

## Playing Difficult to Understand? -- Single-verb Sentences and Nominal Sentences in Marathi

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### Abstract

The significant role of the verb in the sentence semantics has been established by various theories of verbal cognition in ancient Sanskrit literature as well as in the modern Linguistics. While a few theorists explain a sentence from a structural point of view, others consider the semantic aspect of it. We study the very first sentence-definition given by an ancient Indian grammarian and philosopher *Bhartr̥hari* in the second chapter of his magnificent work ‘*Vākyapadīya*’ (circa 5<sup>th</sup> Century CE) which attributes the status of a sentence to a single-verb in the conversations.

This paper attempts to investigate the cognitive aspect of this definition along with a contrastive analysis of purely nominal sentences, and complete sentences to explore the interplay among them. The subjective reports of 100 neurologically healthy Marathi native and non-native speakers obtained from two web-based experiments suggest that the single-verbs in Marathi conversations are certainly comprehensible and hence can be regarded as a complete sentence. With the contrastive analysis, it is observed that, even though single-verb sentences and nominal sentences seem difficult to process, average Marathi readers understand them with similar effort as they process complete sentences. A few sociolinguistic variables which might affect the data such as age, gender, first language and period of language acquisition are taken into consideration while analysing the data and some inconsistencies among the results are noted. The effect of some textual features such as difficulty and familiarity with the text are also discussed. We account for the results by performing a statistical significance test using a standard t-test and z-test formulations and also by offering general remarks, observations, and discussion. The data is validated by calculating the inter-annotator agreement. Some limitations with respect to the data set, methodology and participants are given along with the possible future work before concluding the topic.

**Keywords:** Marathi, verb, nominal sentences, Language comprehension, web-based experiment

**“His sentences didn’t seem to have any verbs... All nouns, no action...”**  
**-Jennifer Cruise, ‘Charlie All Night’, 1997<sup>1</sup>**

## **1. Introduction and Literature Review<sup>2</sup>**

Language is an integral part of the human communication process. Ancient Indian thinkers have devoted themselves to study the language from different analytical aspects such as phonetic, syntactic, semantic, logical, etymological, epistemological and metaphysical, etc. They have addressed various topics such as the source of the speech, different layers of the language, the ultimate unit of the language, notion of a word and a sentence, role of the function words, ways to disambiguate the word-meanings and determine the intended meaning, the process of verbal cognition, etc. The notions of a sentence and sentence-meaning have been a captivating area of discussion since then. Various ancient Indian etymologists, grammarians, logicians and rhetoricians have defined the sentence either from a formal perspective (i.e. structural- considering the only syntax) or from a semantic perspective.<sup>3</sup> They have explored the meaning of the sentence which is in the form of an ‘action’. The discussion was carried on by modern Indian and western scholars about what makes a sentence and what are the necessary conditions for it. The complete discussion revolves around the presence or the absence of the verb in it. While few scholars agree that it is necessary for a linguistic string to have at least one verb to make it a sentence, others argue that Sanskrit, by resorting to Paṇini’s grammar, allows constructions of purely nominal sentences which are devoid of any verb, either attested on the surface level of the language or understood mentally.<sup>4</sup>

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<sup>1</sup> This famous quote is taken from the novel ‘Charlie All Night’ written by a NYT bestselling author Jennifer Cruise. It captures the role of the verb in the sentence perfectly well where author emphasizes that the verb in a sentence expresses the action. (The quote is taken from a web link: <https://www.goodreads.com/quotes/230954-his-sentences-didn-t-seem-to-have-any-verbs-which-was> Accessed on 09 January, 2020)

<sup>2</sup>The list of abbreviations is presented at the end of the paper.

<sup>3</sup> The definition ‘*saṃhitā padaprakṛtiḥ*’ (Ṛk.Prā.2.1) (Meaning: ‘A sentence is a group of the words’), ‘*ākhyātam sāvya-kāraka-viśesanam vākyam*’ (Meaning: ‘A sentence is chiefly the action-word, accompanied by the particle, nominal words, and adjectives’) and ‘*eka tiṅ vākyam*’ (V.10-11 on P.2.1.1) (Meaning: ‘a sentence is that [cluster of words] containing a finite word as an element’) (both by Kātyāyana) look at the sentence from the structural perspective. The definition ‘*arthaikatvādekam vākyam sākāṅkṣam ced vibhāge syāt*’<sup>3</sup> (Pu.Ms. 2.1.46) by Jaimini (Meaning: ‘So long as a single purpose is served by a number of words, they form one single unit called a sentence’) deals with the semantic aspect of the sentence.

<sup>4</sup> From a derivational perspective, Deshpande (1987) argues that the construction ‘*rāmaḥ sundaraḥ*’ can be derived without making any reference to the finite verb since here, *rāma* is neither an agent nor the patient of any action stated by any verb which is present or understood. He takes the derivational of such NS without any reference to the copula as against Bronkhorst (1990) who argues that not all NS are complete. He provides illustrations given by *Patañjali* i.e. in a sentence ‘*vrksaḥ plaksaḥ*’ (Meaning: ‘the Figtree [is] a tree’), the word ‘*asti*’ (is’) is understood.

