Locational pointing in Murrinhpatha, Gija, and English conversations

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It has been suggested that the gestural accuracy used by speakers of Australian Aboriginal languages like Guugu Yimidhirr and Arrernte to indicate directions and represent topographic features is a consequence of absolute frame of reference being dominant in these languages; and that the lack-adaisical points produced by North American English speakers is an outcome of relative frame being dominant in English. We test this claim by comparing locational pointing in contexts of place reference in conversations conducted in two Australian Aboriginal languages, Murrinhpatha and Gija, and in Australian English spoken by non-Aboriginal residents of a small town in north Western Australia. Pointing behaviour is remarkably similar across the three groups and all participants display a capacity to point accurately regardless of linguistic frame of reference options. We suggest that these speakers' intimate knowledge of the surrounding countryside better explains their capacity to accurately point to distant locations.

Keywords: pointing, place reference, frames of reference, conversation

Introduction

This study investigates locational pointing in contexts of place reference amongst Australian Aboriginal speakers of Murrinhpatha and Gija, and non-Aboriginal speakers of Australian English residing in Halls Creek, Western Australia. The two Aboriginal languages and Australian English are spoken within a reasonably circumscribed area of north Western Australia and the Northern Territory. Our innovative methodology combines the microanalytic tools of conversation analysis (CA) with geospatial information derived from satellite technology. Data from

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a geographic information system (GIS) allow us to accurately identify the directional vectors of locational points, which we compare with the verbal place reference formulations within the same extracts of conversation. In this way we simultaneously examine details relating to the production of points and their placement within sequences of talk, and how they align with respect to landmarks such as hills, rivers, roads and the coast. In doing so, we gain insight into the environments that these conversationalists live in, and that they converse about on a regular basis.

Pointing gestures have long been considered a foundational communicative action (e.g., Haviland, 1993; Sherzer, 1973; Wundt, 1973/1921) and have been examined in gesture studies (Kendon, 2004, pp. 119–224) as well as in other disciplines (Kita, 2003). Although pointing gestures are used in conversation for a variety of different purposes, we adopt a definition put forth by Enfield et al. (2007), who regard pointing as "a communicative bodily movement which projects a vector whose direction is determined, in the context, by the conceived spatial location, relative to the person performing the gesture, of a place or thing relevant to the current utterance" (p. 1724; see also Kendon, 2004, p. 200).

Interactional studies have positioned pointing as a contextually situated, jointly formatted action (Goodwin, 2003) and a complex multimodal achievement that provides insight into the organisation of interactional activities (Mondada, 2014). We focus on pointing in the context of place reference as a locus for investigating participants' verbal and bodily behaviour, and the accuracy of points to real geographical locations.

There are noted commonalities about directional pointing across different spoken and signed language groups, including the oft-cited iconic relation between gesture elevation and distance in prototypical 'absolute' languages (e.g. Bauer, 2014; de Vos, 2012; Kendon, 1988; Le Guen, 2011; Levinson, 2003; Wilkins, 2003). In contrast, there are noted differences in pointing styles across various cultures and language groups such as the range of manual and non-manual articulators deployed and the types of handshapes used to indicate locations and directions (Enfield et al., 2007; Kendon, 2004, pp. 199–224; Wilkins, 2003). One alleged locus of difference is directional accuracy, a trait that has been described as cultural, cum-linguistic in its alleged relationship to linguistic frames of reference (Levinson, 2003, Chapter 6).

Frames of reference (FoR) are coordinate systems that use angular information to locate a 'figure' object relative to a 'ground' object (Talmy, 1983).[1] Levinson's (1996, 2003) three-part FoR typology (relative, intrinsic and absolute)

1. Alternative terms include 'referent' and 'relatum' (Palmer, 2015), and 'located object' and 'referent object' (Levelt, 1984).

has contributed to understandings of linguistic variation in the expression of space and has (with some modifications) established a strong theoretical basis for cross-linguistic research on language and cognition (Levinson & Wilkins, 2006; Majid, et al., 2004; