Handshape Preferences for Objects and Predicates in Central Taurus Sign Language

Rabia Ergin and Diane Brentari

1. Introduction

The literature on sign language literature has so far shown that spoken and signed languages share the fundamental properties of a language despite radically differing from each other on the surface –that is, one is produced by vocal signals and perceived through the auditory channel, and the other is produced by manual signals and perceived through the visual channel (e.g., Newport & Supalla, 2000; Meier, 2002; Perniss et al., 2007 etc.). On the whole, both systems are organized around systematic grammatical patterns within the limits of their own affordances.

Previous studies on language typology have revealed many similar patterns across spoken languages. One of the widely accepted linguistic universals across spoken languages is the distinction they make between nouns and verbs (e.g., Robins, 1952; Sapir, 1921). The universal status of this distinction continues to be unchallenged (e.g., Givon, 1979; Hawkins, 1988; Hopper & Thompson, 1984; Schachter & Shopen, 1985; Thompson, 1988). For a pattern to be generalized as a linguistic universal, it must be far too common across natural languages to be an outcome of a coincidence. Therefore, if the distinction between nouns and verbs is uncontested, then it should be realized in signed systems as well. Not surprisingly, Supalla and Newport (1978) present evidence for such a distinction in American Sign Language (ASL) based on sign movement: Nouns in ASL are produced through a reduplication process of the same movement whereas predicates do not exhibit this repetitive movement. In addition, Brentari, Coppola, Jung and Goldin-Meadow (2013) report that noun-verb distinction is one of the acquisition milestones, and deaf children acquiring ASL systematically distinguish between these two word classes as of age four by using distinct hand shape classifiers for each category. In brief, previous studies suggest that the noun-verb distinction is present not only in spoken but also in sign languages.

In order to investigate the distinction between nouns and verbs, previous studies on various sign languages have focused on agentive/non-agentive

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contexts. This is because such an opposition is fundamental to semantic and syntactic structure, and it has a long history in linguistic theory (e.g., Pustejovsky, 1991).

One of the important parameters marking semantic and syntactic structure in sign languages is handshape classifiers. Two of the frequently used handshape classifier types in sign languages are *object handshapes* (OHSs), which represent the class, size, or shape of objects, and *handling handshapes* (HHSs), which represent how objects are handled or manipulated. The difference between the two is illustrated in Table 1.

Table 1 Examples for OHSs and HHSs

Object-HSs	Handling-HSs
1. A flat object (e.g., book) 	1. Handling a flat object (e.g., book) 
2. Small round object (e.g., coin) 	2. Handling a small object (e.g., coin) 
3. Long-thin object (e.g., pen) 	3. Handling a thin object (e.g., pen) 

Work on sign languages has shown that OHSs tend to be used more when the object is acting on its own or not acting at all, as in (1) and (2) (Brentari et al., 2014; Brentari et al., 2016). We will call these "non-agentive contexts."

(1) The lollipop falls.
(2) The lollipop is on the table.

HHSs tend to be more frequent when the object is being acted upon by an agent, as in (3). We will call these "agentive contexts".

(3) The man puts the lollipop on the table.

Previous studies have found that the distribution of these handshapes in classifier predicates varies systematically and function productively as a morphological marker to distinguish between agentive vs. non-agentive events in several sign languages, including ASL (Benedicto & Brentari, 2004; Janis, 1992; Kegl, 1990; Schick, 1987) Nicaraguan Sign Language (NSL: Goldin-Meadow et al. 2015; Brentari et al. 2015), Italian Sign Language (LIS: Mazzoni, 2009), British Sign Language (BSL: Brentari et al., 2016), Hong Kong Sign Language (HKSL: Brentari, Tang, & Benedicto, 2001) and Sign Language of the Netherlands (NGT: Zwitserlood, 2003). In a cross-linguistic study conducted on ASL, BSL, HKSL and LIS, Brentari et al. (2016) report that the use of HHSs is more frequent in agentive contexts, and the use of OHSs is more frequent in non-agentive contexts.

Other studies have shown that some sign languages display a preference for OHSs in instrument *nouns* (e.g., toothbrush), while others prefer to use HHSs.

For instance, Aronoff et al. (2009) and Padden et al. (2013) explored the distribution of two types of handshape (HS) iconicity in sign language instrument nouns: a) "hand-as-hand" iconicity, which is analogous to HHSs in this study, b) "hand-as-object" iconicity, which is analogous to OHSs. They found that American, Swedish, Danish, and Al-Sayyid Bedouin Sign Languages make use of OHSs in instrument nouns, while British, New Zealand, Israeli, and Japanese Sign Languages prefer to use HHSs. This handshape preference in nouns varies across sign languages but on the whole, *within* a single language, noun forms are quite stable. The handshape preference in verb phrases, on the other hand, varies based on the agentive or non-agentive nature of the verb. The different distributions of OHSs and HHSs in nouns and verbs have been used as evidence for a distinction between nouns and verbs (Goldin-Meadow et al., 2015).

In this study, we explore the conditions behind these distinctions in an emerging village sign language, Central Taurus Sign Language (CTSL), a very young village sign language, and compare this case to parallel investigations into other sign languages. The goal of this paper, first, is to investigate the distribution of morpho-syntactic properties of handshape classifiers in CTSL; second, to contribute to the crosslinguistic theoretical discussion concerning handshape preference. To the best of our knowledge, while there is some research on classifiers in village sign languages (de Vos, 2012; de Vos & Zshan, 2012), previous research investigating the agentive/non-agentive distinction has only looked at classifiers in community sign languages (e.g., LIS: Mazzoni, 2009; BSL: Brentari et al., 2016; HKSL: Brentari, Tang, & Benedicto, 2001; NGT: Zwitserlood, 2003).

Central Taurus Sign Language

Central Taurus Sign Language (CTSL) is a village sign language that naturally emerged within the last half century in a remote, mountainous area in southern central Turkey. It has developed in three neighboring villages with little or no influence of Turkish Sign Language (TID), and is distinct from it, as evaluated by a deaf native TID signer[1].

One of the two main reasons for such a language to develop on its own is the high population of deaf individuals in these communities as an outcome of hereditary deafness. The deafness in the CTSL community is preserved up until today probably because of marriage patterns involving close or distant relatives and/or deaf individuals getting married to each other. These marriage patterns are thought to have caused new deaf members being born into the community. The other reason for CTSL to emerge naturally without the influence of any other language is the financial, geographical and cultural conditions in the region. It is a labor-intensive community on top of one of the most mountainous

[1] Okan Kubuş, PhD, viewed several different videos involving CTSL spontaneous conversations and confirmed that this language is completely distinct from TID.

regions of Turkey and the villagers rely on agriculture and animal husbandry in order to meet their own basic needs. Because of this self-sufficient way of life, until the last couple of decades, sending children away for education was not only unaffordable but also irrelevant to the lives of the villagers. Hearing children were able to receive compulsory elementary school education for five years in the village school. However, until early 2000s, financial, geographical and cultural factors inevitably led to the isolation of the deaf individuals from the facilities of the modern world and prevented them from having access to the formal education for the deaf in Turkey. As a consequence of these circumstances, CTSL has developed on its own in the absence of an accessible language model as the primary (and only) means of communication for the deaf individuals.

Named after the Central Taurus mountain range in the region, CTSL spreads over three tiny villages today: Village 1 with a population of 326 involving 15 deaf individuals, Village 2 with a population of 1,955 involving 14 deaf individuals and Village 3 with a population of 182 involving 1 deaf individual (deaf population in each village: 4.6%[2], .7%, .5%, respectively)[3]. All three of these villages are located within a 15-mile radius and most of the deaf individuals in these villages are connected to each other from birth or through marriage. Not only the deaf individuals, but also hearing members of the community can sign CTSL at varying proficiency levels.

de Vos and Zeshan (2012) report that 12 other village sign languages have been discovered so far in the world. All of these languages are very young systems that emerged at a specific point in time. Like other village sign languages, CTSL provides yet another vantage point from which to view how a language develops systematic patterns over time in the absence of an accessible language model.