This paper attempts to study the first definition of a sentence given by Bhartṛhari in his text ‘*Vākyapadīya*’.<sup>5</sup> The definition ‘*ākhyātaśabdaḥ*’ suggests that the single-verb can be regarded as a sentence itself. The explanation of the definition as given by Bhartṛhari himself is: ‘when by a mere verb, definite means of action are understood then the single-verb can also be regarded as a sentence.’ The commentator *Puṇyarāja* offers an illustration that, an utterance of a single-verb ‘*varṣati*’ (‘[he/she/it] pours’) also conveys the *kartā* (i.e. ‘*devaḥ*’- ‘God’) and *karma* (i.e. ‘*jalam*’- ‘waters’) of the action ‘raining’. Since it conveys the complete meaning of a sentence ‘*devo jalam varṣati*’, the single verb ‘*varṣati*’ can be considered as a sentence itself. While the major part of the sentence semantics can be conveyed by the mere verb, the role of the other words in the sentence is to confirm that meaning.

The text ‘*Vākyapadīya*’ is studied by various ancient and modern Indian and western scholars, mainly from philological (Manjali 1995), philosophical (Iyer 1969, Pillai 1971, H. Coward 1976), linguistic (Manjali 1996) and psychological (G. H. Coward 1973) points of view. The cognitive aspect of the theories on the analysis and interpretation of the language presented in the text has also been a topic of discussion in the recent time (Tiwari 2008) mainly from the perspective of modern cognitive linguistics (Houben 2003). Gajjam et al. (2018) have studied the first definition from the experimental perspective by conducting an eye-tracking experiment to derive the importance of the verb in the sentence semantics and also considered some textual (Gajjam and Kulkarni 2018a) and sociolinguistic variables (Gajjam and Kulkarni 2019a) while analysing the data. In their later work, the authors have provided guidelines to convert theoretical discussions provided by Bhartṛhari and other ancient Indian scholars into an experimental perspective (Gajjam and Kulkarni 2019). Some philosophical insights have also been provided by them (Gajjam and Kulkarni 2019b).

This paper, too, by an experimental method investigates whether a single verb in Marathi conversational data conveys more than what is warranted by its form alone and hence be considered as a sentence itself. For contrastive analysis, we also take purely nominal sentences (NS, henceforth, in which there is no verb at all) and complete sentences (CS, henceforth, in which there are other words including the verb) to explore the degree of comprehension along with the single-verbs (SV, henceforth, in which there is only a verb). These three types of sentences are abundantly found in the conversational data, especially in the Indo-European languages. The meanings of the unuttered words in

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<sup>5</sup> The eight definition enumerated by Bhartṛhari are as follows:

“*ākhyātaśabdaḥ saṅghāto jātiḥ saṅghātavartinī, eko ’navayavaḥ śabdaḥ kramo buddhyanusamhr̥tiḥ | padamādayaṃ pṛthak sarvaṃ sākāṅksamityapi, vākyam prati matirbhinnā bahudhā nyāyavādinām ||*” (VP II. 1-2) (P. R. Sarma 1980, 1) (Meaning: ‘Theorists hold different views about the notion of a sentence. [Thus a sentence is defined as:] the verb, the close combination of the words, the universal which resides in that close combination of the words, an utterance which is one and devoid of parts, the sequence [of the words], the meaning principle which lies in the speaker, the first word itself, any word in the sentence having mutual expectancy of each other’.)

the single-verb expressions and nominal sentences are denoted by the attested words on the surface level of the language. The very feature of the language is used in a spoken or written language mainly to avoid the repetition of the message to be conveyed and also to bring about effective and speedy communication. A competent listener or the reader comfortably processes these meanings with proper attention and capacity to bridge the necessary words from the previously stated message to the next string where it is needed.

While the definition primarily talks about the Sanskrit language, we extrapolate it to the Marathi language. The main reason behind this is that all earlier works on this topic focus on the Sanskrit language and thereby, on non-native speakers of Sanskrit language. In order to study the scope and working of the definition among the native speakers, the Marathi language is chosen for the research. Marathi belongs to the Indo-European language family and is one of the 22 official languages in India spoken by almost 83 million of the population primarily in the Maharashtra state, by both native and non-native speakers.

**Hypothesis:** Our primary hypothesis is: ‘single-verb’ in Marathi conversations can successfully convey the complete meaning hence can be regarded as a sentence in itself. The study also aims to measure the degree of comprehension of single verbs with respect to the complete and nominal sentences in order to understand whether SV sentences are as difficult to process as CS.

**Research Questions:** We try to find answers to the following questions: (1) Can a single-verb in Marathi conversational data convey its *kāraka*/s (a.k.a. means of the action denoted by the verb)?<sup>6</sup> (2) Can a single-verb be completely meaningful in all the cases such as difficult and easy texts, familiar and unfamiliar texts? (3) Does the definition hold true given varied external conditions such as different age groups, the gender of the readers? (4) Does the native speaker process single-verbs more efficiently than the non-native speaker? (5) Does the linguistic exposure play part in the comprehension of the single-verbs? The major aim of this study is to test the working and the scope of the definition and understand its limitations in the human comprehension process.

## 2. Experimental Design

Two web-based experiments were conducted on the neurologically healthy and adult, native and non-native Marathi speakers in India by creating a Google form containing the experiment and the questionnaire. The form is sent to the randomly chosen readers with the help of the emails and social networking medium. The experiment is divided into three main parts: (1) The first part consists of the introduction to the experiment, instructions for the participants about the need for attentive reading and

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<sup>6</sup> *Kārakas* are also known as thematic roles played by the words with respect to their verbs. According to Pāṇinian grammar, there are six *kārakas* such as agent (*kartā*), destination (*karma*), instrument (*karaṇa*), beneficiary (*saṃpradāna*), a point of departure (*apādāna*) and a substratum (*adhikaraṇa*).

annotation input method. Participants were asked to give their consent before participating in the experiment along with their personal information such as age, gender, etc. which is used only for the data analysis. No participant was aware of the purpose of the experiment beforehand. (2) Six paragraphs containing the conversations in Marathi constitute the second part of the experiment. Paragraphs were chosen and finalized from the active online Marathi webpage<sup>7</sup> by two expert linguists. All of them are modern writings in Marathi. During the experiment, one paragraph was presented at a time along with the questionnaire. They contain a minimum of 8 to a maximum of 20 lines (Refer to Table 1) and were presented in the *Devanagarī* script. Each paragraph has at least one single-verb sentence in it. For Exp 2, we chose the paragraphs containing nominal sentences as well.<sup>8</sup> Other words in the SV are dispersed in the paragraph and the omitted verb in the NS needed to be carried from the previously presented message in the paragraph (Figure 1) by the readers.

With proper attention, an average reader can comfortably construe the complete meanings of these sentences. The number of the sample is six owing to the restriction posed by the average attentive span of the reader. To eliminate the effect of mental fatigue and boredom, we have kept the sample size small hence no filler was added in between the paragraphs. Each paragraph was tested and analyzed to derive the conclusion. Another reason to choose the six paragraphs is: to test one of the six *kāra*kas in each paragraph. Readers are requested to complete the experiment in one sitting without a break. (3) In the last part of the experiment, the feedback form and the acknowledgment receipt are attached.

**Table 1: Experiment Details**

	<i>Type of Data</i>	<i>Topic of Interest</i>	<i>Sample Details</i>	
			<i>Paragraphs</i>	<i>Participants</i>
Exp 1	Conversations, Modern writings	Single-verb sentence, Complete sentence	6 Para, 8-15 lines	Total 59 Age- 21 to 57 years
Exp 2	Conversations, Modern writings	No-verb sentence, Single-verb sentence, Complete sentence	6 Para, 15-20 lines	Total 41 Age- 21 to 43 years

<sup>7</sup> <https://misalpav.com/> (Link accessed on 20<sup>th</sup> July 2019)

<sup>8</sup> Few examples of all types of sentences from both experiments are mentioned here:

Single-verb sentences such as: ‘*bolā*’ ([Please] speak up’) (Paragraph 6, Exp 1), ‘*lāvuyā*’ ([We] will plant [the saplings]) (Paragraph 5, Exp2)... Nominal sentences such as: ‘*tī mulagī*’ ([People just refer to me as] ‘that girl’) (Paragraph 1, Exp 2), ‘*nakkich ajobā*’ (‘Sure, Grandpa!’ [I will water the plants.]) (Paragraph 6, Exp2)... and Complete sentences like ‘*andhāryā abhyāsikece paḍade odhalele hote*’ (‘Curtains were drawn of the dim study room.’) (Paragraph 4, Exp1), etc.

Each paragraph contains two questions related to the textual features such as difficulty-level and the familiarity with the paragraph. Readers are expected to rate the difficulty level on 5-point 'Likert scale', where the value 1 denotes the least difficulty and 5 denotes the highest difficulty level. Similarly, readers were asked to choose one among two options whether the paragraph was familiar or not. The next question was related to the SV in the paragraph. The question and the answers are constructed in such a way that the correct answer to this question confirms the successful comprehension of the respective SV along with the mean/s of the action (i.e. the *kāra*). The next question was concerning the CS. The motivation behind this question is that to compare it with the SV. The correct answer to this question ensures successful comprehension and attentive reading. In Exp 2, we added one more question related to the NS. The correct answer to this question confirms the successful bridging of the omitted verb in the NS which is carried forward or assumed or filled in based on the previously presented message in the paragraph. Answers marked to all questions are considered to calculate the inter-annotator agreement in order to ensure the attentive reading of the readers.

Participants belonging to the age group of 21 to 57 years were randomly selected. They are both native and non-native speakers of Marathi. Almost all of them have acquired language in their early years of life i.e. before age 6 except for a few. Many of them also have daily exposure to the written Marathi texts and almost all of them use Marathi in their day-to-day communication.

In the web-based experiment, the investigator cannot observe readers' reading behaviour, speed and reaction time taken to annotate the answer after reading the question. However, the accuracy of the comprehension and the degree of comprehension can be tested, given the fact that the readers perform an attentive reading. The subjective reports are highly useful if readers are honest with their annotation input and have not marked the random answers. Since the reader could view both paragraphs and the questions at the same time on a single page, nowhere in the experiment readers' memory is tested. One expert linguist who is also a Marathi native speaker has validated the data set giving his 100% agreement that the paragraphs are comprehensible, which forms the ground truth of our experiment.

