# A STUDY OF NON-MANUAL MARKERS IN INDIAN SIGN LANGUAGE

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**ALL INDIA INSTITUTE OF SPEECH AND HEARING**
**MANASAGANGOTHRI, MYSORE-570006**

# CERTIFICATE

This is to certify that the dissertation entitled ***"A Study of Non-Manual Markers in Indian Sign Language"*** is the bonafide work submitted in part fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student (Registration No.09SLP003). This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other university for the award of any other Diploma or Degree.

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# CERTIFICATE

This is to certify that the dissertation entitled ***"A Study of Non-Manual Markers in Indian Sign Language"*** has been prepared under my supervision and guidance. It is also certified that this has not been submitted earlier in any other university for the award of any Diploma or Degree.

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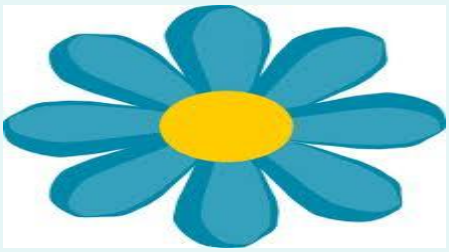
# DECLARATION

This dissertation entitled ***"A Study of Non-Manual Markers in Indian Sign Language"*** is the result of my own study under the guidance of Dr. R. Manjula, Professor in Speech Pathology, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier at any other University for the award of any Diploma or Degree.

Mysore

June, 2011 **Register No.: 09SLP003**



"A master can tell you what he expects of you. A teacher, though, awakens your own expectations"

I am indeed blessed to have a mentor and guide like you. Ma'am, with your words you have inspired me to dream, to work and to reach. You've motivated me to know, to grow and to succeed. You've taught me the value of honesty in research and in so many ways you have made me, me.

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***'Guru govind dou khade, kaake laagun paaye,***

***Balihaari guru aapne, govind diyo bataye'***

[I face both God and my Guru. Whom should I bow to first?

I first bow to my guru because he's the one who showed me the path to God]

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***"The love of a family is life's greatest blessing"***

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*"Even though we've changed and we're all finding our own place in the world, we all know that when the tears fall or the smile spreads across our face, we'll come to each other because no matter where this crazy world takes us, nothing will ever change so much to the point where we're not all still friends."*

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# INTRODUCTION

Indian Sign Language (ISL) or Indo-Pakistani Sign Language (IPSL) is the sign language variety that is predominantly used by the deaf communities in the Indian sub-continent. Gordon (2005) estimated that Indian Sign language (ISL) is used by around 2,680,000 deaf signers in India. ISL is not only used by the deaf people but also by the hearing parents of the deaf children, the hearing children of deaf adults and hearing deaf educators (Zeshan, Vasishta & Sethna, 2004). [Note: This dissertation uses the term 'deaf' instead of Persons with Hearing Impairment as this is the term preferred by the deaf community itself and the same has been used consistently across their public forums like the website for the National Association for the Deaf etc.]

ISL has a complex linguistic structure having its own morphology, phonology, syntax, and grammar (Vasishta, Woodward & Wilson, 1978 and Zeshan et al., 2004) and is not based on any spoken language. Structural analysis and comparison of ISL with other sign languages has revealed that ISL is indigenous with no documentation of the influence of foreign sign language. In a significant finding, Vasishta, Woodward, & Wilson (1978) found that ISL does not share the features of European sign language families which include French and Spanish but shares few features of American Sign Language. There is also some influence from British Sign Language on the finger spelling system used in ISL (Vasishta et al., 1978).

Handshape, orientation, location, movement and expression or the HOLME features constitute the basic parameters of signs, just as is seen in other sign languages. ISL signs can be generally classified into three classes:

- One handed
- Two handed, and
- Non-manual signs

Investigations in ISL are limited to the development of dictionaries of signs used in the different lexical and grammatical categories. Few investigations have concentrated on syntax, with major emphasis being given to the manual component of signs (Pallavi & Manjula, 2010; Sinha, 2007 and Zeshan, 2003). In comparison to the studies on manual features of sign, non manual features in ISL have received much less attention.

In spoken languages, additional semantic information is carried through prosody in speech whereas in sign language, it is conveyed through one's body and facial expressions. Although there is a universal nature of facial expressions reported among people all around the world, across cultures as seen in the expression of anger, contempt, disgust, fear, happiness, sadness and surprise, there are specific rules that govern how to manage and modify these universal emotional expressions based on social circumstances (Ekman, 1992). There are significant variations seen in terms of the degree of expressiveness for these emotions across countries. Culture exerts considerable influence over the verbal languages that we speak, from the syntax of the language to its pragmatics. Culture also exerts considerable influence over the nonverbal languages. Some cultures are animated; others restrained. People of different cultures as followed in

different countries across the world learn to use the nonverbal behaviors – facial expressions, gestures, distance, gaze and postures- as part of their communication repertoire, but people in each culture learn to do them in different ways.

**Need for the Study**

Majority of the research in ISL has been focused on lexical analysis-exploring similarities and differences among different sign language varieties (Aarons and Morgan, 1998; Vasishta, Woodward and Wilson, 1978 and Zeshan, 2000a), development of dictionaries ((Delhi variety: Vasishta, Maden, Woodward, and DeSantis, 1980), (Mumbai variety: Ghate, Sunder, Maricar and Bhatnager, 1990; Roy, Rathna, Ghate, Sethna, and Tembe, 1990; Vacha, Ghate, Banerji, Nanavat, and Gakhale, 1980 and Vasishta, Maden, Woodward, and DeSantis. 1986), (Kolkata variety: Vasishta, Maden, Woodward, and DeSantis, 1987a), (Bangalore variety: Vasishta, Maden, Woodward, and DeSantis, 1985) and growth of sign language corpora by detailed structural analysis (Pallavi & Manjula, 2010; Sinha, 2007 and Zeshan, 2003). Most of the linguistic analysis has given major emphasis to the manual component of signs including handshape, orientation, location and movement. However, representation of non-manual features has received much less attention than the manual features of the sign. A few studies do comment on the non-manual expression across different sentence types and discourse patterns, however, the methodology used to analyze the same have not been very clearly defined.

Well studied and documented sign languages have clearly defined roles of non-manual expression in different contexts. They function as abstract grammatical markers

for different sentence types, convey adjectival and adverbial information, express emotional states and affective information and act as discourse markers (Liddell, 1980). Is the same true for Indian Sign Language? Do non-manual markers serve similar functions with the same frequency of occurrence or are there substitute manual expressions for the same? This study attempts to derive answers for these issues by assessment of non-manual marker expression across different sentence types and comparing the findings with those obtained in other well studied sign languages.

**Aim of the study**

1. To study the expression of non-manual markers in Indian Sign language users across the different sentence types namely declaratives (affirmative and negative), interrogative (yes-no, WH and rhetorical questions), conditionals, comparatives, exclamatory, imperative and topicalization.
2. To classify the expression of non-manual markers used by deaf signers under each sentence type based on their frequency of occurrence.

**Method**

Nineteen deaf signers (11 males and 8 females) who were users of Indian Sign language (ISL), aged between 14-25 years, participated in the study. The selection of participants was based on a set criterion. The test material consisted of 60 sentences belonging to different sentence types. Each sentence was written on separate cards. The participants (ISL users) were presented with the cards one at a time and instructed to express each sentence through ISL signs. The signs produced by the ISL users were

video-recorded and later analyzed by three judges individually. Comparison between sentence types for type and frequency of non-manual marker expression was made. Item by item inter and intra-judge reliability was checked for both the judgments

**Limitations of the study**

1. The study used a forced paradigm for elicitation of non-manual markers for different sentence type which could have restrained the signers from the natural expression of non-manual feature. Sampling from narration task or discourse would probably throw some light on the consistency of the findings of this study.
2. The video recording of the signed expressions of the participants was made only in one plane while information from other planes (in 3-dimension) could have been missed out.

**Implication of the study**

This study facilitates a better understanding of Indian Sign Language (ISL) in terms of the non-manual marker expression across different sentence types in elicited-simulated condition.

# REVIEW OF LITERATURE

*"As long as we have deaf people on earth, we will have signs. And as long as we have our films, we can preserve signs in their old purity. It is my hope that we will all love and guard our beautiful sign language as the noblest gift God has given to deaf people."*

– George Veditz, 1913

(Former President of National Association of the Deaf)

Hall (1968) described language as an institution whereby human beings communicate and interact with each other by means of habitually used oral-auditory arbitrary symbols. Sign language is a visual-gesture language which, instead of sounds, uses manual communication, body language and lip patterns to convey meaning by simultaneously combining handshapes, orientation of the palm and fingers, movement of the hands, arms or body and non manual markers/facial expressions to express fluidly a speaker's thoughts. It is a language that is commonly evolved in deaf communities, which includes deaf people, their friends and families as well as people who are hard of hearing. Despite common misconceptions, sign languages are complete natural languages, with their own syntax and grammar. However, sign languages are not universal i.e. no sign language is shared by all the deaf people of the world. Just as spoken languages differ across regions in their lexicon, in the types of grammatical rules they contain and in historical relationships, sign languages also differ along these parameters.

Linguistically, sign languages are as rich and as complex as any oral language. Sign languages have their own unique phonology, morphology and syntax; which is essentially not similar to the spoken languages. Signs are conventional in nature, often arbitrary and do not necessarily have a visual relationship to their referent. They are acquired during childhood through normal exposure without instructions. Just like spoken languages, sign languages effectively fulfill the same social and mental functions, and they can be simultaneously interpreted into and from spoken languages in real time.

Approximately 121 sign languages are reported to exist in the world (Gordon, 2005): the most popular of these include American Sign Language (ASL), British Sign Language (BSL), French Sign Language (FSL), Italian Sign Language (LIS), Indian Sign Language (ISL) and others. The structure of sign language as used in different countries, for example, American Sign Language (ASL), British Sign Language (BSL) differ from each other in terms of their structure representing syntax, morphological units, lexicon, and other features.

Like oral languages, sign languages also have an organization of elementary, meaningless units called 'Cheremes' (Stokoe, 1960) which are bound into meaningful semantic units and they are of 3 kinds: the **L**ocation of the sign in relation to the body, which is called the Tab (short for Latin *Tabula*), the **H**andshape- the configuration of the hand/hands involved in articulating the sign, which is called the Dez (designator ); and the **M**ovement executed by hand /hands which is called the Sig (signation). Friedman (1977) and Battison (1978) have claimed that a fourth parameter is obligatory-the **O**ri-the

spatial **O**rientation of the hands in relation to each other and the rest of the body. Along with these four units, **N**on – manual markers (Facial expressions), is an important building block of sign language which are summarized in the acronym "**HOLME**"**.** Thus to describe a sign one would need to specify the location, handshape, movement, orientation and non-manual markers of that sign. These parameters are common for all the sign languages used across the world.

***H****andshape*

Handshape refers to the shape of the hand used in a sign. It is probably the most apparent parameter of the sign. The human hand is however capable of assuming a vast array of other possible handshapes. It may be closed into a fist, or fingers may be spread out or held together. The hand may be bent at the wrist or the fingers may be bent at the knuckles or joints. The thumb may be extended, held parallel to the fingers or held across the palm or closed fist. The index, middle, ring or little finger may be extended or in contact with each other. The signs are formed with one hand or two hands. When a sign is formed using only one hand, the hand used is determined by the signer's natural dominance. The same is true for two-hand signs in which only one hand moves. The hand that moves is known as dominant hand, while the other hand is known as *passive hand.*

***O****rientation*

This refers to the direction of the palm and fingers. A particular handshape can be oriented in a number of different ways in relation to the signer's body. The palm and

fingers may be oriented left, right, up, down, towards or away from the signer. Some signs also make contrastive use of hand arrangement and point of contact (Klima & Bellugi, 1979). In signs that involve two hands, hand arrangement refers to the placement of hands in space with respect to each other. Some signs are produced with only one hand and others are produced with one hand acting on the other. In both cases, signers use their dominant hand as the main articulator depending on whether a signer is left handed or right handed.