2. Methods

2.1. Participants

We tested 7 deaf CTSL signers in August 2015 for this study (M_{age}=37.7; Range=18-55; 4 females and 3 males; 1 Cohort-1 signer, 4 Cohort-2 signers and 2 Cohort-3 signers). Six deaf participants are the members of the same extended family in Village 1. Only one of the participants is from Village 2; however, he is married to a deaf woman from Village 1.

A cohort distinction was made based on birth order as well as on the ages of the signers, rather than simply categorizing them according to the biological generations in the family tree. The first-born-deaf siblings in each family were categorized as Cohort 1 whereas the younger deaf siblings were categorized as

[2] Considering .1% deaf population in the US (Emmorey, 2001) and .4% in Turkey (Demir & Aysoy, 2002), this is a very high proportion of deafness within a tiny community.

[3] These are official numbers based on 2011 population count (Retrieved on 10/2/2016 from http://www.yerelnet.org.tr/koyler/koy.php?koyid=248633).

Cohort 2. The rationale behind this categorization is that first-born-deaf children probably had to invent their own systems from scratch while later deaf siblings probably had some language input from their older siblings in the first years of their lives. Cohort 3 signers are the children of Cohort 2 signers. They were not language-deprived, since Cohort 1 and Cohort 2 signers had already been contributing to the development of CTSL for over three decades when Cohort 3 signers were born.

Both of the Cohort 3 signers who took part in this study attended the school for the deaf starting in early 2000s and they are both bilingual in CTSL (native) and TID (non-native). Except for these two participants, the others did not attend school.

Table 2 illustrates each participant who took part in the study.

Participant	Gender	Age[4]	Village	Schooling	Cohort
1. DT	F	55	1	No	1
2. FT	F	45	1	No	2
3. KF	F	45	1	No	2
4. BC	M	40	2	No	2
5. ZB	M	40	1	No	2
6. SK	M	21	1	For 9 years, between ages 9-18	3
7. IB	F	18	1	For 4 years, between ages 7-11	3

2.2. Materials and Procedure

The stimulus set involves a total of 88 short video clips and still images of eight different objects (i.e., *book*, *lollipop, marble, TV, tweezers, coin, airplane* and *pen*) being depicted in situations with and without a human agent. The stimulus items and the situations are illustrated in Table 3.

Table 3 illustrates the situations in which the stimulus items were depicted.

Stimulus items for the agentive/non-agentive opposition	
No Agent	1. picture with [object] alone on the table
	2. picture with [object] alone in a strange position (e.g., upside down)
	3. picture with multiple [objects] of the same kind on table with a regular arrangement in row
	4. picture with multiple [objects] of the same kind in strange positions (i.e., random arrangement)
	5. video clip of an [object] falling on its own
Agent	6. video clip of an [object] alone being manipulated by an agent
	7. video clip of an [object] alone being manipulated by an agent in strange manner (i.e., being put on table upside down)
	8. video clip of multiple [objects] of the same kind being manipulated in a regular arrangement
	9. multiple [objects] of the same kind being manipulated in a random arrangement
	10. the function of the [object] in use
	11. the [object] being used by an agent in an unusual way

[4] The ages of the participants are those in August 2015 when they were tested.

The stimuli were presented on a computer screen and participants were asked to describe what they saw. All of the signers viewed the stimulus items in the same randomized order. Each signer was paired up with another CTSL signer to whom they described the stimulus items.

This stimulus set elicited systematic variation between OHSs and HHSs in ASL, BSL, HKSL, LIS and NSL (Brentari et al., 2012, 2015, 2016, 2017; Coppola & Brentari, 2014; Goldin-Meadow et al., 2015; Horton et al., 2016, Mazzoni, 2009). We used the same stimulus set on purpose in order to collect comparable data with those in the previous studies.

