the internal structure of the test.

In this sense, it would have been interesting if she had carried out factor analyses to check whether the number of learning styles she proposed to identify with her test was adequate or not. We do not even have Cronbach Alpha coefficient of each style, which would have allowed meta-analysis to be carried out with subsequent research to test the validity of the *PLSPQ*, so that Reid herself makes it impossible, from the outset, to turn into reality one of the implications of her article due to the lack of available data: «Future research projects might attempt to replicate this study and to assess the accuracy of student self-assessment through classroom observation and testing» (Reid 1987: 103).

Fortunately, three years after this article, Reid (1990) publishes another one which is paradoxically entitled 'The dirty laundry of ESL survey research', in which she publicly acknowledges the weaknesses of her instrument. Far from being 'dirty laundry', I believe that the information it provides is very useful for understanding the process of making the *PLSPQ* and can be used as a guide for developing similar instruments. Therefore, I consider it very commendable that Reid (1990: 335) humbly acknowledged before the scientific community that her questionnaire could have been better if she had accepted certain advice or spent more time analyzing the items: «Of course, I do not present my study as an ideal. The construct coefficients, for instance, could have been higher, and my survey more reliable, had I followed the counsel of my advisers and worked a little longer on the item analysis».

Given Reid's (1990) explanations of the process of creating the *PLSPQ*, it is incomprehensible that, out of the ten authors who refer to her 1987's article to justify the validity of the questionnaire, only three of them (Naserieh 2009; Alkhatani 2011; Saleh Alkahtani 2016) also refer to the 1990 questionnaire. In fact, Reid herself recommends Alkhatani (2011) in a personal email to use this article to adapt the *PLSPQ* to his sample, suggesting that he uses four reagents instead of the five in the original version:

> At most, you will want to re-norm the survey on your target audience (see my 'Dirty Laundry' article in the Forum section of the *TESOL Quarterly* in 1990 for my norming processes). At least, if you are publishing your results, you will need to indicate that the survey was not normed for your population. […] my statistics mentor suggested that we rescale to 0-4 for ease of doing the statistical analysis (Alkhatani 2011: 241).

If these authors had been aware of Reid's 1990 article, they would have realized that a reference to her previous work (1987) was not sufficient to justify the validity of the *PLSPQ*. It is clear that these behaviours are not typical of a rigorous research methodology; however, the lack of scientific rigour is even greater in those works in which Peacock (2001) is referred to as a source of reliability of the *PLSPQ*, as is the case with Mulalic and Shah (2009: 9), Shen (2010: 542) or Vaseghi et al. (2013: 84), since the former makes no comment on either the validity or the reliability of Reid's questionnaire.

Nevertheless, it is fair to acknowledge the contribution of certain authors who provide evidence of validity based on the content of the questionnaire. Thus, some use qualitative methods, such as DeCapua and Wintergerst (2005), Teshome (2012), Zhang (2015) and Vakilifard (2016). While DeCapua and Wintergerst (2005) use semi-structured questionnaires, student interviews and participant observation, the others use various methods based on expert judgement. Thus, Teshome (2012) and Zhang (2015) use the item-target consistency index (ITCI). The first has the opinion of two PhD students, but does

not provide the results of his analysis, and the second has the collaboration of two English professors who are native Chinese speakers, whose ITCI is .95, so they consider the Chinese translation of the *PLSPQ* to be valid. Vakilifard (2016) indicates that he has consulted Persian teachers, but does not specify the number or data of his analysis.

In addition to these qualitative techniques, other authors (Wintergerst et al. 2001; Peters et al. 2008; Sun and Teng 2017) use quantitative methods, such as factor analysis, to provide evidence based on the internal structure of the test, but do not reach homogeneous conclusions (Table 3). Thus, Wintergerst et al. (2001) find that the most satisfactory option is to consider three styles: group activity orientation, individual activity orientation and project orientation (in this type they include items from the Tactile, Visual and Kinesthetic styles). Peters et al. (2008), on the other hand, obtain a five-factor questionnaire, in which the Group and Individual styles would be part of the same dimension in which they would be related by opposition. Finally, Sun and Teng (2017) conclude that the optimal structure of the questionnaire would be constituted by four factors, in which the Auditory and Visual styles, on the one hand, and the Kinesthetic and Tactile styles, on the other, would be integrated in the same dimension.