***L****ocation*

Location refers to the position of the hand on the body or in the space around the signer. Like handshapes, there are number of different locations on the body and in space that may be locations such as face/whole head, neutral place, forehead/ upper face, mid face, eye, nose region, chin, lower face, cheek, temple, neck, trunk, upper arm, elbow, and forearm wrist etc. Approximately 75% of the signs are performed in the head and neck area because they can be seen more easily. All signs must be made within the "signing space", which extends from the top of the head to just below the waist on the vertical axis while horizontally and laterally extending from the signer's extreme right to the signer' extreme left. The signing space may be proportionately enlarged for signing to larger audiences or confined for purposes of more rapid signing or to be secretive so as not to be overseen.

***M**ovement*

Much of the meaning of signs may be expressed through movement. It involves the hand moving away from the body, towards it, upwards, downwards, to and fro, in an arc, a circle or spiral. The direction in which a sign moves may indicate the initiator or recipient of the action. For e.g., if the sign HELP moves out of the signer, that means the signer is offering help to someone. If the sign moves in towards the signer, it means that someone is helping the signer.

***E**xpression or Non-manual signs*

In spoken languages, additional semantic information is carried through one's tone of voice. In sign language, additional semantic information is conveyed through one's body and facial expressions also known as the non-manual markers. Both hearing and hearing impaired individuals use their face in the same way to convey emotions such as happiness, grief, and anger which are said to be universal (Ekman, 1992). However, sign language users were reported to use facial expressions and changes in head and body position to convey *linguistic contrasts* in American Sign Language (ASL) (Liddell, 1980).

Linguistic and facial expressions are reported to differ in their scope and timing and in the facial muscles that are used (Baker-Schenk, 1983; Riley, McIntire, & Bellugi, 1991). Facial expressions that function linguistically have a clear onset and offset, and they are coordinated with specific parts of the signed sentence. In contrast, emotional expressions have more global and inconsistent onset and offset patterns, and their timing

is not linked to specific signs or sentential structures. The non-manual parameter occurs at the same time that the sign is being executed to contribute to its meaning.

## The Form of Non-Manual Markers

Spoken languages are normally thought of as uni-channeled and having one articulatory channel through which linguistic information is conveyed (i.e. the mouth). In contrast, signed languages are considered multi-channeled in the sense that a signer can simultaneously express information using not only the hands, but also other articulators such as body and face. These non-manual signals include all visible information that the signer expresses during signing other than the information coded in the manual articulators. Signers use their body position and orientation, head position and orientation, eye gaze, and facial expressions for linguistic purposes.

### *Body position and orientation*

A signer may lean forwards or backwards, or shift the body along an imaginary vertical axis when taking the role of a referent other than the signer himself (Coerts, 1992). This mechanism of role-taking is referred to as *role play*. In the typical case of role play, a signer changes his eye gaze away from the interlocutor, changes his facial expression, and moves his body towards the location where the referent earlier has been established in discourse. Also, the signer will adopt one or more physical characteristics of the referent. The use of role-play is most frequent in spontaneous conversations and narratives. Body positions may also serve different functions, e.g., body leaning also

serves pragmatic functions. Interestingly, the various functions of body leans may enhance or conflict with each other.

*Eye gaze, head position and orientation*

During signing, head and eye positions change constantly; they move up or down, away from or towards the interlocutor, from left to right and vice versa. Most certainly, when signers look at their interlocutors they do not look at each other's hands constantly, nor do they look deeply into each other's eyes. The movements that are made by the head and eyes are important in establishing discourse as well as referent-tracking, by directing eye gaze towards points in sign space in which referents have been previously established (Coerts, 1992).

**Functions of Non-manual Markers**

The non-manual markers comprise a number of independent channels: head, body position, eyebrow & eye gaze, nose and mouth, tongue, cheek (Wilbur, 2009). Non manual cues provide morphemic information on lexical items, or indicate the end of phrases. In well studied sign languages such as ASL and British Sign Language (BSL) the non manual signs made on the face are roughly divided into two-groups: lower and upper. The lower portion of the face is used to provide adverbial and adjectival information. The mouth, tongue and cheeks provide meaningful markers that associate with specific lexical items or phrases (Liddell, 1977, 1980; Wilbur, 2009) and nose is said to be used for discourse marking purpose (Wood, 1996). The non manual signals

supplied by the upper part of the face and head such as eyebrows, head nods, tilts and shakes, eye gaze (Wilbur, 1997) occur with higher syntactic constituents (clauses, sentences). So we see that non-manual signals are important in all areas of ASL structure; phonology, morphology, syntax, semantics, and discourse.

Of the different sign languages used across the world, American Sign Language (ASL) is the mostly widely studied.

**American Sign Language (ASL)**

ASL is a visual/gestural language. It is the natural native language of the American Deaf community. ASL is reported to be used by majority of the deaf adults since 1800's (Moores, 1978, Padden 1987). O'Rourke, Medina, Thames and Sullivan (1975) suggest that nearly 500,000 deaf people and an unknown number of hearing people use ASL. American Sign Language (ASL) is a natural language with a linguistic structure distinct from English and used as a primary means of communication for approximately one half million people in the U.S. (Mitchell, 2005). This includes deaf native signers, who have learnt ASL as their first language; hearing children, who also have learnt ASL as their native language from their deaf parents; and fluent signers, who have learnt it from deaf people (Wilcox & Wilcox, 1997). It is a rule-governed system that uses symbols to represent meaning. The following combined elements serve as unique features of ASL signs:

- Limited Finger spelling
- Facial expression,

- Eye gaze,
- Body language
- Head movement and use of space and directional movement.

Grammatical facial expressions are critical to the syntax of ASL because they distinguish several different syntactic structures. ASL has some basic sentence types and non-manual markers play an important role in distinguishing the same and thereby are an important part of syntax in the same. The most canonical sentence types discussed are questions, negations, commands, topicalization and conditionals. ASL also has declarative sentences (i.e. sentences that convey referential information), but these do not seem to be marked by specific non-manual signals as are the other sentence types.

Liddell (1977, 1980) identifies uses of facial expressions and head position in five different contexts: (1) as abstract grammatical markers (topicalization, question, negative, and so on), (2) as adverbs, (3) as parts of lexical items (4) as a pantomime and (5) as indication of emotional states or evaluative judgments of the signer. The abstract grammatical markers are notable because of their precise onset and offset times with respect to manual signs.

Some of the common ASL sentence types include:

*Questions:*

*Yes-no questions*

These are questions which require yes or no as an answer. When spoken by a speaker of English language, these yes-no questions usually end with a rising intonation. In English language, these yes-no questions have a definite form that is different from other kind of sentences. The same is true for ASL. These yes-no questions do have certain specific non-manual signals that are associated with them. When someone asks a yes-no question, the eyebrows are raised, the eyes are widened and the head and body may tilt forward; sometimes the shoulders are raised and sometimes the last sign is held. The symbol that is used to represent the non-manual signal that goes with a yes-no question is *q* (Aarons, 1994 and Baker-Schenk, 1983).

*WH Questions*

WH questions involve the use of words like where, who, when, what and why. When an English speaker asks a WH question, there is usually a fall in his intonation at the end of the sentence. WH questions in ASL also include the use of signs WHERE, WHO, WHEN, WHAT and WHY along with a very specific non-manual marker. These include eyebrow squint and head tilts, also, the body may lean slightly forward and the shoulders might be raised. The symbol used for a WH-question is *wh* (Aarons, 1994 and Baker-Schenk, 1983).

*Rhetorical Questions*

They do not seek a 'yes' or a 'no' or the information that WH-questions seek. These look like questions however they do not do the work that real questions do. There is usage of a form which looks like questions but answers are not expected from the

person they are directed to. These questions are called *rhetorical questions*, and their function is to provide connections between what the speaker is saying. Most rhetorical questions use a WH-word, and one might expect WH-non-manuals with them —squinted eyebrows and tilted head. But the non-manuals used with rhetorical include raised eyebrows and a slight shake or tilt of the head. So even though the form may be a WH-sign, the non-manuals indicate that the function is not that of a WH-question. The symbol used to indicate a rhetorical question is *rhet (*Baker-Schenk, 1983).

*Negation*

Sentences in ASL are not always *affirmative.* Signers often have occasion to use negative sentences, as do speakers of English. Some examples of negative sentences in English are '*The man is not home* or *Me cannot see me.'* The process of changing an affirmative sentence to a negative is called *negation.* Aarons, 1994 reports that the non-manual markers in negatives are squeezed eyebrows, frown, wrinkling of the nose, a raised upper lip and a headshake used at the same time with the negative word (Aarons 1994). The non-manual signal is sufficient to produce a negative sentence. The symbol used for negation in ASL is *neg* (Liddell, 1980).

*Commands*

The sentences that people use to give commands are different from other kinds of sentences. In English, commands (or imperatives) often occur without a subject (the result of a transformational rule that deletes the subject *you),* as in Sit *down!* or *Come here!* In ASL the subject is also often deleted or occurs after the verb as a pronoun. ASL

imperatives also have particular non-manual signals including making direct eye contact with the person being spoken to, and possibly frowning. The symbol * is used to indicate an imperative.

*Topicalization*

Topicalization occurs in ASL when the object of a sentence can be moved to the front of the sentence. The object that is moved to the front of the sentence and is topicalized is marked by particular non-manual signals, which include raised eyebrows and a head tilt, and possibly a short pause. An Example of Topicalization In English: 'As For The Homework, I Detest It.' The symbol used for the non-manual markers of topicalization is *t.*

*Conditionals*

Conditional sentences express a condition upon which the topics being discussed depend. An example of a conditional sentence in English is '*If it rains tomorrow, the game will be cancelled.'* In English, words such as *if* indicate a conditional. The ASL signs #IF and SUPPOSE also can be used to express conditionals. However, non-manual signals play a very important role in conditional sentences. Conditional sentences can be constructed in ASL with non-manual signals and without the use of signs to show the conditional. The non-manual signals for conditionals include raised eyebrows, a head tilt and possibly a short pause. The symbol used for conditionals is *cond.*

Liddell identifies “hn”, head nod, as a slow, forward head nod which signals assertion and/or existence. The “hn” marker behaves parallel to English “be” and “do”, especially in its function when the main verb is missing and for emphasis. Table 1 provides a summary of the non-manual signs across different sentence types in ASL.

Table 1

*Non-manual Signs across Different Sentence Types in ASL*

| Sentence Type | Non-manual Signs | Example |
|---|---|---|
| Yes/No questions | Eyebrows raised, eyes widened, head and body may be tilted forward; shoulders may be raised; last sign may be held | _____q<br>MAN HOME |
| WH questions | Eyebrows squinted, head tilted; body may be forward; shoulders may be raised | _____wh<br>MAN WHERE |
| Rhetorical questions | Eyebrows raised, head may be tilted or may shake slightly | Rhet<br>PRO.1 TIRED WHY STUDY ALL NIGHT |
| Negation | Head shakes side-to-side; may have frown or squint | _____neg<br>MAN HOME |
| Commands | Direct eye contact with addressee, may frown | *SIT* |
| Topicalization | Eyebrows raised, head tilted, possibly a short pause | t<br>HOMEWORK PRO.1 DETEST |
| Conditionals | Eyebrows raised, head tilted; possibly a short pause and eye gaze shift | _____cond<br>TOMORROW RAIN, GAME CANCEL |

**British Sign Language (BSL)**

British Sign Language (BSL) is the sign language used in the United Kingdom (UK), and is the first or preferred language of deaf people in the UK where the number of signers has been estimated to be 250,000 with hearing impairment as well as 125,000 hearing people who use BSL (British Deaf Association, 2007).