## Paragraph 3

रेघवात्या मुलीचा नावासाठी हट्ट चालूच होता. हिच्यासाठी काहितरी नाव शोधायलाच हवं. डोंगरे सरांनी काहीतरी आठवेल, सुचेल या हिशोबाने आजूबाजूला नजर फिरवली. काळ्या फळ्याचं काळंशार आकाश, त्या आकाशात दूरवर ती पांढर्या खडूची अक्षरे चमकत होती. काळ्या रंगावर चमकदार दिसणारी पांढरी शुभ्र अक्षरे.

.....ठरला! भाषण तुझं नाव शुभ्र ठेवूया. चमकदार सगळ्या रंगाना सामावून घेणारा रंग पांढरा शुभ्र! शुभ्र.

"आ काका, काय सल्लीड नाव सुचवलंत! शुभ्र! मस्त... शुभ्र!"

नाव मिळाल्यामुळे शुभ्र हरखून गेले होती. तीचे ते ठिपक्यांचे डोळे अगस्तीचा तारा चमकावा तसे विलक्षण तेजाने चमकू लागले.

"काका तुमच्याकडे खडू आहेत आणखी?" बराचवेळ फळ्यावरच्या काळ्या मैदानात पांढर्या खडूच्या रेघांनी आखलेल्या कौलारू शालेकडे पाहून झाल्यावर तो रेघवाता मुलगा, अरर...! त्याचे नवे नाव 'नील' म्हणाला.

"बघतो हं. का रे, काय झालं? काय करायचं आहे? सवयीने डोंगरे सरांनी त्यांचे खिसे चाचपले.

"हो, आहेत की!" खिशातल्या अखंड चार-पाच खडूच्या कांड्या काढत डोंगरे सर म्हणाले. "पांढरा, तांबडा, निळा हिरवा आणि पिवळासुद्धा आहे."

"आखू खडू?" नीलचे ते ठिपक्यांचे डोळे विस्फारले होते. इतके अखंड खडू तो बहुतेक आयुष्यात प्रथमच पहात असावा. अर्थात तेही खरेच होते.

शालेच चित्र काढताना शालेच्या इमारतीपासून सुरवात व्हायची. शिकणारी, खेळणारी मुले ही सर्वात शेवटी. तो पर्यंत संपत संपत खडू बोटाच्या

पेराएवढा तुकडा झालेला असायचा. खर्चा शालेचही अतंज होतं की. शालेत शिकणाऱ्या, खेळणाऱ्या मुलासाठी सर्वात शेवटचा प्राधान्यक्रम असतो.

डोंगरे सरांच्या मनात आले.

"काय हवंय तुला?" त्यांनी नीलला विचारले.

"मला ना, सांगू का? अं अं... मला ना... काय बरं! मला..." काहीही ध्यानीमनीसुद्धा नसताना अचानक काय हवे ते देणारी जादूची छडी मिळावी किंवा काय हवं ते मोग म्हणत देव प्रसन्न व्हावा आणि भांबवल्यामुळे आजवर रोज घोकत असलेल्या हव्या असलेल्या शंभर गोष्टींपैकी एकही गोष्ट आठवू नये अशी काहिशी नीलची अवस्था झाली. तो नुसता 'अं ...अं...' म्हणत राहिला.



**Figure 1: A Screenshot of a Sample Paragraph: With examples of all types of Sentences**

### 3. Results, Analysis and Discussion

The primary aim of the data analysis is to explore the nature of the single-verbs namely whether the SV can convey the means of action too. This forms Part I of the data analysis in which we test the comprehension vs. non-comprehension of the SVs in both experiments. This offers the answer to whether Marathi speakers can comprehend SVs in the written conversational data which in turn prove our hypothesis. To measure the degree of SV comprehension *viz.* to discover the comparison between the SV, NS and the CS comprehension, we have performed a contrastive study of them and present the results in Part II. While doing so, we analyze the overall data set along with the separate analysis of the paragraphs. Few sociolinguistic factors and other textual features that affect the comprehension of these sentences are considered in Part III and IV of the analysis respectively. We also compare the inter-variable differences to have a clear broader picture of the data in Part III. To account for the readers marking less correct answers and for other discrepancies, we present the error analysis in Part V by providing some remarks and discussion.

#### ***Part I: Comprehension of the Single Verb (SV) Sentences:***

**Overall comprehension:** We take the answers marked by all readers to the SV questions in both experiments and present the results in Table 2. We set a cut-off limit at 70% since this is not a high-load experiment.<sup>9</sup> We found that more than 95% of the population has

<sup>9</sup> Conventionally, the cut-off is set to 65% in the high-load tasks.

more than 70% accuracy, which shows the successful comprehension of the SV sentences in both experiments. The single verbs in Marathi conversations denote the complete meaning and hence can be regarded as the sentence.

