

## Research Paper

## A New Persian Version of Language Assessment, Remediation, and Screening Procedure (P-LARSP)



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**Citation** Salmani M, Asadi M, Tohidast SA, Shekariyan T, Shah Hoseyni F. A New Persian Version of Language Assessment, Remediation, and Screening Procedure (P-LARSP). *Iranian Rehabilitation Journal*. 2022; 20(4):517-528. <http://dx.doi.org/10.32598/irj.20.4.1470.1>

**doi** <http://dx.doi.org/10.32598/irj.20.4.1470.1>

**Article info:**

**Received:** 09 Feb 2022

**Accepted:** 14 May 2022

**Available Online:** 01 Dec 2022

**Keywords:**

Language, Language tests, Screening, Children, Language remediation, Speech-language pathology

**ABSTRACT**

**Objectives:** In 1998, the Persian form of Language Assessment, Remediation, & Screening Procedure (P-LARSP) was introduced. However, this adapted version remained on library shelves and was not used by Iranian speech and language pathologists (SLPs). The present study aimed to explore the barriers to using P-LARSP, resolve the possible issues, and provide a preliminary grammatical sketch from typical children aged 2-5.

**Methods:** The study started with two surveys in two different populations to find the possible barriers and then, continued with the cross-cultural adaptation of the LARSP through international guidelines (forward and backward translations, cognitive interviewing, and pretesting). Finally, by the new P-LARSP, 120 language samples obtained from children (aged 2-5) in a free-play context were analyzed and data were processed in SPSS software, version 21.

**Results:** Our surveys showed that Iranian SLPs had little familiarity with the P-LARSP, and they found it unclear, and difficult to understand the framework. While most of the participants recognized the P-LARSP as a relevant framework to analyze language samples, few numbers of participants used the P-LARSP with clinical or research aims. Through cross-cultural adaptation, a simple, clear, relevant, comprehensive, and applicable Persian profile along with a published manual was obtained and introduced to the SLPs through social media, workshops, and national congresses. Quantitative and qualitative analysis of 120 language samples showed grammatical structures have significant changes by age in terms of numbers and varieties of clauses, phrases, inflectional morphemes, and general syntactic indices.

**Discussion:** The present study revealed why the P-LARSP remained unknown. We removed the barriers by introducing a new version of P-LARSP fully in Persian and increasing its simplicity, clarity, and understandability with a proper manual. Introducing the new version through proper channels to the target population was another taken step to increase the familiarity of the Iranian SLPs. In addition, the preliminary data indicated that the new P-LARSP with its manual is applicable to the language samples taken from typically developing children.

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## Highlights

- The present study revealed why P-LARSP as introduced by Samadi and Perkins was not used by Iranian speech and language pathologists.
- A newly adapted version along with a manual version was introduced to Iranian speech and language pathologists with the hope to increase the use of the new P-LARSP.
- A preliminary morphosyntactic sketch based on language samples of 120 Persian-speaking children in a free-play context was introduced to the Iranian speech and language pathologists.

## Plain Language Summary

The Persian version of Language Assessment, Remediation, and Screening (known as P-LARSP) was produced in 1998. However, some technical issues left this profile on the library shelves. Through this study, we removed most of those barriers, made the P-LARSP fully in Persian and applicable to the research and clinical fields, and provided preliminary data on how Persian-speaking children acquire the morphosyntactic features.

### 1. Introduction

Language Assessment, Remediation, and Screening Procedure (LARSP) was introduced by Crystal, Fletcher, and Garman in 1976 to be used by speech pathologists, teachers, and other professionals concerned with teaching and study in relation to morphosyntactic disabilities [1]. The LARSP received a lot of revisions and finally, its final form was introduced in a book named “Profiling Linguistic Disability” in 1992 [2]. Since then, considerable studies have been done on the adaption of the LARSP into other languages [3-5]. The results of these studies came out as two books named “Assessing Grammar: The Languages of LARSP” and “Profiling Grammar: More Languages of LARSP”, which brought different versions of the LARSP in 25 different languages around the world [6, 7]. This process made the LARSP as a widely used framework in the analysis of the expressive grammatical ability in children and adults with language problems.

Using a well-known framework, such as LARSP or its adapted versions would facilitate the cross-linguistically framed language development studies. Such studies usually have taken place for two purposes: testing the claims of universalism and focusing on language-specific particularism [8]. These two aims are complementary, which means in research to reveal how children acquire a specific language in general, the researchers are able to show the language-specific acquisition paths of learners. Although the advantages of cross-linguistic studies have been confirmed, only 2% of the world's

languages received at least one language development study [9]. Except for these recent studies, there is very little information about how discourse is structured (morpho-syntactically) in non-English languages [9]. This situation of relative ignorance warrants effortful cross-linguistic studies on caregiver-child interactions. Among different approaches to studying children's language, language sample analysis produces well-worth outcomes, especially when the culturally relevant settings and a proper recording, transcription, coding, and analysis of interactive discourse frameworks, such as LARSP have been chosen.

Persian is one of those non-English languages that has been understudied. The Persian-LARSP or P-LARSP was the first formal framework, an invaluable resource for Iranian speech-language pathologists (SLPs) and other professionals interested to work on the grammatical abilities of Persian people with language problems of different ages produced by Samadi and Perkins in 1996 [5]. The purpose of the P-LARSP was to provide a grammatical sketch of the Persian language, a brief overview of Persian grammar, and a description and justification for the profile. However, there are drawbacks to using this profile for clinical and research purposes. The profile was not written in the Persian script, without a user guide, and accompanied by a grammatical sketch based on the language samples of three children who have been followed in different timelines (1.8 and 3.0, 2.2 and 3.2 and 2.4, and 3.4).

A review of available studies indicated that Iranian SLPs have not used the P-LARSP neither in research nor in speech and language pathology clinics. For example, in 2006, Ghelmani Pour investigated some of the morphosyntactical structures in children aged 1.6-2.6 according to LARSP instead of P-LARSP [10]. In 2015, Kazemi et al. provided a systematic review of child language development and disorder studies in Iran [11]. They found the Iranian descriptive studies -all after 1998- did not have any formal procedures, such as P-LARSP or SALT to investigate the structure of the Persian language. In another part of their results, they introduced studies on language test development and evaluation of psychometric features of available Persian language tests. Again, P-LARSP as a comprehensive formal tool that could provide a lot of morphosyntactic information along with some discourse analysis was not part of psychometric evaluation studies in Iran.

There are remarkable reasons that explain why Iranian SLPs need to administer the language sample analysis through a formal framework. Kazemi showed the necessity of using language sample measures for Iranian children to reach an accurate diagnosis. Besides, in her survey among Iranian SLPs, while over 80% of participants reported using language sample analysis to evaluate children, less than 10% used “natural sampling” (a spontaneous language sample taken from an interaction between a child and a communication partner) [12]. A review of the literature available in the [Scientific Information Database \(SID\)](#), and [Iranian Research Institute for Information Science and Technology](#) as Iranian local resources in addition to [Google Scholar](#) using different keywords (for example Morphology, syntax, morphosyntactic structures, development of morphology, development of syntax, ...) indicated that other studies concerned with morphosyntactic structures in typical children or children with any type of language impairment used their own procedures. They usually used mean length of utterances [13-15], different types of morphemes [16], and researcher-made tasks [17]. These kinds of methodological differences make cross-linguistic comparisons difficult.

The research team of the present study assumed the P-LARSP would provide a proper framework to run the cross-linguistic study in Persian. Even compared with the SALT-2012 research version [12], regarding using the P-LARSP, researchers do not need to adapt the transcriptions. Therefore, in 2017, the language research team at Semnan University of Medical Sciences started a series of studies using the P-LARSP. This paper aimed to:

- Clarify the barriers that the Samadi's version of P-LARSP was not implemented by Iranian SLPs;
- Find and apply a proper solution -here we mean an international approach to adapt and make a new version of P-LARSP- for each of those barriers;
- Derive the pattern of morphological-syntactic development in Persian-speaking children based on the P-LARSP.

## 2. Materials and Methods

### Phase 1: Barriers to use P-LARSP

The aim of the first phase was to identify the barriers that Iranian SLPs confronted in the use of the P-LARSP.

#### Procedure

The Iranian SLPs -with at least a year of work experience and registered in the database of the Iranian speech and language therapy association- were invited to participate in this study through social media groups. They all received the original P-LARSP form (as published in “Assessing Grammar: The Languages of LARSP”), an invitation letter, an information sheet, and a consent form. Those SLPs who agreed to participate were invited to complete our survey. The survey included seven questions with a 5-point Likert scale as an answer sheet ([Tables 1 and 2](#)). The experts (because of their job demands) answered an extra question: “how much do you think the current version of P-LARSP is in Persian?”.

#### Participants

Thirty SLPs from different backgrounds (universities and clinics) completed the survey. Ten participants worked as faculty members in different universities (their mean±SD for age was 39.56±8.03; eight females and two males; three had a master's degree in speech-language pathology, and seven had a PhD degree in speech-language pathology; the Mean±SD years of work experience was 16.2±7.98); all had research and clinical backgrounds mainly in the language field. We considered this group as ‘experts’.

The other 20 participants worked in clinics and had different interest areas (mean±SD for age was 31.56±9.7; 13 females and 7 males; 8 with a bachelor's degree, 8 with a master's degree, and 4 PhD degree; years of work experience = 9.25±9.09; 11 cases worked in language field; 18 cases had research experiences, and 11 cases had a history of teaching in universities). We considered this group as ‘clinicians’.

**Table 1.** Survey on experts' opinions about the first version of P-LARSP (n=10)

| Number | Question   | Very Little | Little | To Some Extent | Much | Very Much |
|--------|--|-------------|--------|----------------|------|-----------|
| 1      | Are you familiar with the P-LARSP?   |             | 4      | 4              | 2    |           |
| 2      | Have you ever used the P-LARSP in your clinical activities?  | 8           | 2      |                |      |           |
| 3      | Have you ever used the P-LARSP in your research activities?  | 9           | 1      |                |      |           |
| 4      | How much do you think the current version of the P-LARSP is clear?   | 5           | 4      | 1              |      |           |
| 5      | How much do you think the current version of the P-LARSP is simple and understandable?                                   | 7           | 2      | 1              |      |           |
| 6      | How much do you think the current version of the P-LARSP is related to the morphosyntactic features of Persian grammar?  |             |        | 2              | 5    | 3         |
| 7      | How much do you think the current version of the P-LARSP is applicable in clinical settings to analyze language samples? | 8           |        | 2              |      |           |

P-LARSP: Persian form of Language Assessment, Remediation, &amp; Screening Procedure

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### Phase 2: How could we make the P-LARSP a daily clinical tool?

When the barriers to using Samadi's P-LARSP were clarified in the previous step, the research team designed this phase to resolve most of those issues. The main steps of this phase were taken place according to the WHO guideline [18], and Beaton et al. procedure outlines [19] in order to do the cross-cultural adaptation. Figure 1 represents the stages that researchers followed in the present study.

### Forward translation

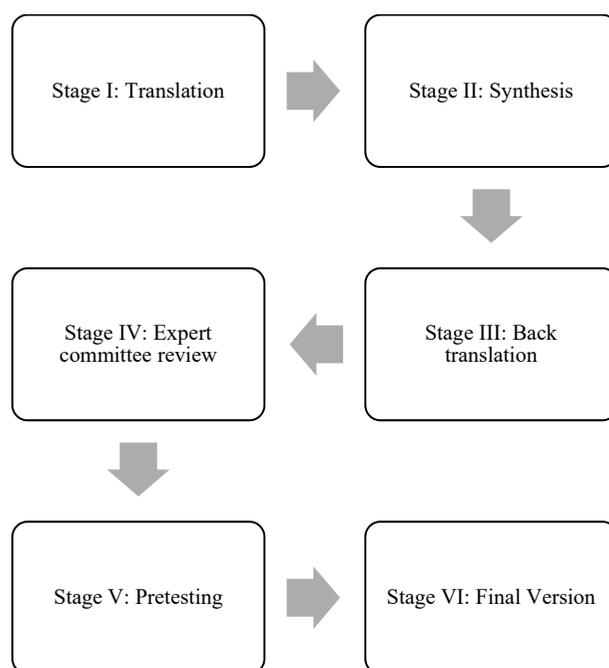
Two independent, native Persian speakers who spoke English (as their second language) fluently translated the P-LARSP into Persian. They reported any difficulty or ambiguity in the translation. The reported difficulties and ambiguities were reviewed by the first author. She resolved any discrepancy between the two translated versions with special emphasis on lexical choice and nuanced terms in Persian. Hence, through a meeting, the translators and the other team members synthesized the two translated versions and produced a single, consensus-based Persian version.

**Table 2.** Survey on clinicians' opinions about the first version of P-LARSP (n=20)

| Number | Question   | Very Little | Little | To Some Extent | Much | Very Much |
|--------|--|-------------|--------|----------------|------|-----------|
| 1      | Are you familiar with the P-LARSP?   | 8           | 3      | 8              | 1    |           |
| 2      | Have you ever used the P-LARSP in your clinical activities?  | 16          | 3      |                | 1    |           |
| 3      | Have you ever used the P-LARSP in your research activities?  | 19          | 1      |                |      |           |
| 4      | How much do you think the words and phrases in the P-LARSP are understandable?   | 8           | 3      | 7              | 2    |           |
| 5      | How simple do you think the application of the P-LARSP would be?   | 4           | 9      | 7              |      |           |
| 6      | How much do you think the P-LARSP in its current form matches Persian grammar?   | 7           | 7      | 6              |      |           |
| 7      | How much do you think you can use the current version of the P-LARSP in clinical settings to analyze language samples? | 6           | 8      | 6              |      |           |

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**Figure 1.** Steps toward making a clinical Persian form of Language Assessment, Remediation, & Screening Procedure (P-LARSP)

### Backward translation

Two independent translators (blinded to the original P-LARSP/LARSP and without any role in the previous part) translated the new Persian version into English. The research team intended to ensure that the forward translation into Persian was taken place accurately and the new Persian version reproduced the content of the original P-LARSP. Besides, identifying any conceptual errors in the translation process was another motive to run the backward translation [19]. Both English forms were compared with each other, and with the original version.

### Pre-testing

The new Persian version obtained from the previous part should have been applied to spontaneous language samples. Thus, ten participants aged 4-5 years old (after their parents consented) were recruited from a random kindergarten. The children participated in an interaction with an experienced SLP. The children had typical development in all areas evaluated by an adapted version of the ages and stages questionnaire and the family physicians. The context was free-play and the length of each interaction was 20 minutes. The first three minutes of each interaction were excluded to eliminate the warm-up effect. Then, an experienced SLP continued the transcription to reach 100 analyzable units according to the

LARSP principles. The SLP segmented and allocated morphosyntactic structures of the language samples regarding the translated profile and the translated chapter of Crystal's book.

As a clinical-based SLP, she needed definitions for each part and section and this information was not provided in the Persian chapter of Crystal's book. The first author with plenty of experience in LARSP [20] and the SLP went through language samples and analyzed them by Samadi's P-LARSP but they had to use LARSP as introduced in different books and papers [1, 2, 21] because the P-LARSP was not informative (research team contacted the original author of P-LARSP through electronic-mails to get help and used her thesis as a manual too). For ten language samples, the language sample analysis looked like a hectic, problematic, and time-consuming job. Many utterances looked ambiguous. The language team received a report from this stage that included the difficulties of the P-LARSP and the next step was started.

### Phase 3: The solution

When the research team realized that the cross-cultural adaptation did not resolve all latent issues in P-LARSP, they provided a draft of the P-LARSP manual and the final version of the new P-LARSP. Fifteen academic experts in different universities in Iran who had language

**Table 3.** Information related to language sample analysis

| Topic                    | Description  |
|--------------------------|--|
| Sampling context         | Type of context: free play to get a natural perspective.<br>Procedure for eliciting sample: self-generated although SLPs were allowed to ask questions.<br>Participants: Two speech and language pathologists & typical children.  |
| Sample length            | 20 minutes however the first three minutes were eliminated to avoid the potential of warm-up and the rest were transcribed.<br>The analysis was continued as long as the SLPs reached 100 analyzable utterances or analyzable-unit (a-unit)  |
| Transcription procedures | Two speech and language therapists transcribed all language samples. They were blind to the participant's condition. All meaningful sounds from the SLP and child were transcribed.<br>Training of transcribers by the rules of the P-LARSP.<br>The transcription was segmented according to Fletcher and Garman [21]. |

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studies in their resumes were invited to evaluate the draft and confirm the content and face validity of the new P-LARSP. As the last stage, to evaluate the potential clinical use of the P-LARSP [19], three different studies on children with Down syndrome [22], children with moderately-severe hearing loss [23], and typical children [24] were performed. The research team evaluated the applicability of the manual and the new P-LARSP on populations with and without language disorders. The results were promising.

### Phase 4: Language pattern for children with typical language through P-LARSP

When our efforts in previous studies came out assuring, the language team decided to provide a stronger language sketch for Persian-speaking children. Two trained SLPs interacted with 120 children aged between 24 and 60 months. All children had typical development according to direct observation, their health profile kept by the kindergartens, the result of the ages and stages questionnaire [25], and the teachers' reports. The SLP and language samples from phase 2 were not included in this phase.

**Table 4.** Quantitative aspect in P-LARSP (data collected from free play context)

| Morphosyntactic Stages |        | Mean±SD      |               |               | P      |
|------------------------|--------|--------------|---------------|---------------|--------|
|                        |        | 24-36 Months | 37-48 Months  | 49- 60 Months |        |
| Stage I                | Minor  | 16.46±10.359 | 15.23±7.267   | 11.03±7.262   | 0.018  |
|                        | Major  | 23.29±9.689  | 15.67±7.626   | 14.03±8.837   | 0.001  |
| Stage II               | Clause | 12.17±6.479  | 11.33±6.381   | 9.60±4.447    | 0.141  |
|                        | Phrase | 20.54±9.882  | 32.73±13.277  | 47.91±18.286  | <0.001 |
| Stage III              | Clause | 17.04±6.906  | 22.13±7.473   | 20.57±7.151   | 0.033  |
|                        | Phrase | 10.67±5.961  | 12.77±6.229   | 20.09±6.926   | <0.001 |
| Stage IV               | Clause | 8.92±5.484   | 13.13±6.296   | 18.26±7.659   | <0.001 |
|                        | Phrase | 4.21±4.118   | 5.00±3.930    | 7.77±4.291    | 0.002  |
| Stage V                | Clause | 3.67±2.869   | 6.07±3.930    | 13.74±9.391   | <0.001 |
|                        | Phrase | 0.33±0.565   | 0.50±0.861    | 2.11±3.104    | 0.019  |
| Stage VII              |        | 2.17±3.226   | 3.50±4.486    | 6.83±7.668    | 0.001  |
| Affixes                |        | 86.87±29.323 | 112.00±28.129 | 153.94±47.528 | <0.001 |

P-LARSP: Persian form of Language Assessment, Remediation, & Screening Procedure

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All language samples received in-depth evaluation through the new P-LARSP. Details on how language samples were taken and analyzed (from sampling context to reliability between language analyzers) are displayed in Table 3. Ten percent of these language samples were transcribed, segmented, and analyzed by a trained master student in speech therapy. A point-by-point agreement was applied and between 90 and 98% of the agreement was obtained for transcribing, segmenting, analyzing, and allocating the structures in different sections of the new P-LARSP.

The SLPs filled out a P-LARSP profile for each child. To provide a preliminary norm-referenced sketch, we used a productivity criterion of two appearances of each structure of interest within a 50- to 100- utterance language sample. Besides two-thirds of children in each age group must show this criterion for each structure otherwise structure was not reported for that age group.

### Statistical analysis

The study variables and their definitions are presented in Appendix 1. The descriptive indices were mean and standard deviation (SD). The comparison was done through the Kruskal-Wallis test. The level of significance was 0.05 for all analyses.

## 3. Results

Through this exploratory study, different aspects of the clinical use of P-LARSP were highlighted.

### Phase 1: What was the barrier?

The P-LARSP was not introduced properly to the Iranian SLPs (Tables 1 and 2) because only 10% of our respondents reported the level of their familiarity as “much”. Eighty percent of respondents used the P-LARSP “very little” in their clinical settings and over 93% of them used the P-LARSP “very little” for research purposes.

Approximately 70 % of the participants reported the clarity and simplicity of Samadi’s version of P-LARSP as “little” or “very little”. Almost half of the respondents believed that Samadi’s version had “little” applicability in clinical settings. At the same time, for half of the participants, the P-LARSP looked “to some extent” or above relevant to Persian grammar. The expert group also reported the P-LARSP was not in Persian.

### Phase 2: The fully Persian P-LARSP

The new P-LARSP was prepared fully in Persian. The experts evaluated the new version simple, clear, fully in Persian, comprehensive, relevant, and necessary. The research team did not change the number of items in the new P-LARSP. Except for the “sentence” that we replaced with “utterance”, the other words and phrases remained untouched.