Although, there are strong cultural and spoken language similarities between United States & England, the vocabulary of BSL is different from that of ASL. Each sign language clearly has its own grammatical and semantic system (in the form of signs as the building blocks).

BSL includes 4 components (3 are similar to ASL):

a) The location of the sign in space (the Tab)

b) The handshape used in making the sign (the Dez)

c) The type of movement made by the hand/hands (the Sig)

d) The orientation of the hand relative to the body (the Ori)

Each of these components derives its importance from the existence of 'minimal' pairs where the meaning of the sign is altered by change in only one of the components. However, there are further components in the articulation of a sign which include facial expressions, lip patterns, signer's eye gaze (a system of pronouns in BSL is based on eye-gaze and position in space), the body posture, the shoulder and head. The term 'quality'; refers to the degree, manner or size of the referent. E.g. In English, words like 'very', 'really', and 'a little' can be added to adjectives to alter quality; or the tone of voice may indicate quality. In BSL, a range of modifiers of quality are available, some involving

alterations in the manual component, others requiring the addition of non-manual markers. Different types of modifiers of quality apply to different parts of speech. Hence finding out which quality modification can be used is one way to test what category/part of speech a sign belongs to.

There are quality modifiers for verbs, nouns and adjectives. Verbs can be modified to indicate the qualities of effort, intensity and speed. A verb can be modified for ease / effort by adding a specific mouth and eyebrow movement to manual movements. The neutral form of the verb can be considered as having no special markings, with the qualified form having one of two opposing sets of markers. E.g. the quality modifiers 'ease' and 'effort' maybe considered as opposites. In the 'ease' modification the mouth is closed, with slightly protruding and rounded lips. The mouth may open in coordination with the movements of the hand, and the eyes are slightly widened with eyebrows slightly raised. The head may tilt from side to side, also in coordination with the hands movements. This sign can be translated as WALK easily or WALK COMFORTABLY.

In the 'effort' modification, the mouth is open, tense and spread, and the lips may be drawn back. This modification can be translated as WALK WITH EFFORT. Here the features are opposed, closed, relaxed mouth versus tense, spread mouth, tilting head versus rigid head, raised brows versus lowered brows.

These features can be represented as + or –

i.e. '+' 'effort' modification is + tense mouth

| | |
|---|---|
| | + head rigid |
| | + brows lowered |
| '-' 'effort'/ease modification is: | - tense mouth |
| | - head rigid |
| | - brows lowered |

The neutral form is

- tense mouth (free to move)
- head rigid (free to move)
- brows lowered (free to move)

Intensity (e.g. English – verb tired, really angry) is indicated in BSL by a combination of manual and non-manual features. This modification has been termed as 'initial hold'. In the 'initial hold' modification, the movement is held momentarily before being completed. These modifications appear with verbs referring to a state of being, rather than an action and HAPPY, SORRY, COLD, DEAF etc. (though these are adjectives in English they are taken as verbs in BSL). There is also 'speed' modification wherein the movement of the hand(s) is reduced and repeated rapidly so that they may just appear to oscillate, the body leans forward and the mouth is closed with cheeks puffed out. Air may be expelled steadily from the mouth throughout the articulation of the sign. Nouns and adjectives may also undergo changes related to quality. These collectively reflect the use of expressions or non-manual markers at a morphological level. Facial expressions are known to play higher syntactic functions too. The non-manual markers are found to be different across different sentence types.

*Sentence types*

Most languages contrast declarative (statement A) and interrogative (question) sentence types. Interrogative sentences are generally differentiated from declarative sentences by word order, special interrogative particles or intonation. E.g. He can drive (Declarative) as Can he drive? (Interrogative). Lyons (1977) has claimed that, 'The distinction between yes-no questions and WH questions is a logical, or semantic, distinction that is universal, in the sense that it can be drawn independently of the grammatical and lexical structures of particular languages. Thus these distinctions are also expected in BSL. A change in sign order would not be expected as a feature of question, since such a change would indicate a basic alteration in meaning rather than an interrogative. So, intonation is considered as a possible source of contrast between declaratives and interrogatives. Just as intonation occurs simultaneously with articulated words, similarly it can be expected that whatever marks questions in BSL occurs simultaneously with articulated signs and to extend over stretches as long as a sentence. In BSL – intonation is replaced by facial expressions. Specific facial expressions, occurring simultaneously with signs, differentiate declarative sentences from interrogatives. Furthermore, yes-no questions and WH-questions are differentiated by contrasting facial expressions.

*WH questions*

There are a set of signs which appear in WH-questions. Several of the WH-question signs resemble each other; they share a common handshape and movement. The same handshape and movement (five fingers extended, separate and wiggling) occurs in

WHEN, HOW-MANY and HOW OLD. The appearance of these signs in a sentence does not, suffice to form an interrogative any more than the use of when / who in the sentences – 'She'll go there when she has time etc. does in English'. Signs such as WHEN and WHO are sometimes used as relative pronouns. Signs clearly interpret utterances as WH questions only when particular non-manual features occur. Bracketing of utterances with 'WH signs' frequently occurs: WHY YOU GO AMERICA WHY.

Yes/no questions are not distinguished formally in terms of manual sign order. A number of optional manual markers may appear in conjunction with facial expressions to distinguish questions from statements, but these are also found where no question is implied. There are certain turn-relinquishing markers to serve the additional emphasis that a question is being asked: E.g.: Pointing to the addressee prolonging the duration of the last sign/facial expression. Facial expression in Yes-No questions consists of head and shoulders forward, chin forward and eyebrow raised. However, the facial expression found in WH- questions is different. Here the eyebrows are lowered and together (as in a frown) and shoulders are hunched as well as forward. For both WH and Yes-No questions the expressions extends over the entire clause which is being questioned. Question facial expressions are marked as distinct from other facial expressions in other utterances which incorporate facial expressions as an essential part of their meanings.

**Indian Sign Language (ISL)**

Vasishta, Woodward and Wilson (1978) estimated that Indian Sign Language is used by over 1,000,000 hearing impaired adults and by approximately 500,000 hearing

impaired children. Gordon, 2005 estimated that Indian Sign language (ISL) is used by around 2,680,000 Hearing Impaired in India.

*Language variation and use:*

Jepson (1991b) described signs in India as either urban signs or rural signs. While the urban sign is considered one language across India (Vasistha et al. 1978), Jepson describes the rural sign as "comprised of a variety of independently invented signed languages used by isolated deaf individuals" (Jepson 1991a). Most deaf in rural areas have little chance for education and interaction with other deaf people. Thus their sign is more restricted to gestures used with family, close friends, and co-workers. The signs/gestures developed in more isolated settings will vary from deaf person to deaf person and village to village. Other literature refers to this as "home sign." Because the deaf are fully capable of working in most village manual labor jobs, the families keep them working. Not all villages have schools, and most are not equipped to teach a deaf child. Schools for the deaf are only in the larger urban areas, and most schools charge a tuition that is too high for a villager's income. Thus most deaf from the rural areas are not in contact with other deaf to learn a common sign language.

According to the 1981 census, an estimated 59 percent of the deaf live in the rural areas (Government of India - Ministry of Social Welfare, 1981). This estimate is lower than the population as a whole (74 percent, 1991 census), suggesting that a higher percentage of the deaf move to urban areas than within the hearing population. Jepson (1991b) describes the urban signs as closely tied to the middle-class urban Deaf

community. This group and the upper class Deaf have had resources for education; consequently, they have come in contact with other Deaf and learned a common sign language. Vasistha et al. (1978) quoted an estimate of 1,000,000 Deaf adults and 500,000 Deaf children use ISL or "Urban Indian Sign Language" as suggested by Jepson (1991b). Based on population growth between 1981 (683 million according to the census) and the 2005 approximately 1.6 million Deaf adults and 0.8 million Deaf children for a total of 2.4 million or 24 percent of all Deaf use the urban sign. Gordon (2005) lists the number of signers at 2.68 million.

Gordon (2005) observed that there are three main sign language families in ISL; Mumbai-Delhi Sign language, Kolkata Sign language and Bangalore-Madras sign language. However, Vasishta et al. (1978) observed that although there are varieties in ISL language, they 1) constitute one single sign language, 2) have systemic variation in and between regions, and 3) would not create problems for standardization or planning. Zeshan (2000c and 2003) found the grammar in Pakistan and India to be the same and thus preferred to call ISL as Indo-Pakistani Sign Language (IPSL). Amongst the three sign language families in India, viz., Mumbai-Delhi Sign language, Kolkata Sign language and Bangalore-Madras sign language, Gordon (2005) reported that 75% of their vocabularies were common in the three sign language families and of these, the Mumbai Delhi dialect is the most influential.

*Linguistic Studies in ISL:*

Linguistic work on Indian Sign Language (ISL) began in the 1970's.

*Lexical analysis*

Vasishta et al. (1978) conducted a more recent linguistic study of sign language in 1977. They concluded that the varieties in India 1) constitute one sign language, 2) are not related to European Sign languages, 3) have systemic variation in and between regions, and 4) would not create problems for language standardization or planning. Woodward (1993) compared a small wordlist of 62 signs from the capitals of Pakistan (Karachi), Nepal (Kathmandu), and four cities in India and concluded that the language varieties are distinct but closely related varieties of the same language family. Zeshan (2000a) conducted a more extensive lexical analysis with 500+ words in 10 cities in India, in Kathmandu, Nepal, and in Karachi, Pakistan. She found lexical similarity to vary from 60 percent to 84 percent within India. She also found that Karachi and Kathmandu lexical similarities between each other and the 10 cities in India ranged from 65 to 82 percent. Aarons and Morgan (1998) suggested that Irish Sign Language had an impact on India's signed language.

*Dictionaries*

Since 1977 several regional "dictionaries" have been produced (Delhi variety: Vasishta et al. 1980, 1998; Mumbai variety: Ghate et al. 1990, Roy et al. 1990, Vasishta et al. 1986 and Vacha et al. 1980; Kolkata variety: Vasishta et al. 1987a; Bangalore variety: Vasishta et al. 1985). In 2001, Mani, Gopalakrishnan and Amaresh produced a dictionary representing 1830 words signed from forty-three cities and fourteen states across India. All "dictionaries" are wordlists with graphical representation of signs and English or other spoken language glosses. They do not contain definitions

*Structural Analysis*

Zeshan (2000c and 2003) found the grammar in Pakistan and India to be the same and thus called the signed language Indo-Pakistani Sign Language. Her extensive grammatical analysis describes the signs including their components and influences; the morphology including word classes, directionality, aspects and complex signs; and the syntax including word order, localization, non-manual syntax, and some discourse strategies. Sinha (2007) reported that the morphology is complex; it exhibits both sequential as well as simultaneous affixation of its manual as well as nonmanual components (Sinha (2007). Pallavi and Manjula (2010) investigated the word order seen in signed expression of ISL users, wherein the influence of the verbal language order on the signed expression by ISL users were found to be majorly SOV type.

*Structure of ISL*

There is a level of sublexical structure in sign language analogous to but not dependent on the phonological components of oral language (Battison, 1978). Certain handshapes and locations in sign language are less marked (complex) than others. ISL has all the least marked i.e. the simplest handshapes found in all other researched sign languages (Stokoe, Casterline & Croneberg, 1965). These handshapes are B, 5, G, A, S, C, bO, O & F. ISL also has complex handshapes found in other sign language: H, V, Y, I, 3 & X. ISL does not have certain other extremely complex handshapes found in only a few sign language. For example, ISL does not have K, R, T, E, 7, D, M & N. Thus ISL phonology is highly systematic, since it follows the universal system of handshape

complexity found in all researched sign languages, although the individual handshapes are unique to ISL.