**Table 2: Population-wise Accuracy of Single-verb sentence comprehension**

Population-wise Accuracy		
Accuracy	Exp1	Exp2
100%	86%	75%
83%	12%	20%
67%	-	5%
50%	2%	-

**Inter-Annotator Agreement:** To validate the data, we perform the inter-annotator agreement of all the participants for all paragraphs in both experiments by using *Fleiss' Kappa* and we found that many readers show full agreement with respect to most of the paragraphs (values ranging from 0.6 to 1= almost perfect agreement to perfect agreement) with respect to the difficulty level and familiarity with the paragraphs along with the answers to the SV, NS and CS sentences. Paragraph 4 shows the least agreement i.e. 0.41= moderate agreement. This validates that participants have read the texts attentively and have not performed random markings of the answers.

**Table 3: Inter-Annotator Agreement table for both Experiments**

	Exp1				Exp 2				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q5
Para 1	0.75	1	1	0.97	1	1	1	0.9	0.55
Para 2	0.59	0.93	0.97	0.97	0.74	0.82	1	0.9	0.54
Para 3	0.7	1	1	0.94	1	0.9	0.86	0.86	0.51
Para 4	<b>0.41</b>	0.88	0.94	0.97	1	0.56	0.78	0.86	<b>0.48</b>
Para 5	0.53	0.97	0.91	0.97	1	0.86	0.71	1	0.53
Para 6	0.56	0.91	0.91	0.94	0.74	1	1	0.95	0.59

**Part II: Comprehension of Single Verb (SV), Nominal Sentence (NS) and Complete Sentence (CS)**

To perform the contrastive analysis of different types of sentences and to understand the interplay among them, we consider SV sentence, NS and CS in both experiments and present the accuracy results along with the t-test/ z-test results in Table 4. In experiment 1 which has the easy paragraphs, both SV and CS have similar accuracy namely 86% of the



total population has 100% accuracy. The p-value being insignificant (0.42),<sup>10</sup> we can argue that both sentences require a similar amount of processing. In experiment 2 where the difficulty level is increased, CS is seen to be processed in a more undemanding manner than the rest two. Among SV and NS, it is the single-verb which has more accuracy than the nominal sentence suggesting that the verb and their means were understood easily as compared to the pure NS. However, this difference cannot be confirmed by the statistical significance test as the p-value is 0.1.

**Table 4: Comprehension of Single-verb Sentence in Both Experiments**

	Exp 1			Exp2				
	SV	CS	P	SV	NS	CS	P	
			SV vs. CS				SV vs. CS	NS vs. CS
Overall	86%	86%	0.42	76%	54%	68%	0.3	0.1

#### Paragraph-wise comprehension:

When we perform a separate analysis for all paragraphs in both experiments, we found no difference in Exp 1. However, some inconsistencies are seen in Exp 2. The significant p-values for Paragraphs 2, 4, 5 and 6 show differences in the comprehension of SV and CS. It is interesting to note that among these four paragraphs, SVs in Paragraphs 4 and 5 have more accuracy than the CS. These single-verbs in these two paragraphs ‘*kādhato*’ (‘[I will] draw [a picture].’) and ‘*lāvūyā*’ (‘[We will] plant [the trees].’) demanded their complements playing the roles of *karaṇa* and *apādāna kāraka* respectively. Here, readers have easily understood the complete meaning of the single-verb sentences along with the means of action denoted by the verb. The complete derived meaning i.e. ‘I will draw with a chalk’ and ‘We will plant the trees starting right from the *pārijātaka* tree’ by the single-verb alone. The competent readers have used the extra meaning which is previously presented in the conversation. In these two cases, since the single-verbs conveyed complete desired meaning, they can be considered as the sentence. In Paragraphs 2 and 6, it is the CS that gained more accuracy than the SVs where the single-verbs ‘*sāngā*’ (‘[Please] tell’) and ‘*ghe*’ (‘take’) demanded *karma* and *adhikaraṇa kāraka* respectively. While readers could easily understand the *karaṇa* and *apādāna kāraka* of the verbs, it is seen that the *karma* and *adhikaraṇa kāraka* were not understood when they are not attested explicitly. No difference can be seen in remaining paragraphs i.e. 1 and 3 where both SVs and CSs are comprehended with a similar amount of processing. The single-verbs ‘*dyā*’ (‘[Please] give’) and ‘*tharala*’ (‘[It is] decided’) in these two paragraphs and

<sup>10</sup> P-value is the probability value obtained from the t-test or z-test (also known as the statistical significance tests) which is less than 0.05 rejects the Null hypothesis mentioning no-difference in two variables.

their means of action i.e. *saṃpradāna* and the *kartā* respectively were comprehended as easily as the complete sentences.