### Phase 3: The Persian manual for the new P-LARSP

A manual was written to help experts and clinicians to use the new P-LARSP. To increase the applicability of the new P-LARSP, three studies were performed and the

**Table 5.** The clause and phrase structures reached to the productivity index (27 out of 40)

| Stages |        | Statement               |                                   |                                   |
|--------|--------|-------------------------|-----------------------------------|-----------------------------------|
|        |        | 24-36 Months            | 37-48 Months                      | 49-60 Months                      |
| II     | Clause | CV                      | VI                                | VI                                |
|        | Phrase | PrN/Pron- NAdj- ObjO/ro | PrN/Pron- NAdj- ObjO/ro- NN- Pron | PrN/Pron- NAdj- ObjO/ro- NN- Pron |
| III    | Clause | XVI- CompVI             | XVI- CompVI- XCV                  | XVI- CompVI- XCV                  |
|        | Phrase | Adj/NVI                 | Adj/NVI                           | Adj/NVI                           |
| IV     | Clause | XCompVI                 | XCompVI- Other                    | XCompVI- Other- AОВI              |
|        | Phrase |                         |                                   | XcX                               |
| V      | Clause | Coord. 1                | Coord. 1                          | Coord. 1 & Subord. 1: O           |
|        | Phrase |                         |                                   |                                   |

**Table 6.** The Inflectional morphemes reached productivity index

| No.     | Inflectional Morphemes                | Definitions  | Children With Typical Hearing |              |              |
|---------|---------------------------------------|--|-------------------------------|--------------|--------------|
|         |                                       |  | 24-36 Months                  | 37-48 Months | 49-60 Months |
| 1 & 2   | Verb/Complement + Personal Pronoun    | Personal affixes attach to roots of verbs, which are -am, -i, -e, -im, -id, -and.  | ✓                             | ✓            | ✓            |
| 3       | Nouns/pronouns + Possessive Pronouns  | Six inflections as possessive determiners (am,-et/t, -esh, -mun, -tun, and -shun, for the 1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> person singular and plural respectively) are attached to nouns/pronouns. | ✓                             | ✓            | ✓            |
| 4       | Prefix /be- bo- biy/                  | These prefixes are added to the present root in order to express either imperative or subjunctive forms of the verb.   | ✓                             | ✓            | ✓            |
| 5       | Negation Prefix                       | If the prefix /ne, na/ attach to the beginning of main verbs/modal auxiliaries, verbs will turn to negative mode.  | ✓                             | ✓            | ✓            |
| 6       | Plural Marker                         | To form plural nouns, countable & mass nouns receive one of these suffixes: (h)a: or a:n.  | ✓                             | ✓            | ✓            |
| 7       | Object marker                         | Usually, objects would be marked by the suffix o/ro.   | ✓                             | ✓            | ✓            |
| 8       | Prefix /mi/ as a Tense Marker         | To form the present, present continuous and future tense, the prefix mi- should be added to the verb root.   | ✓                             | ✓            | ✓            |
| 9       | Ezafe marker /e, ye/                  | Noun, adjective, and prepositional phrases have specific construction: the head of phrase + unstressed morpheme e/ye + modifiers and complements.  | ✓                             | ✓            | ✓            |
| 10      | /i/ as Indefinite Marker &            | Most Persian nouns appear to be definite unless they receive -i which is the indefinite suffix.  |                               |              |              |
| 11      | /e/ as Definite Marker                | Singular names can be shown as definite when the suffix -e is added to their ends.   |                               |              |              |
| 12      | Past Participle Inflection /e/        | To make the past participle form of verbs, speakers add the suffix /e/ to the past root, which is followed by an auxiliary verb.   | ✓                             | ✓            | ✓            |
| 13 & 14 | Comparative & Superlative Inflections | The two inflectional morphemes -tar & -tarin can be added to the adjectives and produce comparative and superlative utterances.  |                               |              |              |

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results were optimistic [22-24]. Then, the manual was sent to the original developer of P-LARSP and she confirmed the content and granted us to publish the manual. The Persian manual of the new P-LARSP was published in 2020 [26] and it is available for all clinicians, researchers, teachers, and language professionals.

posters at Iranian national and international congresses (2017, 2018, & 2019). The manual of the speech-language pathology was introduced to the academic population of SLPs through social media with the hope that they can use it for clinical and research purposes.

To increase the familiarity of the Iranian SLPs with the new P-LARSP, the research team had presentations and

**Table 7.** The mean length of utterances (MLU) and type-token ratio (TTR) in children aged between 24 and 60 months

| Variables                 | Mean±SD      |              |               | P-Value |
|---------------------------|--------------|--------------|---------------|---------|
|                           | 24-36 Months | 37-48 Months | 49- 60 Months |         |
| Mean Length of Utterances | 2.96±0.69    | 3.78±0.62    | 4.84±0.98     | <0.001  |
| Type-Token Ratio          | 0.48±0.08    | 0.45±0.06    | 0.43±0.07     | 0.041   |

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#### Phase 4: Preliminary data on different sections of P-LARSP

It was important to know the applicability of the new P-LARSP to the target population. The study participants were in three age groups (40 children in each) and their mean age was  $30.46 \pm 3.73$ ,  $40.93 \pm 3.68$ , and  $53.11 \pm 4.97$  years.