Table 3. Results of the factorial analysis of the *PLSPQ*

AUTHORS	FACTORS				
	I	II	III	IV	IV
Wintergerst et al. (2001)	Group activity orientation .85	Individual activity orientation .77	Project orientation .65	-	-
Peters et al. (2008)	Group and individual .-810-.815	Tactile .640-.789	Kinesthetic .397-.738	Visual .566-.755	Auditory .455-.720
Sun and Teng (2017)	Auditory/visual .69	Kinesthetic/tactile .80	Group .74	Individual .72	-

Since evidence found by researchers on the content and internal structure of the test are so different, evidence based on other variables should be interpreted with caution. In this sense, only one variable (the mother tongue) out of the six[4] that Reid (1987) relates to the learning styles is a recurrent element in the literature we have analyzed[5]. Therefore, it is impossible to compare Reid's data with the other authors, who have focused on these issues mainly: learning strategies, teaching methods, academic performance and students' socio-demographic characteristics (except for the age factor because the samples of each study are homogeneous in this aspect).

Learning strategies are the variable that most often appears to be related to styles. Three types of studies can be distinguished according to the element with which they compare learning styles:

1. Feneral learning strategies (Rossi-Le 1989; Gorevanova 2000; Tabanlioğlu 2003; Farajolahi and Asghar 2014; Saleh Alkahtani 2016);
2. Strategies for learning some aspect of communicative competence, such as vocabulary (Zokaee et al. 2012), listening comprehension (Tzuching Chen et al. 2010; Jowkar 2012) or reading (Zhang 2015);
3. Some of the other variables, such as performance (Chen 2009), teaching method (Brahim 2012) or the socio-demographic factor of gender (Viriya and Sapsirin 2014).

Due to the thematic diversity of the studies looking for correlations between learning styles and strategies, it is only going to be commented below on those where more than one paper has been published and

[4] These variables are academic degree, age, TOEFL test score, length of stay in the USA, time studying English in the USA and mother tongue.

[5] It should be noted that Rossi-Le's (1995) work does address all of them.

therefore results can be compared. In this sense, studies on general learning strategies and those related to oral comprehension are going to be described.

As far as general learning strategies are concerned, all the authors use Oxford's (1990) *Strategy Inventory for Language Learning* (*SILL*), with the exception of Rossi-Le (1995), who uses the 1986 version since her article is prior to 1990. As this one, in addition, discards the Group and Individual styles of her analysis, it is impossible to compare her work with the others; however, it is appropriate to mention that Rossi-Le (1995) observed that the Auditory style correlates with more strategies, since it presents connections with the independent strategies, memory and authentic use of language. She also notes that there are two strategies that correlate with more than one style: self-management (with the Kinesthetic and Tactile styles) and communicating meaning (with the Visual and Tactile styles).

The conclusions reached by the other authors are not homogeneous (Table 4). According to Farajolahi and Asghar (2014), no style correlates with compensatory or memory strategies, but for Saleh Alkahtani (2016) perceptive styles correlate with all strategies. On the other hand, Gorevanova (2000) observes that Group style correlates with metacognitive and social strategies. These results are similar to those of Farajolahi and Asghar (2014), for whom Group style also correlates with cognitive strategies. Finally, Tabanlioğlu (2003) shows that the greatest correlations are found between Auditory style and memory and cognitive strategies.