**Table 5: Paragraph-wise Comprehension of all types of Sentences in both experiments**

	Exp 1			Exp2				
	SV	CS	<i>p</i>	SV	NS	CS	<i>p</i>	
	Q2	Q3		Q1	Q2	Q3	Q1vs.Q3	Q2vs.Q3
Para 1	100%	100%	0.5	100%	100%	100%	0.5	0.5
Para 2	97%	98%	0.26	85%	90%	100%	<b>0.003</b>	0.3
Para 3	100%	100%	0.5	100%	95%	93%	0.29	0.4
Para 4	93%	97%	0.19	100%	68%	88%	<b>0.01</b>	<b>0.01</b>
Para 5	98%	95%	0.12	100%	93%	83%	<b>0.001</b>	0.1
Para 6	95%	95%	0.5	85%	100%	100%	<b>0.003</b>	0.5

Coming to the comprehension of the NS in Exp 2, we see the significant difference only for Paragraph 4 where NS is comprehended with the least accuracy as compared to the CS. In the remaining paragraphs both NS and CS do not show the difference in terms of comprehension. The NS in Paragraph 4: ‘*laṅgadī khelaṅārī, lagorī khelaṅarī*’ (Meaning: ‘[Please, draw the boys] playing hopscotch and seven-stones’.) demanded the verb ‘[Please] draw’ which was not construed properly to derive the desired meaning by the majority of the readers, which in turn was not comprehended successfully.

To conclude, the majority of the readers of Marathi comprehend the NS as easily and successfully as CS. They are seen to construe the required verb with the NS to reach the desired meaning which amounts to conclude that there is a similarity between NS and CS comprehension (i.e. NS=CS). While analysing the interplay among SV, NS, and CS, it is seen that SV sentences show similarity with the NS and CS comprehension for only 33% of times (SV=NS=CS). For other 33% of times, they outperform CS (SV>CS) and for remaining 33% of times CS outperform SV (CS > SV). Based on the available data, we cannot derive the hierarchy among the comprehension of these three types of sentences, but the similarity among them. More types of such sentences and a large sample size might help to conclude about the interplay among them.

### ***Part III: Sociolinguistic Factors that affect the comprehension***

In this section, we consider readers’ demographic data to explore what factors affect the comprehension of the sentences in Marathi speakers. We take the information regarding readers’ age, gender, first language, time of language acquisition, and exposure to the written language. Daily life language usage is also taken into consideration. The results

related to the population-wise accuracy for all types of sentences for all these features are presented in Table 6 along with the t-test and z-test results.

**Table 6: Sociolinguistic Factors and Accuracy in the Comprehension**

		Exp 1			Exp 2				
		SV	CS	P	SV	NS	CS	P	
		Q2	Q3	(Q2Vs. Q3)	Q1	Q2	Q3	(Q1Vs. Q3)	(Q2Vs. Q3)
Age-wise	>30	84%	84%	0.4	73%	62%	65%	0.3	0.3
	30<	93%	93%	0.5	80%	40%	73%	0.4	0.1
Gender-wise	M	88%	81%	0.4	78%	52%	70%	<b>0.04</b>	0.06
	F	85%	91%	0.2	72%	56%	67%	0.31	0.5
First-Lang.	Nat	89%	85%	0.5	86%	54%	69%	<b>0.05</b>	0.13
	Non-nat.	77%	92%	0.3	17%	50%	67%	<b>0.04</b>	0.3
Lang Acq.	>6	85%	87%	0.4	77%	51%	72%	0.3	<b>0.05</b>
	6<	100%	100%	-	50%*	100%*	0%*	0.4*	-
Lang. Expo.	Daily	#	#	#	79%	52%	64%	0.1	0.2
	Rarely	#	#	#	50%	50%	83%	0.1	0.1
Lang. Usage	Regular	#	#	#	79%	53%	68%	0.2	0.1
	Rare	#	#	#	33%	67%	67%	0.3	0.5

\*Sample size is small. # Data is not available for particular variables.

As it can be observed from the Table 6, Exp 1 does not show any kind of difference concerning SV and CS comprehension with respect to any of the factors mentioned above. The p-value for each variable is insignificant (i.e. higher than 0.05). Readers have comprehended SV sentences with similar efforts as of CS. The verbs in SV sentences denote the complete meaning and can be regarded as the sentence itself, similar to CS. Few inconsistencies can be seen in Exp 2, where male readers have processed SV in a better manner than the female readers (p-value is 0.04) while female readers show no difference in SV and CS comprehension (p-value is 0.31). Similarly, the basic difference

in the comprehension among native and non-native speakers of Marathi can be seen in the comprehension of the SV and CS. Native Marathi speakers have comprehended SVs easily than the CS as 86% of SV sentences and only 69% of CS has 100% accuracy. As against this, non-native readers of Marathi have comprehended CS easily than the SV since only 17% of the SV sentences have 100% accuracy while 67% of CSs have 100% accuracy. Both native and non-native readers show significant p-value i.e. 0.05 and 0.04 which amounts to say that SV sentences are more demanding for non-native readers of Marathi. No difference can be seen in any other factor with respect to SV and CS comprehension.

Coming to the NS comprehension, it can be argued that readers who acquired language before age 6 have difficulty in processing NS as compared to the CS. Logically, earlier the language learning, more the period of language exposure! However, it is interesting to note that readers who began learning Marathi before age 6 years process CS more effortlessly than the NS as only 51% of NS gained 100% accuracy while 72% of CS gained 100% accuracy. The p-value is significant (0.05) showing a difference in comprehension in NS and CS. For other variables, the comprehension of NS and CS has no difference. The NS is processed by assuming the verb just as the CS is processed.

**Inter-variable differences:**

**Table 7: Inter-variable differences: Experiment 1 and 2**

		T-test or Z-test Results					
		SV		NS		CS	
		Exp1	Exp2	Exp1	Exp2	Exp1	Exp2
<b>Age</b>	>30 vs. 30<	0.1	0.4	#	0.2	0.12	0.4
<b>Gender</b>	M vs. F	0.4	0.3	#	0.2	0.1	0.5
<b>First Lang.</b>	Native vs. Non-native	0.3	<b>0.01</b>	#	0.43	0.5	0.44
<b>Lang. Acq.</b>	>6 vs. 6<	<b>0.01</b>	0.4	#	<b>0*</b>	<b>0*</b>	<b>0*</b>
<b>Lang. Expo.</b>	Daily vs. Rarely	#	0.3	#	0.2	#	<b>0.04</b>
<b>Lang. Usage</b>	Daily vs. Rarely	#	0.2	#	0.3	#	0.5

\*Sample size is too small for data analysis. #Data is not available for particular variables.

In Part III, we have seen the effect of sociolinguistic factors on the comprehension of SV vs. NS vs. CS. In the current section, we present the difference of comprehension of SV, NS and CS in diverse sample i.e. native vs. Non-native speakers etc. In contrast to the earlier results presented in Table 6 where male readers have comprehended SVs better than the CSs, here there is no gender-wise difference (Table 7) which means that both male and female readers have comprehended all SV sentences, NSs and CSs in a similar manner in both experiments. Similar to the results presented in Table 6, we can see a significant difference (i.e. 0.01) among the native and non-native speakers of Marathi in the comprehension of SV sentences in Exp 2. Similarly, the age of language acquisition has proved very important when we study the comprehension of all three types of sentences since there is a significant difference (i.e. 0.01) in the processing of sentences among readers having learned the language before age 6 and after age 6 years. Readers who have rare exposure to the language, process the complete sentences in a different manner than those who have daily exposure to the language as the significant difference can be seen i.e. 0.04, In connection with Table 6, it can be seen that readers having daily exposure to the written Marathi texts have understood SV sentences more easily than the CS as opposed to the readers having rare exposure to the Marathi texts.

It can be concluded that age and gender have no effect on the comprehension of the sentences in Marathi readers. However, readers' first language, language acquisition period and language exposure play an important role in the comprehension of different types of sentences. With the contrastive analysis, it is observed that the complete sentences are processed in a more undemanding manner than the single-verb sentences which in turn are easier to comprehend than the nominal-sentences.

#### ***Part IV: Textual Features that affect the comprehension***

Only 7 readers among a total of 59 readers in the Exp1 have marked the paragraphs as the 'average difficult', however, all of them have marked all the correct answers to both the questions. No reader has marked any of the text as 'the most difficult'. Among remaining 52 readers, 36 readers have scored full marks for both questions. Only one reader P17, a 21 years old female reader who was familiar with all the paragraphs scored 100% accuracy for both types of questions, while no other reader was familiar with any of the text presented to them. In Exp 2, only 4 out of 41 readers were familiar with the paragraphs and all of them have marked all correct answers for all types of sentences. Similarly, 4 out of 41 readers marked the paragraphs as 'average difficult' and have marked all correct answers to SV sentences. One reader (P18) marked the paragraphs as 'difficult' who has 83% accuracy. Logically, the difficulty-level and familiarity with the text can affect successful comprehension. However, we cannot find any such effect from our study. The main reason might have been the conversational aspect of the paragraphs which can easily be read and understood even though the readers are reading it for the

first time i.e. s/he is unfamiliar with the content of it. The more specific and refined experimental design having multiple levels of difficulty such as extremely easy, easy, average, little difficult and the most difficult paragraphs may show some useful insights and shed some light on this topic.

#### ***Part V: Error Analysis***

As given in Table 2, while 98% of the population has more than 70% accuracy, only 2% of the population has the least accuracy in Exp 1. The participant (P31) is a 28 years old male reader and native Marathi speaker who was unfamiliar with all the paragraphs and marked them as ‘average difficult’. We cannot account for the least accuracy for SV sentences that he shows since he has scored 100% accuracy for CS. The 5% of the population who shows 65% accuracy (Table 2) in Exp 2 scored the least marks in SV comprehension. Even though they have acquired language before age 6 and read Marathi text daily, they have less accuracy for SV compared to NS and CS comprehension.

In Exp 2, paragraphs 2, 4, 5 and 6 show significant differences with respect to the SV and the CS comprehension (Table 5). While accounting for this difference, we found that single-verb sentences in these four paragraphs demand their *karma*, *saṃpradāna*, *apādāna*, and *adhikaraṇa kārakas* respectively, which demanded more mental efforts to process than the complete sentences. The single-verbs of remaining two paragraphs 1 and 3 demanded *kartā* and *karaṇa kāraka* which were easily understood by the readers. Similarly when it comes to the native and non-native speakers of Marathi, both types of readers show the same kind of linguistic behaviour as they process complete sentences in an undemanding manner than the single-verbs as shown in Table 6. However, if we only focus on the SV comprehension in both experiments, native speakers of Marathi perform better than the non-native speakers as shown in Table 7. It is obvious to conclude that the native speakers having early exposure to language and more usage in daily life process SV better than those of non-native ones.