#### Unanalyzable utterances

To reach 100 analyzable units, the number of unanalyzable utterances was different in each age group. The mean age of 2, 3, and 4 years old children was  $14.08 \pm 9.09$ ;  $12.27 \pm 6.8$ ; &  $10.43 \pm 7.54$ , sequentially.

#### Analyzable units: clause, phrase, & inflectional morphemes

In P-LARSP, SLPs can have quantitative and qualitative perspectives, each presented in Tables 4, 5, and 6. As expected, the number of structures in stage 1 decreased with age, while the number of clause structures in other stages increased. Except for the clause structures in stage 2, the differences among age groups for the number of clause structures were significant ( $P < 0.05$ ). The results of the qualitative part (variety of clause and phrase structures) are presented in Tables 5 and 6.

#### Mean length of utterances (MLU) & Type-Token ratio (TTR)

Table 7 displays data regarding the last line of the P-LARSP. The significant increasing trend of MLU and decreasing trend of TTR with age showed the increase of morphosyntactic complexity.

## 4. Discussion

LARSP is one of the most common formal frameworks in the analysis of expressive grammatical ability in children and adults with language problems [3]. Therefore, adapting the LARSP for use in different languages can provide an appropriate universal platform for clinicians and researchers in the field of language development and language disorders. So far, LARSP has been adapted for use in some languages. including French, Welsh, Malay, Chinese, Colombian Spanish, and Persian [3, 5, 27-29]. While Persian LARSP developed by Samadi and Perkins (we called it Samadi's version) was one of the first adapted ones [5], Persian linguistic professionals did not implement Samadi's version in their activities. For this reason, the present study investigated the limited use of Samadi's P-LARSP and resolved the barriers that cause this lack of use.

According to the Iranian SLPs (both experts and clinicians) who participated in the study, there were some issues related to Samadi's version of Persian-LARSP that made it difficult to use. Most SLPs were not familiar with Samadi's version; thus, they did not use the P-LARSP in their clinical and research activities. Moreover, they reported that Samadi's version was not understandable and applicable. It should be noted most of the SLPs and academic staff believed that P-LARSP is relevant for language analysis. These issues indicated the need to revise Samadi's version of the LARSP and produce a new version that was more applicable and understandable.

The original version of Samadi's P-LARSP was adapted again to Persian for removing barriers identified in phase one of the present study. To this end, international standard guidelines were used based on Beaton et al. and WHO suggestions [18, 19]. The stages that were used for adaptations included forward translation, backward translation, pre-testing and cognitive interviewing, preparation of manual, and pre-testing of the new P-LARSP. Given that each of the adapted versions to other languages than the original language of the LARSP takes into account consideration the special nature of the morphosyntactic structure and omits in the target language's, adapting and adding items to consider this nature [3]. These stages used in the current study can guarantee these mentioned issues to expand the use of the newly adapted version of the P-LARSP by Iranian clinicians and researchers. Our study found that under controlled conditions to take language samples, the new P-LARSP is a valid, and reliable framework to analyze language samples. The information was not provided by Samadi and Perkins in 1998 and 2012 [5] and according to the literature, the absence of this information would cause problems in the use of clinical tools [30].

The present study provided a preliminary norm-referenced morphosyntactic sketch for the Iranian SLPs. The first and most noticeable finding was that none of the imperative or interrogative structures in the P-LARSP reach the productivity index. Such a finding might be a consequence of a communication partner who was an unfamiliar person to the children; thus, children took her as their superior and tried not to give orders or ask questions. Secondly, very few numbers of structures met the productivity index, and the increase in the number of structures was still limited. The such finding might be an artifact of free-play context that would not provoke children to use complex structures or have varieties in their clauses and phrases [31]. Thirdly, although children used limited types of syntactic structures, the MLU still increased significantly with age. Since the types of clauses

and phrases had limited varieties among age groups, the increase in MLU might be a result of complexities that children added to their words by using inflectional morphemes. The number of inflectional morphemes in 5-year-old children was twice that of the 3-year-old children, which confirmed this assumption. This finding was in agreement with the findings reported by Salmani et al. [23]. Besides, the TTRs showed a marginally significant decrease among age groups, which can be a consequence of the increase in the use of inflectional morphemes. Finally, the definite and indefinite markers and comparative and superlative inflections did not meet the criterion of the productivity index. This finding can be partly explained by the context and communication partner and might be the result of their frequency of use in Persian speakers.