The same holds true for locations in ISL. De Santis (1979a, b) has shown that if a sign language has signs on the arm, it will also have signs on the trunk, face and hand. This is also true of ISL which has arm, trunk, face, and hand signs. ISL has lower and upper arm tabs; high, centre, low trunk and shoulder tabs; forehead, eyes, nose, mouth, chin, throat, and cheek-ear tabs; and hand and zero tabs. These locations follow the universal system of location complexity found in all researched sign languages. ISL signs can be generally classified into three classes:

- One handed
- Two handed, and
- Non-manual signs.

*One handed signs*: the one handed signs are represented by a single dominating hand. One handed signs can be either static or movement related. Each of the static and movement signs is further classified into manual and non-manual signs.

*Two hand signs*: As in the case of one hand signs, similar classification can be applied to two handed signs. However, two handed signs with movements can be further distinguished as:

*Type0:* Signs where both hands are active.

*Type1:* Signs where one hand (dominant) is more active compared to the other hand (non-dominant).

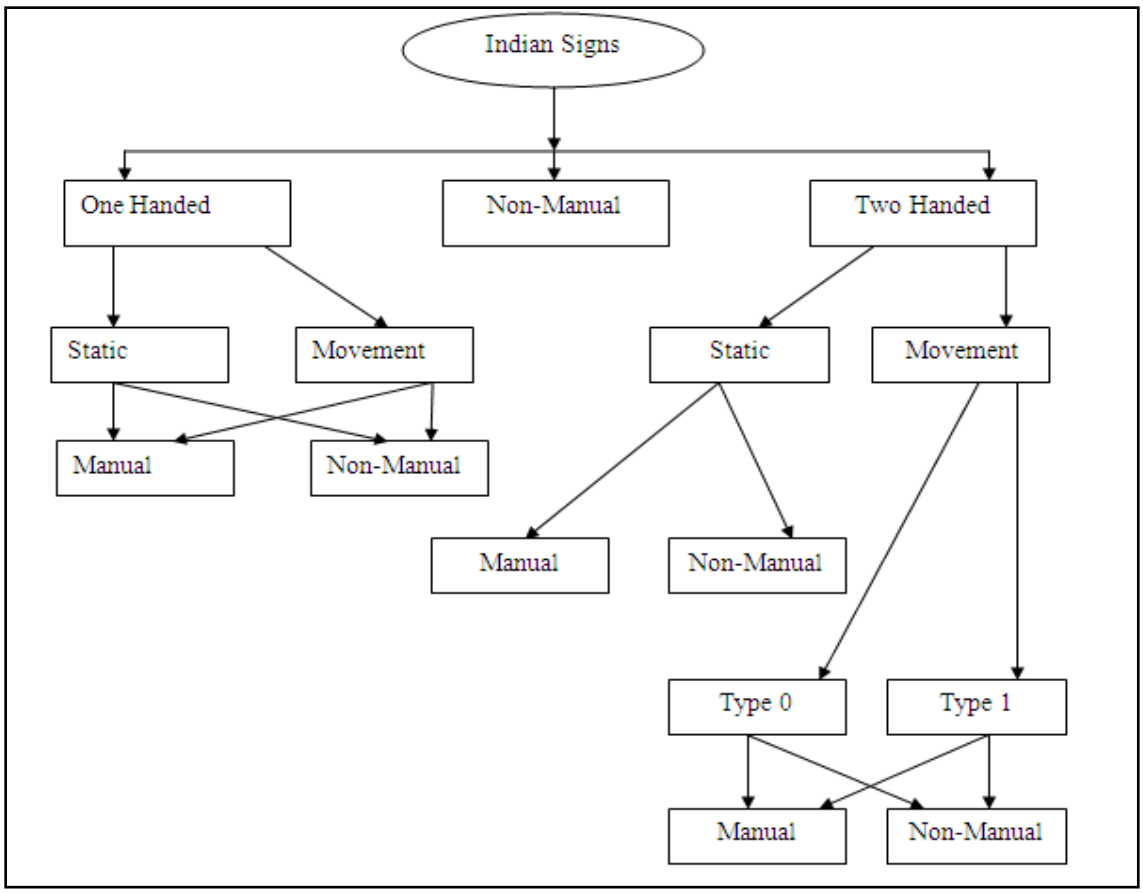



*Figure 1:* ISL Type Hierarchy

As in other sign languages, ISL uses non-manual signs (primarily facial) in parallel with manual signs (hand/arm) to indicate negations, questions, and suggestive phrases. ISL has also been found to share grammatical features with many other sign languages, including the use of space, and simultaneity and the five meaningful parameters, that is, handshape, location, orientation, movement, and non- manual features such as body position, head movement and facial expression (HOLME). However, there exist some signs which may contain only manual or non-manual components. For example the sign “Yes” is signed by vertical head nod and it has no manual component.

Zeshan (2003) in her typological outline of the Indo-Pakistani sign language grammar extensively discusses the non-manual markers/signals. She states that non-manual signs exist as a closed word class out of the three lexical classes in IPSL. Following are her observations:

1. A limited number of signs in IPSL are made without any manual component, that is, without using the hands. These include the following: YES: IPSL has no manual sign for ‘‘yes,’’ although some people use a ‘‘yes’’ sign borrowed from another sign language (American Sign Language in particular). Instead, in IPSL ‘‘yes’’ is signaled by a vertical head nod. The right and left head tilt that hearing people in the region commonly use is not used to mean ‘‘yes’’ in IPSL. Head nods also have various other functions either by themselves or with accompanying manual signs. NO: ‘‘No’’ can be signaled by a side-to-side headshake. There are also various manual negative signs. A headshake is equivalent to neutral negation but cannot signal contrastive negation. Headshakes again have various other functions in grammar and discourse.

2. Non-manual Signs along with Functional Particles and Discourse Particles show no number markings.

3. IPSL has manual negative signs as well as non-manual negation (headshake). There are two un-inflecting clause-final negative particles NAHI:N and NA:_NA. In addition, NAKARO is used for the negative. NAHI:N is a neutral negation, whereas

NA:_NA: expresses contrastive negation. The clause-final negative particles always have scope over the whole clause, whereas the scope of headshake negation is variable.

4. Non-manual negation consists of a side-to-side headshake. Its minimal scope (i.e., the manual signs it co-occurs with) includes the clause-final constituent (either the negative particle or the predicate if there is no negative particle), whereas the beginning of the clause may or may not fall under its scope. The maximum scope is the whole clause. If the initial part of a clause does not fall under the scope of headshake negation, it is interpreted as topicalized. Headshake negation can occur by itself without an additional negative particle, as well as vice versa, even though a combination of both is most common. The double expression of negation by manual and non-manual means is not semantically different from ‘‘manual only’’ or ‘‘non-manual only’’ negation. It never has positive meaning and is not emphatic either. Headshake negation can be combined with a number of other non-manual signals.

5. Manual and non-manual negations are equally incompatible with content questions, that is, there are no negative content questions. Negative polar questions can occur without restriction with either manual or non-manual negation.

6. IPSL has distinct non-manual marking for polar questions and for content questions. Polar questions are signaled by non-manual marking alone, corresponding to questions that are marked just by intonation in spoken languages. Marking for polar questions consists of the following features: eyes wide open, head leaning forward, eye

contact with addressee. Optionally, eyebrows may also be raised, and the shoulders or torso (in addition to the head) may be leaning forward. Eyebrow raise occurs particularly in echo questions (‘‘Do you mean X?’’ ‘‘Did you say X?’’) to add emphasis. The last sign in the sentence is held longer than usual in its final position, that is, it receives an extra hold.

7. There are *non-manual discourse markers* like clause-final head nod which create an intonational break between two successive enumerations. Non-manual markings can be used for topicalization by using particular facial expressions. Additionally, the topicalized constituent can be set off from the rest of the sentence by a prolonged hold, by a change in head position, or by eye blink. The topicalized constituent appears at the beginning of the clause. Non-manual topic marking is used for contrastive topics.

Research on non-manual markers in Indian sign language has been primarily descriptive in nature and has often focused on the phonetic realization of different non-manual expressions. Also, the methodology has not been clearly defined. There are relatively few studies on the syntactic aspects of non-manual marking and its distribution. The current study was carried out to delineate the expression of different non-manual markers across different sentence types in Indian Sign Language.

# METHOD

This study was undertaken with the objective to assess and delineate specific non-manual markers across different sentence types in Indian Sign Language users, if any.

**Aim of the study**

1. To study the expression of non-manual markers in Indian Sign language users across the following sentence types:
    - Declaratives (Affirmative and Negative)
    - Interrogative (Yes/No, WH and Rhetorical)
    - Conditionals
    - Comparatives
    - Exclamatory
    - Imperative
    - Topicalization

2. To classify the expression of non-manual markers used by deaf signers under each sentence type based on their frequency of occurrence.

**Participants**

Nineteen deaf signers, who were studying in a school for the deaf, with input from the Bangalore-Chennai dialect of ISL, participated in the study. The demographic details of the participants are provided in Table 2.

Table 2

*Demographic Details of the Participants*

| **Age Range** | **Groups** | |
|---|---|---|
| 14-25 years | Male | Female |
| | 11 | 8 |
| Mean Age | 18.54 years | 17.25 years |

**Participant Selection Criteria:**

The criteria for inclusion of participants in the study were as follows:

1) Participants were pre-lingually deaf.
2) The minimum educational qualification of the participants was secondary education in a special school for the deaf.
3) Their medium of instruction for writing and reading was English.
4) All these participants had learnt ISL as part of their curriculum and were proficient in the use of the language. For the purpose of the study, the proficiency of the participants for expression of non-manual markers was assessed based on their expression of five emotive words (happy, angry, sad, jealous and sick) using sign language. Their responses were rated on a 3-point rating scale by the investigator with 0 indicating poor expression, 1 indicating average and 2 indicating good expression of non-manual markers. Only those individuals who

scored 2 i.e. had good expression of non-manual markers were considered for the study.

**Material:**

*Stimuli*

- In the first stage, a set of 15 sentences was prepared for each of the following sentence types:
    - Declaratives (Affirmative and Negative)
    - Exclamatory
    - Imperative
    - Interrogative (Yes/No, WH and Rhetorical)
    - Conditionals
    - Comparatives
    - Topicalization

  Initially, a total of 150 sentences were prepared for all the sentence types. These comprised of simple sentences in English.

- These sentences were then given to an experienced linguist who analyzed the same for accurate representation of sentence types under each category.
- Then, the most unambiguous and best representative sentences were selected under each category for the final set.
- After the verification process by the linguist for content, only five sentences were selected for each sentence types including affirmative declarative, negative declarative, exclamatory, comparatives, conditionals, yes/no and rhetorical. For

the WH category twelve sentences were included with three sentences for each of the WH type: who, when, what and why. For the imperative sentence type for representation of the sub-types namely requests, commands and wishes, ten sentences were included. Topicalization had three sentences.

- The distribution of sentences under each category and their subtypes in the final list is as depicted in the Table 3.

Table 3:

*Distribution of Number of Test Sentences across each Sentence Type*

| **Type of Sentence** | **Subtypes** | **No. of Sentences** |
|---|---|---|
| **Declarative** | Affirmative | 5 |
| | Negative | 5 |
| **Exclamatory** | | 5 |
| **Imperative** | 3 sentences each for wishes and requests, 4 for commands | 10 |
| **Interrogative** | Yes/No | 5 |
| | WH (3 sentences for each of the WH type: who, when, what, why) | 12 |
| | Rhetorical | 5 |
| **Conditionals** | | 5 |
| **Comparatives** | | 5 |
| **Topicalization** | | 3 |
| | **Total** | 60 |

- Each of the selected sentences was written clearly on flash cards to be shown to the participants.