2.3. Coding Procedure

The responses of the participants for each stimulus item were cut into individual video files and transcribed using ELAN (Craborn & Sloetjes, 2008), a tool developed at the Max Planck Institute for Psycholinguistics, Nijmegen for the analysis of language, sign language, and gesture. There were *two* main coding tiers in our coding schema:

1) Label/Event tier: The signs identifying the target objects were annotated as *label*; the signs describing what happened were annotated as *event*; and everything else was annotated as *extra information*.

Because CTSL is a de novo style system and we do not have any suggestive evidence yet regarding the existence of syntactic categories, there is no a priori list of characteristics differentiating between a noun and a verb in CTSL. Therefore, we devised our own operational definitions for these categories. Following Sapir (1921), we categorized a "noun" as something to talk about whereas a "verb" as something giving information about the noun with which it is associated. Nouns tend to be concrete concepts like a person or a thing and appear as the subject in discourse. Verbs, on the other hand, tend to be concepts of activity and describe what happens in discourse (Sapir, 1921, p.119). Based on these operational definitions, the *label* tier in our coding schema is associated with nouns, and the *event* tier is associated with verbs. The signs that label the objects are considered as nouns whereas the signs describing the event are considered as verbs.

2) H1 representation type tier: The shape of the signer's dominant hand was coded based on how it represented the target object in the given conditions. The representation types included *object* (representing the object as a whole), *handling* (representing how an agent would hold or manipulate the target object), *both* (participant's hand changes between OHSs and HHSs, or it's unclear whether it is OHS or HHS), *descriptor* (representing a specific dimension of the object such as its size or thickness) and *other* (representing everything else).

For instance, in Figure 1 (a), a CTSL signer uses an OHS for the object "airplane". The flat horizontal hand shape represents an airplane flying in the air in response to a non-agentive vignette. In (b), he uses a HHS for the toy "plane". The handshape represents how the object is handled in an agentive context.


Figure 1. Picture on the left illustrates an OHS representing the shape of a toy "airplane". Picture on the right illustrates an HHS representing how the toy plane is handled.

3. Results

We analyzed signers' productions of objects and actions in order to determine the distribution of OHSs and HHSs. Our results based on this analysis indicate that the handshape preference in the entire task is not stable across cohorts. Cohort 1 shows a preference for HHSs, whereas Cohort 2 and 3 signers exhibit an OHS preference in the entire task (Figure 2). We observe double dissociation for HS preferences as of Cohort 2, which transforms CTSL in a relatively short period of time into a system that is either mixed using both HHS and OHS, or which favors OHSs. This finding must be viewed with caution, however, since there was only one signer in Cohort 1.

In the next two sections we analyze the event description (verb phrases) and the labels of objects (nouns) separately.

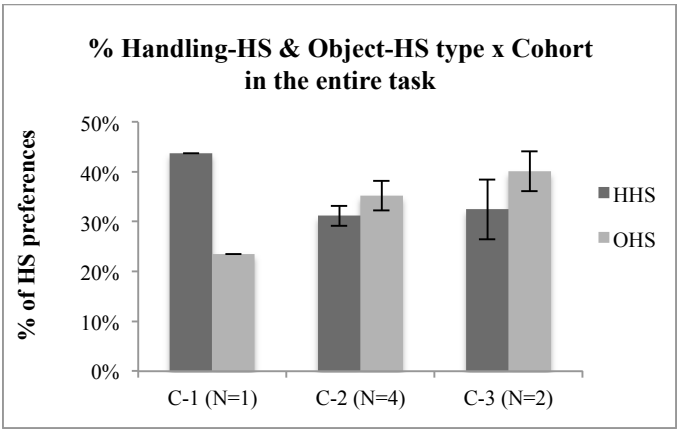


Figure 2. Overall proportion of HHSs and OHSs in the entire task is illustrated. Y axis stands for the percentage of handshape preferences. X axis stands for Cohort-1, Cohort-2 and Cohort-3, respectively. Dark grey and light grey bars represent HHSs and OHSs, respectively.

3.1. Verbs

Figure 3 shows the results in verbs phrases alone. We find that in CTSL the agentive/non-agentive distinction appears in classifier predicates in all three cohorts, with a more frequent use of HHSs in agentive contexts, and of OHSs in non-agentive contexts. These findings are in accord with previous findings in ASL, NSL, LIS and in homesign systems (Goldin-Meadow et al., 2015; Brentari et al., 2015).

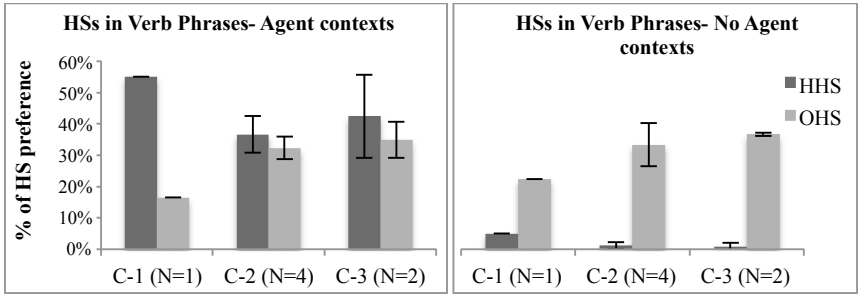


Figure 3. Proportions of HHSs and OHSs in the verb phrases in agentive contexts (on the left) and non-agentive contexts (on the right) are illustrated. Y axis stands for the percentage of handshape preferences. X axis stands for Cohort-1, Cohort-2 and Cohort-3, respectively. Dark grey and light grey bars represent HHSs and OHSs, respectively.

3.2. Nouns

The handshape distinction for agentive/non-agentive contexts disappears in nouns (Figure 4). The use of HHSs and OHSs in nouns is relatively stable across both contexts; that is, a single invariant form is used for nouns in both contexts. As can be seen in Figure 4, the patterns of use in agentive and non-agentive forms do not vary a great deal compared with those of Figure 3. These results concur with previous findings concerning *stability of form in nouns* (Goldin-Meadow et al., 2015).

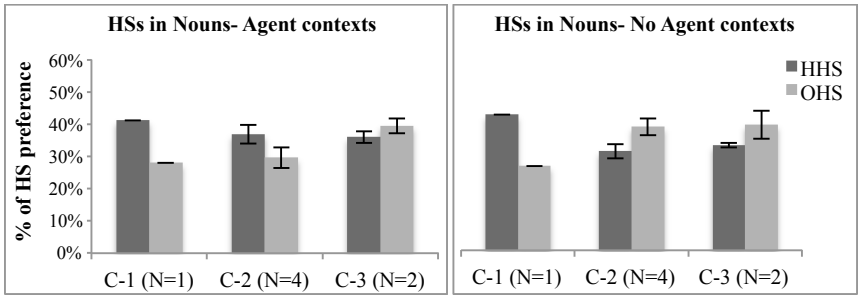


Figure 4. Proportions of HHSs and OHSs in object labels in agentive contexts (on the left) and non-agentive contexts (on the right) are illustrated. Y axis stands for the percentage of handshape preferences. X axis stands for Cohort-1, Cohort-2 and Cohort-3, respectively. Dark grey and light grey bars represent HHSs and OHSs, respectively.

In brief, from the noun and verb analyses, we see that there is ample evidence for a distinction between nouns and verbs based on the distribution of OHSs and HHSs.

3.3. Variation by Object

The distribution of the OHSs and HHSs varies across objects in a number of ways; see Appendix 1 for the HHS and OHS distribution by object. The noun forms exhibit a little variation across agentive and non-agentive contexts; that is, the forms are relatively stable. “Book”, “coin”, and “plane” exhibit an OHS noun form across Cohorts. “Marble”, “pen” and “tweezers” exhibit an HHS noun form across Cohorts. For TV, the noun form is an “other” form (i.e., “tracing”[5]). In addition, the object label for “lollipop” varies in Cohorts 1 and 2, suggesting that there may not be a stable noun for this object in CTSL. It is rather clear, therefore, that the nature of the object itself has an effect on HHS and OHS distributions.