#### **4. Discussion, Limitations and Future Work**

*Some implications of the study are:* Readers while processing single-verbs in the written conversations also consider the meanings of the means of the action denoted by the respective verb in order to derive the desired meaning. A competent reader does this process easily and efficiently with the help of the previously presented message in the conversation. As per the task demands, the meaning of the means of action is uncovered and used with their respective verbs. In such cases, since the single-verbs are capable of denoting the meanings of means of action too, even though these means are not attested at the surface level of language, they are considered as the sentence itself.

In the case of nominal sentences when presented with the context i.e. in the conversations, readers construe the suitable verb which is congruent, both semantically

and grammatically, with the words in the nominal sentence in order to understand the meaning completely and accurately. The words in the nominal sentence are understood as the means of the action denoted by this copular verb. We found that readers take the copular verb to fill in the gap left out by the verb so as to construe meanings of all the words with the respective verb.

***Significance of the results compared to the previously conducted experiments on the Sanskrit language:*** Earlier works on the comprehension of SV, NS, and CS focus on the conversational text in the classical and modern writings in Sanskrit language using more than 150 readers (Gajjam, Kanojia and Kulkarni 2018, Gajjam and Kulkarni 2018a, Gajjam and Kulkarni 2019, Gajjam and Kulkarni 2019a, Gajjam and Kulkarni 2019b). The lacuna left by this research is: each participant is the second language speaker of Sanskrit. The current research on the Marathi language which is focused on both native and non-native speakers of Marathi tries to fill in that gap left by earlier studies. As a result, the population having the 100% accuracy in the comprehension of Marathi is higher than that of in Sanskrit (98% and 74% respectively) (Sanskrit data is taken from an unpublished research).

The broader perspective to look at the phenomena is the universality and generality of the sentence-definition ‘*ākhyātaśabdah*’. Even though it is mentioned nearly 1500 years ago in the Sanskrit versified form by ancient Indian grammarian, the applicability and prevalence of the theory can also be seen even today, for a different language than Sanskrit, for different kind of texts (i.e. modern writings) and for diverse kind of samples (i.e. age-wise, gender-wise etc.).

***Limitations and Future work:*** The main limitation of this research is that the experiments are conducted online in which the investigator has very little control over readers’ reading behaviour. The same experiment if conducted using the offline pen-paper method in the classroom-controlled environment or by using some machines such as EEG, fMRI, the researcher can get some insights into the real-time processing and speed of the comprehension. Another limitation concerning the data set is the lack of a variety of texts. All the paragraphs from both experiments are taken from the modern writings in Marathi depicting day-to-day conversations. Similarly, classical literature can be used with varied literature styles to test the results. The same research can be extended for other European languages with different experiment designs on a large number of speakers to have a better view of the comprehension process and disclose different angles of the same sentence-definition. A large amount of such data can be employed in several computational applications to enhance the accuracy of various algorithms such as word-sense disambiguation, sarcasm detection, etc. The panoramic view of the whole data can

help in the betterment of the language models created for the people having language difficulties such as aphasia, dyslexia, etc.

## 5. Conclusion

Average Marathi readers have processed the single-verbs along with its *kāra* to arrive at the desired complete meaning with similar efforts as they process complete Marathi sentences. Thereby these single-verbs are considered as complete sentences. Given some diverse external conditions such as different age-groups, different native languages, gender, etc., the definition also holds true. We have a better perspective of comprehension of single-verbs when we compared it with the comprehension of nominal sentences and complete sentences and found no major difference in all types of sentences with respect to age and gender. However, native Marathi readers process single-verbs in an easier manner than non-native speakers. Similarly, readers who have acquired Marathi before age 6 process single-verbs more effortlessly than those who learned after age 6 years. Daily exposure to the written Marathi texts has a facilitating effect on the comprehension of single-verbs. Coming to the nominal sentences, it is found that readers assume the suitable verb in order to construe all the words in the nominal sentences with it to have a complete, meaningful linguistic string. The definition ‘*ākhyātaśabdaḥ*’ given by Bharṭṛhari presents its universality and generality when it also applies to the Marathi language.

### List of Abbreviations:

Abbreviations	
acq.: acquisition	<i>P</i> : p-value (i.e. probability value)
CS: Complete Sentence	<i>P</i> : Participant
Exp: Experiment	Para: Paragraph
expo: exposure	Pu.Ms.: ‘ <i>Pūrvamīmāṃsā Sūtra</i> ’
F: Female readers	<i>Q</i> : question
Lang: language	<i>Rk.Prā.</i> : ‘ <i>Rgveda Prāṭisākhya</i> ’
M: Male readers	<i>SV</i> : Single-Verb
<i>M<sub>D</sub></i> : Mean-Difference (between two variables)	<i>V.</i> : Kātyāyana’s <i>Vārttika</i>
NS: Nominal Sentence	<i>VP.</i> : ‘ <i>Vākyapadīya</i> ’

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