**Task and Procedure**

The video / audio recording of the participants of the study, who were ISL users were collected individually. Informed consent was obtained from all the participants before the commencement of the video-recording. The participants were presented the cards containing the 60 randomized sentences across categories, one at a time and instructed to sign the sentences which were written on the card. This was carried out in individual setting, in a room with minimal distractions. Appropriate instructions were given to the participants before recording. Instruction given to the subjects is as follows:

> "You will be presented with simple and short sentences written on the card. A single sentence will be presented one at a time. You have to read carefully and then express this sentence through signing as slowly and as clearly as possible."

Each participant was given 2 trials for each sentence. The signed expressions of each subject for each of the sentences were audio-video recorded by the investigator using a video camera which was placed at a distance of 4-5 feet away from the participants. All the participants were kept blind to the purpose of the study. The order in which the 60 sentences were signed by the ISL signers was randomized across the participants. Average data recording time per participant was around thirty minutes.

**Coding:**

A total of 1140 video clips (60 sentences x 19 participants) were obtained after completion of all the recordings across participants. These were then visually inspected by the investigator for any errors in terms of correct and complete recording of the sentences. Eight video clips were found unsuitable for analysis and hence were discarded. Thus, a total of 1132 sentences formed the final set for analysis. The duration of each clip varied between 4-8 seconds. Each video clip was then coded by the investigator with a reference number along with the sentence type and a serial number.

**Analysis:**

Data analysis was carried out under the following steps:

*Step 1: Selection of the judges*

- Three judges, who were qualified sign interpreters of ISL, were selected.
- The purpose of the study was not revealed to the judges.

*Step 2: Training session*

- A training session was provided to these judges using a video sample of two subjects who were not a part of this study.
- The judges were asked to analyze the non-manual markers used by the sign language users.
- They were oriented towards scoring their responses on the recording form which was specifically prepared by the investigator for the purpose. The recording form had

fifteen pre-listed non-manual markers. Also, there were additional columns provided to mention and mark any other unique features observed or extra remarks to be made.

*Step 3: Response sheet and coding by the judges*

- The 1132 video clippings of 4-8 seconds each were randomized and transferred into a video file and were given to the judges on a DVD along with a key and response sheet including the instructions for the coding and judgment.
- The response sheet included a list of 15 non-manual markers with a key giving the operational definitions of the same.
- The judges were instructed to analyze each clip carefully and indicate on the response sheet the non-manual markers expressed by the participants.
- During the analysis, they were allowed to view the clip(s) any number of times.
- The 3 judges carried out the analysis of the recorded samples for the presence of various non-manual markers.
- Each judge analyzed the samples independently without mutual consultation.
- The analysis was carried out sentence by sentence and required the identification of the non-manual markers used by the ISL signers for each of the sentence.

*Step 5: Reliability Check*

- Item by item inter judge reliability was checked for the judgments of non-manual markers across the different sentence type for all the 3 judges.

- 10% of the total video samples of ISL signed expressions by ISL users were considered for intra-judge reliability and this was carried out by all the three judges independently after a gap of one week.
- The raw data obtained from the judges was tabulated and subjected to statistical analysis. The same is presented and discussed in the following chapter.

# RESULTS AND DISCUSSION

The aim of the study was to analyze the expressions of non-manual markers across different sentence types in Indian Sign Language users.

Specific aims were to:

* Compare the expressions of non-manual markers in Indian Sign language users across the sentence types namely Declaratives (Affirmative and Negative), Interrogatives (Yes/No, WH and Rhetorical), Conditionals, Comparatives, Exclamatory, Imperatives and Topicalization
* Classify the expression of non-manual markers used by deaf signers under each sentence type as 'frequent' or 'infrequent' based on their frequency of occurrence

The results of the study are presented and discussed under the following sections:

A. Reliability Check: Calculation of intra and inter-judge reliability
B. Comparison of type and frequency of non-manual markers expressed by deaf signers for different sentence types
C. Hierarchy in the frequency of occurrence of the different non-manual markers.

## A. Reliability check

*a) Intra-judge reliability*

The video clippings were analyzed by three judges who were professional sign language interpreters. In the first set, the judges analyzed a total of 1,132 sentences for the presence of different non-manual markers as listed on the response sheet. While

analyzing the video-clips for the expression of different non-manual markers, the judges observed that majority of the participants did not understand sentence structure of topicalized sentences and were hesitant and confused in signing the same. This resulted in literal signing of those sentences by the participants without understanding the meaning of the same. Hence, the sentences under the topicalization category were discarded from further analysis by mutual decision of the judges.

For the intra-judge reliability check, 10% of the total video samples of the ISL signed expressions were reanalyzed by each judge after a gap of one week. The values were tabulated and Cranbach's alpha co-efficient was used for calculation of intra-judge reliability using the SPSS 18 software program. Table 4 shows the alpha co-efficient values for intra-judge reliability in identification of different non-manual markers across different sentence types.

Table 4

*Intra-Judge Reliability in Percentage for Identification of Different Non-Manual Markers*

| | Ht[a] | Br[b] | Ew[c] | Se[d] | Nhs[e] | Hn[f] | Bt[g] | Sr[h] | M[i] |
|---|---|---|---|---|---|---|---|---|---|
| J1 | 100 | 98 | 100 | 100 | 100 | 100 | 98 | 100 | 100 |
| J2 | 96 | 96 | 96 | 100 | 100 | 100 | 100 | 87 | 96 |
| J3 | 100 | 98 | 100 | 100 | 100 | 100 | 100 | 96 | 91 |

Note: a=Head tilt. b=Brow raise. c=Eye widening. d=Squeezed eyebrows. e=Negative head shake. f=Head nod. g=Body tilt. h=Shoulder raising/shrugging. i=Mouthing.

The intra judge reliability was more than 87% for all the three judges. Since there was high intra-judge reliability, further analysis was carried out for inter-judge reliability.

*b) Inter-judge reliability:*

The sum of non-manual markers identified for each sentence type by each judge was computed and compared across judges to calculate the inter-judge reliability. Only those markers which were expressed consistently by more than 50% of the participants were considered for all further analysis. This lead to the emergence of eight non-manual markers across the nine sentence types analyzed during the study. Cranbach's alpha coefficient was used to check item by item inter-judge reliability for the judgments of non-manual markers across the different sentence type. The result of the same is presented in Table 5 for each sentence type.

Table 5

*Inter-judge Reliability in Percentage for Identification of Non-Manual Markers across each Sentence Type*

| Sentence Type | Ht[a] | Br[b] | Ew[c] | Se[d] | Nhs[e] | Hn[f] | Sr[g] | M[h] |
|---|---|---|---|---|---|---|---|---|
| Affirmative | - | - | - | - | - | 87 | - | - |
| Negative | - | - | - | - | 100 | - | - | - |
| Exclamatory | - | 90 | 94 | 99 | - | 99 | - | 93 |
| Conditional | - | - | - | 100 | - | - | 97 | - |
| Comparative | 97 | 100 | - | 100 | - | 94 | - | 92 |
| Imperative | 100 | 99 | - | - | - | - | - | - |
| Yes/No | 100 | 99 | - | 100 | - | - | - | 100 |
| WH | 100 | 100 | - | 100 | - | - | - | - |
| Rhetorical | 97 | 98 | - | - | - | - | - | - |

Note: a=Head tilt. b=Brow raise. c=Eye widening. d=Squeezed eyebrows. e=Negative head shake. f=Head nod. g=Shoulder raising/shrugging. h=Mouthing.

The inter-judge reliability for the identification of different non-manual markers was above 87% for all the sentence types. Since the percentage inter-judge reliability

was high, the randomized samples were decoded for the calculation of mean for each non-manual marker expressed for the different sentence types.

**B. Comparison of type and frequency of non-manual markers expressed by deaf signers for different sentence types**

Since the inter-judge reliability was high, mean scores of the three judges for each non-manual expression under specific sentence type was computed for the frequency of occurrence. Initially, the raw mean scores were calculated out of 5 for sentence types. Following this, percentage mean scores were obtained for the expression of non-manual markers across each sentence type for the two groups i.e. males (N=11) and females (N=8). Table 6 shows the mean percent and standard deviation of frequency of expression of non-manual markers across different sentence types.

As shown in Table 7, there is difference in the percentage mean scores of the frequency of non-manual expression across gender, with males exhibiting a higher percent mean score for the non-manual marker for most of the sentence types (though the standard deviation from the mean is significantly higher for males too). To check if the mean score were statistically significant, the Mann Whitney U test was used to compare the frequency of non-manual expressions across the two groups i.e. males and females. Table 7 shows the summary of the comparison of non-manual marker expression across males and females.

Table 6

*Percent Mean Scores and Standard Deviation of Non-Manual Expression across Different Sentence Types for Males and Females*

| Non-Manual Marker | Male (N=11) | Female (N=8) | Total (N=19) |
|---|---|---|---|
| | Mean (Std. Deviation) | Mean (Std. Deviation) | Mean (Std. Deviation) |
| Adhn[a] | 33.94 | 32.50 | 33.33 |
| | (12.46) | (8.31) | (10.66) |
| Ndnhs[b] | 85.45 | 75.00 | 81.05 |
| | (25.44) | (31.62) | (27.87) |
| Exbr[c] | 57.58 | 50.83 | 54.74 |
| | (18.68) | (21.95) | (19.82) |
| Exew[d] | 23.03 | 18.33 | 21.05 |
| | (13.78) | (15.01) | (14.10) |
| Exm[e] | 52.12 | 44.17 | 48.77 |
| | (17.08) | (10.02) | (14.75) |
| Consr[f] | 14.55 | 9.17 | 12.28 |
| | (9.34) | (10.04) | (9.75) |
| Cpbr[g] | 44.85 | 36.67 | 41.40 |
| | (29.83) | (21.38) | (26.25) |
| Cpse[h] | 27.27 | 20.00 | 24.21 |
| | (28.67) | (10.69) | (22.69) |
| Cpm[i] | 38.18 | 37.50 | 37.89 |
| | (20.02) | (14.67) | (17.51) |
| Impbr[j] | 39.39 | 30.00 | 35.44 |
| | (32.72) | (26.19) | (29.74) |
| Ynht[k] | 25.45 | 25.00 | 25.26 |
| | (23.82) | (25.63) | (23.89) |
| Ynbr[l] | 35.15 | 22.50 | 29.82 |
| | (35.29) | (29.15) | (32.61) |
| Ynm[m] | 27.27 | 17.50 | 23.16 |
| | (13.48) | (16.69) | (15.29) |
| Whht[n] | 25.45 | 17.50 | 22.11 |
| | (22.07) | (12.82) | (18.73) |
| Whbr[o] | 40.00 | 42.50 | 41.05 |
| | (41.95) | (40.62) | (40.26) |
| Rhht[p] | 29.09 | 10.00 | 21.05 |
| | (27.37) | (15.12) | (24.47) |
| Rhbr[q] | 27.27 | 32.50 | 29.47 |
| | (22.40) | (31.96) | (26.14) |

Note: a=Affirmative declarative head nod. b=Negative declarative negative head shake. c=Exclamatory brow raise. d=Exclamatory eye-widening. e=Exclamatory mouthing. f=Conditional shoulder raising. g=Comparative brow raise. h=Comparative squeezed

eyebrows. i=Comparative mouthing. j=Imperative brow raise. k= Yes-no head tilt. l=Yes-no brow raise. m=Yes-no mouthing. n= WH question head tilt. o= WH question brow raise. p= Rhetorical question head tilt. q= Rhetorical question brow raise.