## 5. Conclusion

The findings of the current study revealed that Persian-speaking users (SLPs) of the P-LARSP were not familiar with this language profile. Iranian SLPs confronted with many problems for using the first adapted P-LARSP. Therefore, they did not use it often or always in clinical settings and for research purposes. To remove these barriers, we adapted a new P-LARSP without previous problems based on international guidelines. Finally, the use of the newly adapted version of P-LARSP in analyses of the Persian language in the current preliminary study has been convincing enough for its usage in the future.

### Limitation

The present study used free play as the context to collect language samples that limited the complexity of language structures that children used. An unfamiliar communication partner was another source of influence that cannot be ignored. Future studies may repeat Persian language studies using the new P-LARSP with different contexts (narrative or conversation) and a familiar person as the child's communication partner. The research forum for the new P-LARSP is still open by the language team at the Semnan University of Medical Sciences to find proper ages for each morphosyntactic stage and to remove those structures that will not meet the productivity index by other studies with the different methodological conditions.

## Ethical Considerations

### Compliance with ethical guidelines

The Ethics Committee of [Semnan University of Medical Sciences](#) approved the study protocol (Ethics Code:

IR.SEMUMS.REC.1397.162). The consent to implement this study and publish results was taken from the original author of P-LARSP through electronic mail. In all phases, the participants were not subjected to any harm. The participation was based on willingness, and the participants or their guardians have the rights to withdraw from the study at any stage if they wish. All the participants' information has been kept confidential and anonymous. We avoid any deception or exaggeration about the aims and objectives of the research. We communicated with participants and any involved person in the study with honesty and transparency and avoided providing any type of misleading information or data presentation.

### Funding

[Semnan University of Medical Sciences](#) that supported this study financially (Grant No.: 1476).

### Authors' contributions

All authors equally contributed to preparing this article.

### Conflict of interest

The authors declared no conflict of interest.

### Acknowledgments

The authors would like to thank [Semnan University of Medical Sciences](#) for financially supporting this study. We are also grateful to the families and children for their participation.

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**Appendix 1.** Definition of the variables in the present study

| No. | Variable Name             | Definition  |
|-----|---------------------------|---|
| 1   | Unanalyzable utterances   | <p>Unintelligible: The SLP could not retrieve some or all of an utterance after three times listening</p> <p>Symbolic Noise: when a child imitated noises such as animals' sounds from the real world.</p> <p>Deviant: Utterances that did not follow the typical patterns of the child or adult language that have been characterized in terms of morpheme order, morpheme addition, morpheme omission, or morpheme substitution.</p> <p>Incomplete: Utterances that have not been finished and marked by their prosody.</p> <p>Ambiguous: When the SLP could not allocate an utterance to a specific grammatical group, even considering the context of the analysis.</p> <p>Stereotyped: utterances e.g. greetings that speakers learned partially or completely as single units,</p> <p>Repetition: In this study, if the child repeated the whole or part of SLP's stimulus, those repetitions were recorded as 'Repetitions' and considered unanalyzable.</p> <p>Structurally abnormal: Where the grammatical pattern of the child's response does not match that required by SLP's stimulus.</p> |
| 2   | Analyzable utterances     | <p>All analyzable-units that are classified in sections B &amp; C of P-LARSP. Text-units or a-units are considered as:</p> <p>Minor elements, such as the filled pause;</p> <p>Lexical elements consisting of only a single word which were not part of a larger phrase or clause pattern;</p> <p>Phrasal elements consisting of a phrase pattern;</p> <p>Clausal elements.</p> <p>Specific rules for complex utterances including 'and' consider the anaphoric relationship.</p>   |
| 3   | Mean length of utterances | Number of morphemes/100 a-units   |
| 4   | Type-token ratio (TTR)    | The total number of unique words (types) divided by the total number of words (tokens) in 100 a-units. The closer the TTR ratio is to 1, the greater the lexical richness of the segment. Morphologically inflected variants of words (e.g. take, takes, taking) were counted as a single word type.  |