In verb phrases, by contrast, seven of the eight objects exhibit the agentive/non-agentive opposition. The one exception is “book”: Irrespective of the context, CTSL signers from all three Cohorts exhibit a strong preference for an OHS for “book” both in labeling objects (nouns) and describing events (verbs). In other words, the preference for an OHS is so strong that the agentive/non-agentive distinction does not appear in the verbs phrases involving it.

4. Discussion and future directions

In this study we have looked at the distribution of handshapes in a very young village sign language. The patterns found across both established sign languages, such as ASL, BSL, HKSL, NGT, and in NSL have been found in CTSL as well, both with respect to relative stability of form in nouns, and, within verb phrases, with respect to the agentive/non-agentive opposition shown in handshape type. It has been argued that handshapes in sign languages interact with morphological and syntactic rules. Previous studies have presented evidence for the use of OHSs in non-agentive contexts and HHSs in agentive contexts (e.g., Brentari et al., 2015, 2016). In this study, we have the same type of evidence for the morphological status of handshape as an agentive/non-agentive marker in event descriptions in CTSL, which suggests that these handshapes are functioning as classifiers.

The CTSL data suggest, for this small set of signers, that the preference for HHS or OHS can vary across signers and individual objects, and potentially across cohorts in the emergence of a sign language. The single Cohort 1 signer

[5] A size and shape specifier produced through drawing an entity’s size/shape in space.

showed a HHS preference across both noun and verb forms, while the Cohort 2 and 3 signers showed an OHS preference across both noun and verb forms. Our analyses suggest further that a signer's handshape preference applies to both nouns and verbs to some extent. In nouns this preference is unfiltered, since this is all we see, while in verb phrases, the preference is somewhat masked by the handshape's use as an agentive/non-agentive marker.

In the studies cited in the introduction, the verbs in the contexts in (1) "fall", and (2) "is" have been characterized as "non-agentive" versus the context in (3) "put", which is "agentive". This distinction appears in CTSL as well.

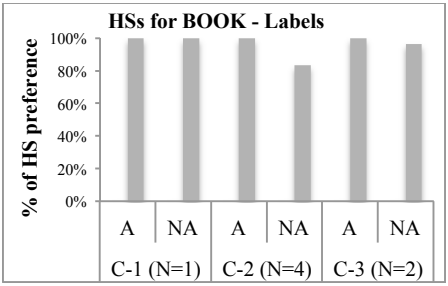
We also see a difference in the distribution of forms in labels for objects (nouns), which tend to be more stable across contexts, and the event descriptions (verb) forms that vary systematically according to the agentive/non-agentive distinction. In keeping with previous studies, we have characterized these distinctions in form in terms of nouns versus verbs. However, we wish to emphasize that these syntactic categories have been used for convenience. Our investigation of CTSL for HS preferences in agentive/non-agentive contexts does not necessarily provide syntactic evidence for a noun-verb distinction. There is no evidence thus far for such a difference in characteristic patterns of inflection, modification, or associated functional categories (e.g. determiner vs. auxiliary) neither in labeling objects nor describing events. Rather, all the data discussed here can be characterized in semantic terms: *object* vs. *action*. It begs the question to assume that object words are nouns and action words are verbs. In particular, in a language with a genuine noun-verb distinction (e.g., English), it is possible to have syntactic nouns that denote actions or events, such as action, event, concert, game, etc. However, in such a young language, we are skeptical of the existence of these syntactic categories. And CTSL is not alone in this respect: Gil (2014) argues that Riau Indonesian, a vocal language with several million speakers, lacks a noun-verb distinction.

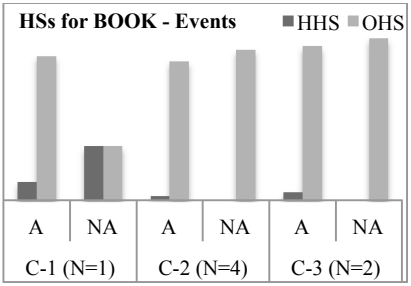
In order to determine if the noun forms are truly stable within and across participants, the specific handshapes produced for each object will need to be analyzed in the future work.