Table 7

*Comparison of Non-Manual Marker Expression across Males and Females using Mann Whitney U Test*

| Non-Manual Marker | Z | Asymp. Sig. (2-tailed)* |
|---|---|---|
| Adhn[a] | -0.13 | .897 |
| Ndnhs[b] | -0.74 | .461 |
| Exbr[c] | -0.52 | .605 |
| Exew[d] | -0.64 | .526 |
| Exm[e] | -1.34 | .179 |
| Consr[f] | -1.33 | .184 |
| Cpbr[g] | -0.63 | .532 |
| Cpse[h] | -0.36 | .718 |
| Cpm[i] | -0.30 | .767 |
| Impbr[j] | -0.59 | .554 |
| Ynht[k] | -0.17 | .862 |
| Ynbr[l] | -0.89 | .372 |
| Ynm[m] | -1.33 | .184 |
| Whht[n] | -0.71 | .480 |
| Whbr[o] | -0.30 | .767 |
| Rhht[p] | -1.66 | .097 |
| Rhbr[q] | -0.13 | .898 |

Note: a=Affirmative declarative head nod. b=Negative declarative negative head shake. c=Exclamatory brow raise. d=Exclamatory eye-widening. e=Exclamatory mouthing. f=Conditional shoulder raising. g=Comparative brow raise. h=Comparative squeezed eyebrows. i=Comparative mouthing. j=Imperative brow raise. k= Yes-no head tilt. l=Yes-no brow raise. m=Yes-no mouthing. n= WH question head tilt. o= WH question brow raise. p= Rhetorical question head tilt. q= Rhetorical question brow raise.

* $p<0.05$

No significant difference was observed in the type and frequency of non-manual expression for any sentence type ($p>0.05$). The reason for the same could be that the expression of non-manual markers for different sentence types is a grammatical function specific to the sentence type and hence was independent of the gender of the participant. Also, the standard deviation from the mean was significantly higher too for both the groups which is suggestive of increased variance in the frequency of occurrence of non-manual expressions. As there was no significant difference in the expression of non-manual markers between males and females, the two groups were combined (N=11+8=19; M=11 and F=8) for further analysis and statistical treatment.

Out of the 15 non-manual makers judged by the coders (See response sheet in Appendix II), 8 major non-manual markers emerged in the expression of deaf signers across different sentence types. These include head nod, brow raise, eye widening, squeezed eyebrows, negative head shake, head nod, shoulder raise and mouthing. The frequency of occurrence of other non-manual markers such as frowning, squinting, raising of the upper lip, body tilt etc., were less than 50% of the participants and hence were not considered for statistical verification.

Stokoe et al., (1965) identified the use of facial expressions and body shifts as important components in the non-manual markers however, non-manual markers have not received the same degree of attention as have the manual components of the sign languages. The research on non-manual marking has been primarily descriptive in nature and has focused on the phonetic realization of different non-manual expressions. The

majority of the data comes from the work of Stokoe (1960), Liddell (1978, 1980) and Aarons (1994) in well studied sign languages like ASL. Zeshan (2003) in her typological outline of the Indo-Pakistani sign language grammar, extensively discusses non-manual signals, which has however been based on the extensive observation made on a single participant There have been relatively fewer studies on the syntactic aspects of non-manual marking and their distribution.

In this study, non-manual marker expressions were studied for nine sentence types including declarative (affirmative and negative), exclamatory, conditional, comparative, imperative and interrogative (yes-no, WH and rhetorical questions). Single exclusive markers were used in signed expressions for certain sentence types while others elicited more than one type of marker with different frequencies of occurrence within same sentence type.

Note: Since majority of the signers used literal signing of the English sentences using the orthographic cue provided, the examples listed in the text have not been transcribed as ISL syntax was not followed.

The findings on non-manual marker expressions for different sentence types are summarized as follows:

*a) Declarative sentences:*

A declarative sentence simply states a fact or argument, without requiring either an answer or action. It declares something, but does so with out showing enthusiasm or asking a question. It is perhaps the most common type of sentence used majority of the

times. Two types of declarative sentences were studied namely affirmative declarative and negative declarative. Two non-manual markers were expressed each unique to the two subtypes of this sentence category. Affirmative declarative sentences were marked by a positive head nod with a frequency of occurrence of 33%. This indicates that not all sentences elicited head nod. It was observed that the participants signed most of these sentences with a neutral facial expression and only few with a slight head nod which occurred close to the expression of the 'being verb' like 'is or are' and sometimes extended till the main verb.

*Head nod (hn)*
↑
Example 1: The glass **is** on the table.

In the above sentence, a slight head nod was expressed by most of the participants and this emerged when it was close to the manual sign 'is'. Also, high variability in head nod expression was evident across sentences within this sentence type i.e. head nods were expressed for different sentences by different participants and frequency of expression varied across participants too.

These findings of non-manual marker expressions have been in consonance with the reports in ASL, wherein Liddell (1980), explains that affirmative declarative sentences are not marked by specific non-manual signals as other sentence types as they mainly convey referential information. Rather, absence of non-manual signals in a sentence may indicate that the sentence is of affirmative declarative type. For example, while signing the sentence 'This is my bag,' most signers would carry out all the manual signs with a neutral facial expression without the use of any non-manual expression.

However, a sentence like, 'Yes, this is my home' is more likely to elicit a head nod for 'yes' by most signers. But this is also not absolute as some might choose to use a manual sign for yes which requires shaking of the fist up and down instead of a head nod. For this reason, some authors propose a third subtype under declarative sentences namely 'neutral declaratives' which encompasses sentences conveying neutral referential information. According to this classification, the affirmative declarative subtype would include sentences beginning with words like 'yes' or 'aye' or including words like 'be' or 'do' indicating some form of assertion. E.g., 'Yes, this is my book.' Zeshan (2003) reports that ISL has no manual sign for 'yes', although some deaf signers use borrowed 'yes' sign from another sign language (ASL in particular) and this is particularly seen in the Bangalore-Chennai dialect of ISL which is influenced by the ASL to a greater degree.

For negative declarative sentences, negative (side to side) head shake was the only non-manual marker expressed by the deaf signers using ISL with a mean percent occurrence around 81%. The expression of the marker was seen in isolation and also along with the manual counterpart of the same and there was good consistency across participants and for different sentences under this sentence type. Three types of manual expression for negation were observed.

*Negative head shake (neg)*

↑

Example 2: The cat is **not** drinking milk.

Some participants finger-spelled the word 'not', some used the manual signal for 'no' (indicated by index and middle finger simultaneously moving down and touching the thumb) as used in ASL while some indicated 'not' by showing a cross sign with both

hands moving apart. In all three conditions, the non-manual head shake accompanied the manual forms most of the time. However, some exceptions were seen when different forms of negation like 'never' and 'hardly' were used in the sentence.

Example 3: He is **never** at home.

To express this sentence, most of the signers used the manual sign for 'never' with no negative head shake. However, some signers expressed the non-manual markers by wrinkling the nose and lowering the eyebrows occasionally. Similar non-manual marker expression is reported to be found in ASL in negative declarative sentences. The negative head nod is sufficient to produce a negation. Negation in ASL can be expressed using non-manual markings, a lexical item, or both. Also, some other markers like a frown or squint might also be associated with this sentence type in ASL (Liddell, 1978, 1980). Such forms of non-manual expression were not expressed by more than 50% of the participants though there were a few isolated expressions of the same seen.

*b) Exclamatory sentences*

Exclamatory sentences are used to express strong feelings, strong emphasis or emotion. Three non-manual markers were elicited under the exclamatory sentence type namely brow raise, eye widening and mouthing. The frequencies of occurrence of each of these non-manual markers were 54%, 21% and 48% respectively. The non-manual expressions commenced at the first word of the sentence and continued till the end for most of the sentences. Also, many participants used the manual signal of physically indicating the 'exclamation' sign (!) with or without associated facial expressions to

differentiate the sentences under this type from those under other categories. Some of the sentences used in the stimuli set were: 'Alas, he didn't survive', 'Hurray, we won!'

Since exclamatory sentences are emotively loaded and include words like 'alas, ooh, hurray, ouch, wow etc,' the affective function in them is simultaneously conveyed along with the syntactic function, by non-manual markers on the deaf signers face. The scope of each function could not be concluded though. Most of the well studied sign languages like ASL and BSL do not consider exclamatory sentences as a specific sentence type for delineation of non-manual marker expression as the facial expressions for this sentence type are highly dependent on the emotive content they convey. However, here, irrespective of the affective component of the sentence which included happiness, sorrow, anger or fear, the three non-manual markers with brow raise occurred more than 50% of the times and mouthing was also approximately 50%. Mouthing was especially used to add emphasis to the content and occurred frequently on the emotive word in the sentence.

*c) Conditional sentences*

Conditional Sentences are also known as Conditional Clauses or 'If' Clauses. They are used to express that the action in the main clause (without if) can only take place if a certain condition (in the clause with if) is fulfilled. In conditional sentences, shoulder shrugging was used as the only non-manual marker with the mean percent occurrence of 12% and was expressed by more than 50% of the participants for this

sentence type. Though gaze shift and squeezed eyebrows were elicited too, there were very few participants who used this and hence were not considered in the analysis.

Sign languages like ASL have more specific and elaborate non-manual expression for this sentence type. Conditional signals require the use of non-manual signals to alert the addressee to the condition. The signal is eyebrow raised, the head titled slightly to one side, the last sign of the conditional clause held slightly longer than the other signs and in some cases, the body inclined forward. The head is usually tilted forward but it may be tilted slightly backward depending upon the style of the signer and context of the sentence (Liddell, 1978, 1980).

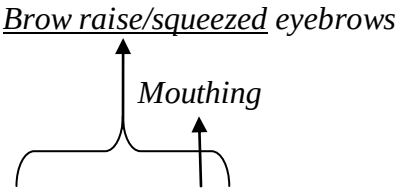
However, this was not observed in the participants of the current study. It could be because, sentences under this type were longer compared to the other sentence types and involved a structure including two conditions (if/then). Since there are specific manual signs available for each of these words, the signers focused on maintaining the accuracy of the grammatical component of the sentence. Also, the elicitation of these non-manual expressions is more natural and readily seen during conversations or discourses which require another communication partner. This study used a forced paradigm wherein the sentence was written on a card and the signers were expected to express the same. Also, signing in a monologue without a conversation partner would be an unnatural situation for expression of the markers. This could have restrained the signers from using the non-manual markers spontaneously; rather they concentrated on signing word by word the chosen sentence.

Example 5: Go to bed **if** you are feeling sleepy.

Here, in the absence of the referent 'you', most of the non-manual markers are automatically eliminated.

*d) Comparative sentences*

Comparative is a sentence form which is used to compare and contrast two conditions. Comparatives are those sentences that indicate either 'more than' or 'less than'. The non-manual markers expressed in comparatives were brow raise, squeezed eyebrows and mouthing with a frequency of occurrence of 41%, 24% and 37% respectively. It was observed that the ISL sign users exhibited eyebrow rising associated with the manual sign to indicate 'more than', and eyebrow squeezing to indicate 'less than' associated with the manual sign. Also, the terms used for comparison like 'bigger', 'more', 'fatter' etc. were mouthed by the signers to emphasize on the same. The non-manual signals appeared at the comparative word and not throughout the whole sentence.




Example 6: **The boy is fatter** than the girl.

The results are similar to those obtained by Yashomati (2010) where they analyzed the non-manual marker expression in comparative sentence types and found eyebrow raising and frowning as the non-manual markers elicited under comparatives in ISL users. ASL discusses the role of non-manual signals in comparatives and

superlatives with respect to their adjectival function and not as a sentence type as a whole.

e) *Imperative sentences*

Imperative sentences are those which give advice or instructions or that expresses a request or command. Imperative sentences included sentences of three types under them i.e. commands, requests and wishes. The sentence set prepared for non-manual maker elicitation under this sentence type had 4, 3 and 3 sentences under each category respectively to provide appropriate representation to each subtype. However, while compiling and computing the scores, it was observed that no specific non-manual marker expression emerged and hence the scores of the subtypes were merged to be discussed under the main sentence category. The imperative sentence type had several isolated non-manual expressions across participants but 'brow raise' was the only marker expressed by more than 50% of the participants with a mean percent occurrence of 35% and hence its expression under this sentence category was documented. Literature under this sentence type in other well studied sign languages is limited probably because of the wide variety of sentence types found under this category and the different non-manual markers thereby elicited under each of them.

*f) Interrogative sentences*

Interrogative sentences are sentences of enquiry that ask for a reply. Three types of interrogative sentences were considered for the elicitation of non-manual markers including yes/no, WH and rhetorical. A 'yes-no' question is one to which the answer is

either ‘yes’ or ‘no’. There are questions, however, those ask for more than a simple ‘yes’ or ‘no’ answer. These questions use interrogative words such as ‘why, when, where, who, what, which, how etc. They are called ‘WH-words’ because many of them start with a ‘WH’ in English. The questions that they form are therefore referred to as ‘WH questions.’ The rhetorical question is usually defined as any question asked for a purpose other than to obtain the information the question asks.

Similar types of non-manual markers were elicited for the different question types; however some differed in the frequency of their expression. Yes/no questions elicited non-manual markers like head tilt, brow raise and body tilt with the mean percent occurrence of 25%, 29% and 23% respectively.

*Question (q)*

Example 7: **Will you bring the book?**

*Question (q)*

Example 8: **Did she pass the test?**

Specific non-manual markings have been defined for questions in most of the well studied sign languages. Studies in ASL have revealed that yes-no questions are accompanied by “y/n-question marking” which consists of raised brows, widened eyes, forward tilting of the head and torso, eye-gaze at the addressee, and a slight pursing of the lips (Baker-Shenk, 1983, Liddell, 1980, Stokoe, 1960). If the question is short, then the signer can raise his eyebrows and tilt his head for the entire question. If the question is long, the signer usually adds the non-manual signal at the end of the sentence while signing those signs that are directly associated with asking questions. Such observations

could not be made as the length of the questions was almost similar. Also, the other non-manual expressions like eye-gaze at the addressee with forward tilt of head and torso could possibly not be elicited as the signing situation employed a situation similar to monologue rather than a conversation or dialogue.

WH and rhetorical question types elicited only head tilt and brow raise. The mean percent occurrence for head tilt was similar (around 21%) while those of brow raise differed significantly. For WH questions, the mean percent occurrence for brow raise was 41 while that for rhetorical questions it was 29%. Body tilt was expressed consistently for WH questions by some participants but since it involved was less than 50% of the participants it was not considered for further analysis. Instances of isolated expression of squeezed eyebrows were also noticed for both WH and rhetorical question type in few signers. Example 9 and 10 highlight the non-manual expression in WH and rhetorical questions respectively.

*Wh*

Example 9: **Where is my book?**

*Rhq*

Example 10: **Are you kidding me?**

In ASL, WH-questions are accompanied by the +wh-marking, which consists of lowered brows, narrowed eyes, a slight frown, the torso shifted forward, head tilt, somewhat rounded lips and often a slight sharp side-to-side headshake Rhetorical questions, in contrast, are accompanied by what has been called the "rhq-feature," which

consists of a brow raise, different head tilt from that characteristic of yes/no questions, the torso in neutral position and eye-gaze towards the addressee (Baker-Shenk, 1983).

The reason for identical expression of non-manual markers for both WH and rhetorical questions could be reasoned due to the failure on the part of the participants to differentiate between the two. As reported earlier, most of the participants in the study were school children who were exposed to a structured curriculum with very limited exposure to rhetorical or tag questions. This could be the reason why the participants did not express differently the two sentence types and used the same non-manual markers for both.

From the findings of the study it can be noted that there was a clear emergence of non-manual markers for different sentence types in Indian Sign Language though expression of some were found specific to certain sentence types while others were common across some sentence types. Following this, Wilcoxon Signed Rank test was done to check the significance of frequency of non-manual expression across different sentence types. On observation of the result it is evident that there is a marked difference in the frequency of occurrence of head nod marker in affirmative declarative sentences and negative head shake in negative declarative sentences compared to other sentence type. Table 8 shows the results of the comparison of non-manual expression frequency of affirmative and negative declarative sentences with other sentence types. Significant differences in frequency of occurrence of some non-manual expression in comparative and conditional sentence type were seen with respect to non-manual expression across

other sentence type. The results of the comparison on Wilcoxon Signed Rank test for comparatives and conditionals in Table 9 and Table 10 respectively.

Table 8

*Comparison of Scores of Non-Manual Expression of Affirmative and Negative Declarative Sentences with other Sentence Types*

| Parameters | Z | Asymp. Sig. (2-tailed)* |
|---|---|---|
| Adhn[a]-ndhs[b] | -3.53 | .000 |
| Adhn-exbr[c] | -3.30 | .001 |
| Adhn-exew[d] | -2.67 | .008 |
| Adhn-exm[e] | -2.84 | .005 |
| Adhn-consr[f] | -3.64 | .000 |
| Adhn-cpse[g] | -2.24 | .025 |
| Adhn- ynm[h] | -2.24 | .025 |
| Adhn-whht[i] | -2.30 | .021 |
| Ndnhs- exbr[j] | -2.22 | .026 |
| Ndnhs- exew | -3.79 | .000 |
| Ndnhs- exm | -3.44 | .001 |
| Ndnhs- consr | -3.85 | .000 |
| Ndnhs- cpbr[k] | -2.97 | .003 |
| Ndnhs- cpse | -3.55 | .000 |
| Ndnhs- cpm[l] | -3.39 | .001 |
| Ndnhs- impbr[m] | -3.10 | .002 |
| Ndnhs- ynht[n] | -3.75 | .000 |
| Ndnhs- ynbr[o] | -3.28 | .001 |
| Ndnhs- ynm | -3.77 | .000 |
| Ndnhs- whht | -3.64 | .000 |
| Ndnhs- whbr[p] | -2.75 | .006 |
| Ndnhs- rhht[q] | -3.52 | .000 |
| Ndnhs- rhbr[r] | -3.25 | .001 |

Note: The table lists only those parameters which were significantly different.

a=Affirmative declarative head nod. b=Negative declarative negative head shake. c=Exclamatory brow raise. d=Exclamatory eye-widening. e=Exclamatory mouthing. f=Conditional shoulder raising. g=Comparative brow raise. h=Comparative squeezed eyebrows. i=Comparative mouthing. j=Imperative brow raise. k= Yes-no head tilt. l=Yes-

no brow raise. m=Yes-no mouthing. n= WH question head tilt. o= WH question brow raise. p= Rhetorical question head tilt. q= Rhetorical question brow raise.

∗ $p<0.05$

Table 9

*Comparison of Scores of Non-Manual Expression of Conditional Sentences with other Sentence Types*

| Parameters | Z | Asymp. Sig. (2-tailed)* |
|---|---|---|
| Consr[a]- cpbr[b] | -3.37 | .001 |
| Consr- cpse[c] | -2.22 | .026 |
| Consr- cpm[d] | -3.47 | .001 |
| Consr- impbr[e] | -2.72 | .007 |
| Consr- ynht[f] | -2.27 | .023 |
| Consr- ynm[g] | -2.26 | .024 |
| Consr- whht[h] | -2.22 | .026 |
| Consr- whbr[i] | -2.30 | .021 |
| Consr- rhbr[j] | -2.28 | .023 |

Note: The table lists only those parameters which were significantly different.

a=Conditional shoulder raising. b=Comparative brow raise. c=Comparative squeezed eyebrows. d=Comparative mouthing. e=Imperative brow raise. f= Yes-no head tilt. g= Yes-no mouthing. h=WH question head tilt. i= WH question brow raise. j= Rhetorical question brow raise.

∗ $p<0.05$

Frequency of few non-manual expressions under exclamatory sentences was found to be significantly different from frequency of expression of some non-manual markers in other sentence types. The results of the same are displayed in Table 11. No significant difference in the frequency of non-manual expression across all the three subtypes of interrogative sentences i.e. yes-no, WH and rhetorical with respect to other sentence types were noticed.

Table 10

*Comparison of Scores of Non-Manual Expression of Comparatives Sentences with other Sentence Types*

| | Z | Asymp. Sig. (2-tailed)* |
|---|---|---|
| Cpbr[a]- ynht[b] | -2.08 | .038 |
| Cpbr- ynbr[c] | -2.08 | .038 |
| Cpbr- ynm[d] | -2.30 | .022 |
| Cpbr- whht[e] | -2.21 | .027 |
| Cpbr- rhht[f] | -2.93 | .003 |
| Cpbr- rhbr[g] | -1.97 | .049 |

Note: The table lists only those parameters which were significantly different.

a=Comparative brow raise. b=Yes-no head tilt. c=Yes-no brow raise. d=Yes-no mouthing. e= WH question head tilt. f= Rhetorical question head tilt. g= Rhetorical question brow raise)

* $p<0.05$

## C. Hierarchy in the frequency of occurrence of different non-manual markers across different sentence types

The mean percentages of occurrence of each non-manual marker for each sentence type were checked for hierarchy. A pattern emerged. There were few non-manual markers which occurred more frequently and some less frequently. The same is shown in Table 12 and Figure 2.

The reported literature across most of the well studied sign languages suggests that no non-manual expression is absolute for any sentence type. Some sentences are marked by single non-manual expression while others elicit a group of non-manual markers simultaneously or one after the other, depending upon the function served by the expression. There are sentence types with minimal to no non-manual expression where the absence of the expressions itself is indicative of the respective sentence type. Also, if there is a manual counterpart available with the same grammatical function as served by the non-manual expression, the non-manual expression might be substituted by the manual markers, especially in artificial situations where the signer focuses more on accuracy and precision of the manual signs over the facial expression itself. Hence a greater than 40% mean percentage score for a marker was considered as the cut-off to identify the more frequently occurring non-manual expression. According to this criterion, the non-manual markers elicited under different sentence types were classified into 'frequent' and infrequent'. Since it was known from previous studies in other sign languages that no non-manual expression is absolute for a sentence type and there is no 100% occurrence criterion, hence, a more lax criterion of 40% percent occurrence was

chosen for the classification. Also, it should be noted that in the initial data analysis itself, only those markers which were expressed by more than 50% of the participants were chosen for further analysis.

Table 11

Comparison of Scores of Non-Manual Expression of Exclamatory Sentences with other Sentence Types

| | Z | Asymp. Sig. (2-tailed)* |
|---|---|---|
| Exbr[a]- consr[b] | -3.85 | .000 |
| Exbr- cpse[c] | -3.28 | .001 |
| Exbr- cpm[d] | -2.37 | .018 |
| Exbr- impbr[e] | -2.55 | .011 |
| Exbr- ynht[f] | -3.14 | .002 |
| Exbr- ynbr[g] | -2.51 | .012 |
| Exbr- ynm[h] | -3.27 | .001 |
| Exbr- whht[i] | -3.47 | .001 |
| Exbr- rhht[j] | -3.44 | .001 |
| Exbr- rhbr[k] | -2.72 | .007 |
| Exew[l]- consr | -2.18 | .030 |
| Exew- cpbr[m] | -2.57 | .010 |
| Exew- cpm | -3.08 | .002 |
| Exm[n]- consr | -3.86 | .000 |
| Exm- cpse | -3.16 | .002 |
| Exm- ynht | -3.06 | .002 |
| Exm- ynm | -3.56 | .000 |
| Exm- whht | -3.44 | .001 |
| Exm- rhht | -2.93 | .003 |
| Exm- rhbr | -2.44 | .015 |

Note: The table lists only those parameters which were significantly different.

a=Exclamatory brow raise. b=Conditional shoulder shrugging. c= Comparative squeezed eyebrows. d= Comparative mouthing. e=Imperative brow raise. f=Yes-no head tilt. g= Yes-no brow raise. h=Yes-no mouthing. i=WH head tilt. j=Rhetorical head tilt. k=Rhetorical brow raise. l=Exclamatory eye-widening. m=Comparative brow raise.