Table 4. Correlations between learning styles and strategies (*SILL*, Oxford 1990)

STYLES	Gorevanova (2000)	Tabanlioğlu (2003)	Farajolahi and Asghar (2014)	Saleh Alkahtani (2016)
Visual	-	-	-	Memoristic Cognitive Compensatory Metacognitive Affective Social
Auditory	-	Memoristic Cognitive	-	-
Kinesthetic	-	-	-	-
Tactile	-	-	-	-
Group	Metacognitive Social	-	Metacognitive Social Cognitive	-
Individual	-	-	-	-

The studies by Tzuching Chen et al. (2010) and Jowkar (2012) on the relationships between styles and strategies of learning listening comprehension use different instruments: the former uses the *Listening Comprehension Strategy Inventory* (*LCSI*) by Vandergrift et al. (2006) and the latter the *Listening comprehension strategy questionnaire* (*LCSQ*) by Oxford (1990). What is most interesting about both studies is that Kinesthetic style correlates with cognitive strategies, according to Tzuching Chen et al. (2010), and with social and memory strategies, according to Jowkar (2012).

Regarding reliability, there are studies that provide Cronbach Alpha coefficient of the entire questionnaire and of each of the scales. In the first case (Table 5), the results would indicate that the *PLSPQ* would be a reliable instrument, since all the works present acceptable values (higher than .7).

Table 5. *PLSPQ's* Cronbach Alpha coefficient

Authors	Cronbach Alpha
Itzen (1995)	.85
Tabanlioğlu (2003)	.82
Tzuching Chen et al. (2010)	.941
Shen (2010)	.93
Teshome (2012)	.84
Khmakhien (2012)	.873

Vaseghi et al. (2013)	.72
Karthigeyan and Nirmala (2013)	.72
Ghezlou et al. (2014)	.81
San and Ye (2014)	.71
Zhang (2015)	.805
Vakilifard (2016)	.78
Saleh Alkahtani (2016)	.89
Sun and Teng (2017)	.86

The situation changes, however, when the internal consistency analysis is applied to each subscale (Table 6), as the coefficient does not always present acceptable levels. In this case, the perceptual styles have the lowest values, specially the Auditory and Visual styles. The Group and Individual styles, on the other hand, always have acceptable levels, which would be in line with Reid's (1990: 331) observations: «In fact, only the Group and Individual constructs would remain if the statements that correlated least well were eliminated».

Table 6. Cronbach Alpha coefficients of the *PLSPQ* subscales

Authors	Visual	Auditory	Kinesthetic	Tactile	Individual	Group
Wintergerst et al. (2001)	.37	.39	.69	.59	.75	.87
Isemonger and Sheppard (2007)	.37	.39	.76	.67	.84	.83
Naserieh (2009)	.68	.73	.78	.70	.89	.85
Peters et al. (2008)	.68	.53	.72	.80	.90	.91
Naserieh and Anani Sarab (2013)	.50	.59	.64	.69	.82	.79
Saleh Alkahtani (2016)	.677	.582	.805	.675	.820	.849
Sun and Teng (2017)	.60	.51	.78	.77	.77	.79

5. Conclusions

The *PLSPQ* is the most widely used instrument for identifying the learning styles of language learners. It has been used in studies in more than 20 countries and it has been translated into 9 languages. Despite its wide dissemination among the scientific community, the studies analysed in this paper indicate that there is a significant gap in many of the research that have used the *PLSPQ*: no validity or reliability tests have been carried out.

As far as validity is concerned, the data obtained would not indicate conclusive results because the structure of the questionnaire varies according to each author: from three to seven possible learning styles. Moreover and depending on the study, the same style can present different behaviors: 1) it can appear as an autonomous style, 2) it can join another one and form a new style in which each one of them would be the opposite pole of a continuum or 3) it can disappear from Reid's initial proposal.

As far as reliability is concerned, only Individual and Group styles show acceptable values. This would imply that the *PLSPQ* would not be a good instrument for identifying sensory styles, but would be suitable for social styles.

In summary, before continuing to use the *PLSPQ* as a resource to identify the learning styles of language learners, it is essential to improve its validity and reliability. Regarding the former, factorial analysis is recommended, and in terms of reliability it could be improved by modifying the questionnaire items and calculating Cronbach Alpha. Otherwise, the results obtained would lack the scientific rigor required of any research and, as a consequence, would not contribute to the validation (or refutation) of the theory of learning styles. And this is fundamental in determining whether it is a valid theory or just a myth.

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