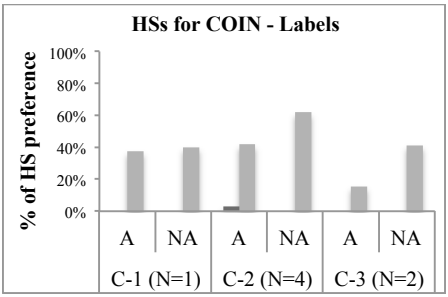
Appendix 1

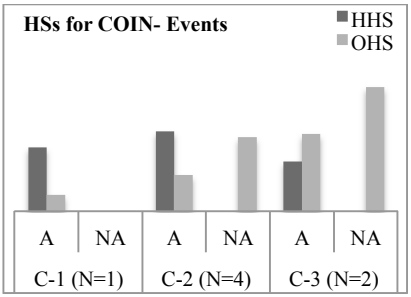
Distribution of HHSs and OHSs for each object in the noun phrases (on the left) and in the verb phrases (on the right) are illustrated in Appendix 1. Y axis stands for the percentage of handshape preferences. X axis stands for agentive (A) vs. non-agentive (NA) contexts, and Cohort-1, Cohort-2 and Cohort-3, respectively. Dark grey and light grey bars represent HHSs and OHSs, respectively.

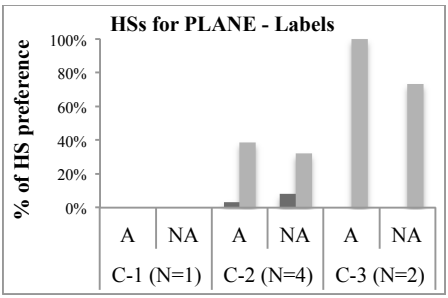
LABELS **EVENTS**

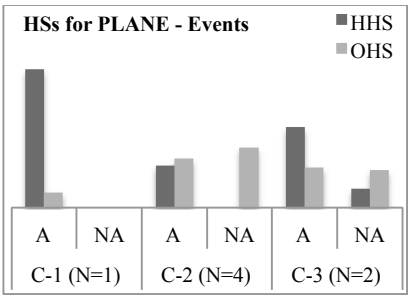


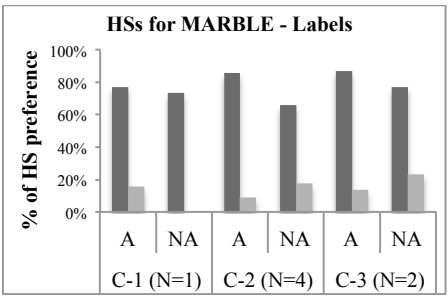


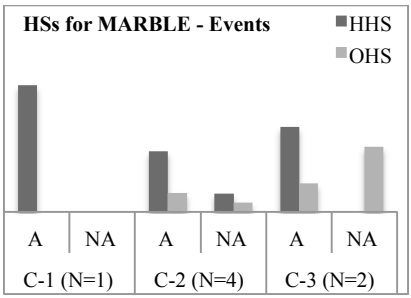


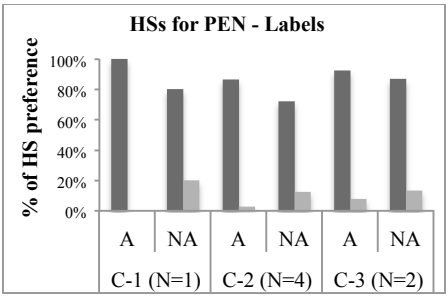


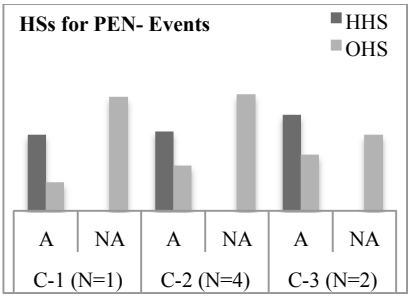


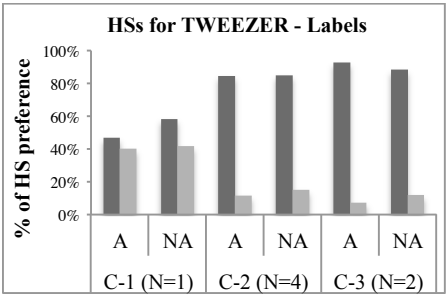


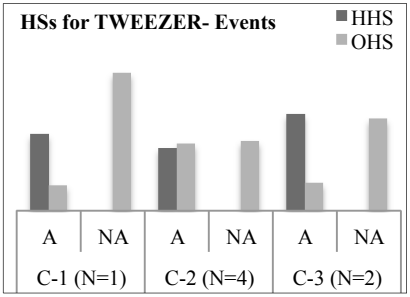


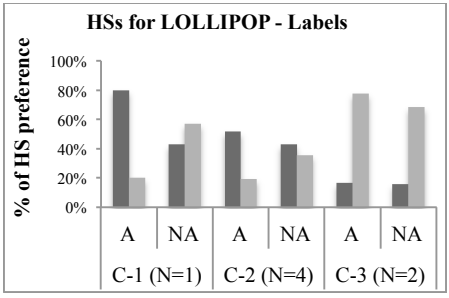


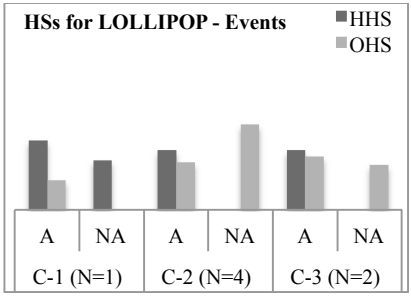

HSs for PEN - Labels
% of HS preference
100%
80%
60%
40%
20%
0%
A
NA
C-1 (N=1)
C-2 (N=4)
C-3 (N=2)

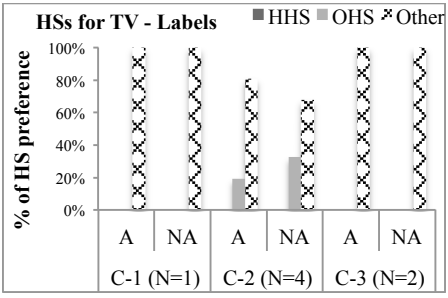

HSs for PEN- Events
HHS
OHS
A
NA
C-1 (N=1)
C-2 (N=4)
C-3 (N=2)

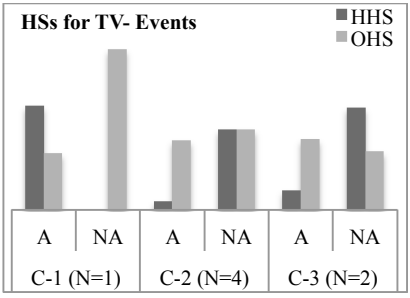

HSs for TWEEZER - Labels
% of HS preference
100%
80%
60%
40%
20%
0%
A
NA
C-1 (N=1)
C-2 (N=4)
C-3 (N=2)


HSs for TWEEZER- Events
HHS
OHS
A
NA
C-1 (N=1)
C-2 (N=4)
C-3 (N=2)


HSs for LOLLIPOP - Labels
% of HS preference
100%
80%
60%
40%
20%
0%
A
NA
C-1 (N=1)
C-2 (N=4)
C-3 (N=2)


HSs for LOLLIPOP - Events
HHS
OHS
A
NA
C-1 (N=1)
C-2 (N=4)
C-3 (N=2)


HSs for TV - Labels
HHS
OHS
Other
% of HS preference
100%
80%
60%
40%
20%
0%
A
NA
C-1 (N=1)
C-2 (N=4)
C-3 (N=2)


HSs for TV- Events
HHS
OHS
A
NA
C-1 (N=1)
C-2 (N=4)
C-3 (N=2)

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