$* p<0.05$

Table 12

*Frequent and Infrequent Non-Manual Expressions across each Sentence Type*

| Sentence Type | Frequent NMM | Infrequent NMM |
|---|---|---|
| Affirmative | - | Head nod |
| Negative | Negative head shake | - |
| Exclamatory | Brow raise and Mouthing | Eye-widening |
| Conditionals | - | Shoulder raising |
| Comparative | Brow raise | Mouthing, Squeezed eyebrows |
| Imperative | - | Brow Raise |
| Yes/no Questions | - | Head tilt, Brow raise and Mouthing |
| WH-Questions | Brow raise | Head tilt |
| Rhetorical Questions | - | Brow raise and Head tilt |

As shown in the table, for affirmative declarative sentence type, head nod was the non-manual marker identified and its frequency of occurrence was low (33.33%). For negative declarative sentences, negative head shake was the only non-manual marker

with a high frequency of occurrence of around (81%). Exclamatory sentences had both frequently occurring (brow raise- 54.74% and mouthing- 48.77%) and infrequently occurring non-manual markers which included eye-widening. Conditional sentences had shoulder raising/shrugging as the infrequent non-manual marker with a mean percent occurrence of 12.28 while Imperative sentences had brow raise as the infrequent non-manual expression of low frequency of occurrence (35.44%). Comparative sentences saw high frequency of brow raise (41.40%) while low frequency of mouthing (37.89%) and squeezed eyebrows (24.21%). Interrogative sentences exhibited mainly infrequent non-manual expression except brow raise under WH sentence type with a frequency of occurrence of 41.05%. Low frequency non-manual expression for yes-no questions were seen for head tilt (25.26%), brow raise (29.82%) and mouthing (23.16%). Low frequency head tilt (21.05%) and brow raise (29.47%) was noted for rhetorical sentence type. Figure 2 depicts the percent frequency of occurrence of different non-manual marker expression across different sentence types as discussed in Table 13.

The result of the study highlights the emergence of non-manual markers in different selected sentence types where some markers seem to be used exclusively to express certain sentence types while others are common to some. The design of the study was such that the deaf signers were given cards with written sentences and asked to express the same through sign language medium. This could have limited the spontaneity in expression of non-manual markers by the participants and it could be delimited as a literal expression of the same order of the written sentences provided to them. Yet, a clear pattern of non-manual expression across certain sentence types seemed to emerge in

the sample analyzed. Affirmative declarative sentences elicited a weak or infrequent head nod to no other form of non-manual marker while negative declaratives were associated with a negative head shake. Similar findings for these two sentence types have been reported in ASL (Liddell, 1980) and BSL (Lyons, 1977).

This leads to the question of whether these are universal forms used to express these sentence types by all deaf signers. However, more studies are required to answer this question. Similarly, the findings for interrogative sentence types were also similar to that of ASL. There are exceptions to this observation, for example, exclamatory sentences are not discussed for grammatical function of sign languages because of the strong emotive content associated. Similarly, imperative sentences include a variety of different types namely commands, requests and wishes, which inherent potential of eliciting different types of non-manual markers. It is likely that fewer sentences of this type of sentences could have restricted the emergence of a clear pattern across each of these subtypes. The study however, has thrown light on the non-manual expressions used by the ISL signers across different types of sentences and a consistent pattern has emerged and in this sense has provided insight into pattern and components used for non manual markers by the ISL users.

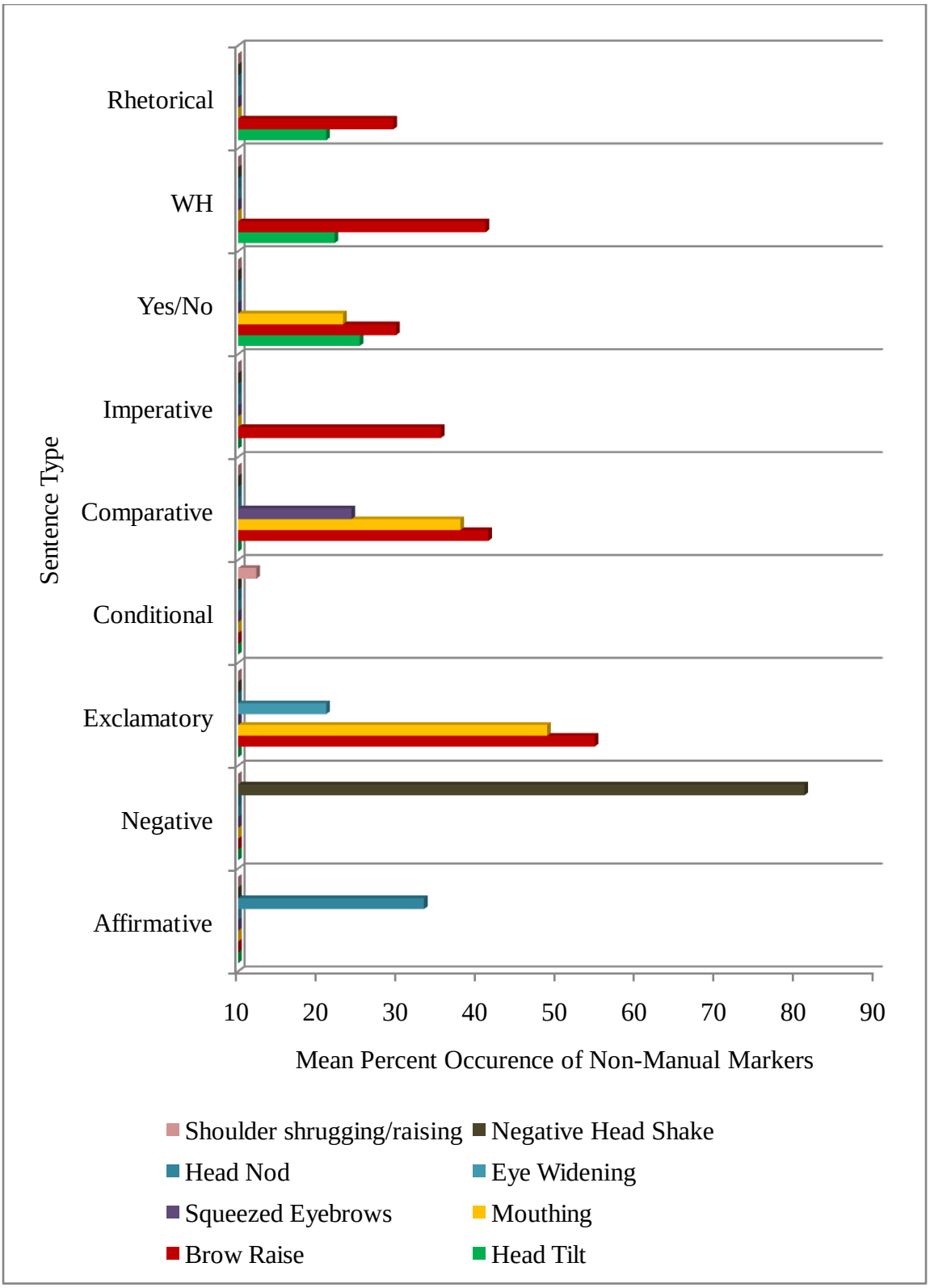



*Figure 2:* Percentage occurrence of non-manual markers across different sentence types

# SUMMARY AND CONCLUSION

Research on non-manual markers in Indian sign language has been primarily descriptive in nature and has often focused on the phonetic realization of different non-manual expressions. There are relatively few studies on the syntactic aspects of non-manual marking and its distribution. This study aimed to analyze the expression of non-manual markers in Indian Sign language users across different sentence types namely declaratives (affirmative and negative), interrogative (yes-no, WH and rhetorical questions), conditionals, comparatives, exclamatory, imperative and topicalization.

Nineteen deaf signers who were users of Indian Sign Language aged 14-25 years participated in the study. The selection of participants was based on a set criterion. The proficiency of signers for their non-manual expressions were assessed based on their expression of five emotive words rated on a three-point rating scale. The participants were users of the Bangalore-Chennai variety of Indian Sign Language. The test material for the study consisted of 60 sentences belonging to different sentence types. Each sentence was written on separate cards. The participants (ISL users) were presented with the cards one at a time and instructed to express each sentence through ISL signs. The signs produced by the ISL users were video-recorded and later analyzed by three judges individually. A total of 1,132 video clippings were analyzed by each judge and coded for the presence of different non-manual markers on a response sheet provided. Item by item inter and intra-judge reliability was checked for both the judgments. The intra and inter-judge reliability was found to be more than 87%. Comparison between sentence types for type and frequency of non-manual marker expression was made.

The salient findings of the study:

- From the set of fifteen non-manual expressions listed for investigation (see Appendix I), eight major non-manual markers emerged in the expression of the deaf signers across different sentence types. Those non-manual features which were expressed by more than 50% of the participants were considered for the study. These included head nod, brow raise, eye widening, squeezed eyebrows, negative head shake, head nod, shoulder raise and mouthing.
- Some sentences led to the elicitation of single exclusive non-manual markers while others elicited more than one type of marker with different frequencies of occurrence within same sentence type.
- No statistically significant difference was seen in the mean percent occurrence of non-manual markers across males and females.
- An attempt was made to classify the non-manual markers across different sentence types as 'frequent' or 'infrequent' based on their percentage of occurrence for each sentence type. With the fear of underestimating the frequency of non-manual expression, a lax criterion of 40% was chosen for the classification of the markers. Table 13 summarizes the non-manual markers identified for each sentence type with their mean percent of occurrence.
- The expression of non-manual markers for certain sentence types were found to be similar to ASL.

Table 13

*Non-manual Expression in ISL across Different Sentence Types*

| Sentence Type | Frequent NMM | Infrequent NMM |
|---|---|---|
| Affirmative | - | Head nod (33.33%) |
| Negative | Negative head shake (81.05%) | - |
| Exclamatory | Brow raise (54.74%) and Mouthing (48.77%) | Eye-widening (21.05%) |
| Conditionals | - | Shoulder raising (12.28%) |
| Comparative | Brow raise (41.40%) | Mouthing (37.89%), Squeezed eyebrows (24.21%) |
| Imperative | - | Brow Raise (35.44%) |
| Yes/no | - | Head tilt (25.26%), Brow raise (29.82%) and Mouthing (23.16%) |
| WH | Brow raise (41.05%) | Head tilt (22.11%) |
| Rhetorical | - | Brow raise (21.05%) and Head tilt (29.47%) |

**Future Implications:**

- The non-manual marker expression can be studied using a naturalistic data collection paradigm using a narrative or discourse analysis task.
- This study mainly included participants using the Bangalore-Chennai dialect of ISL where ASL is reported to have a strong influence. It would be interesting to see if there are any dialectal variations in the expression of non-manual markers across other ISL varieties.
- The recording of data can be carried out in a 3D plane using more than one video camera for analysis.

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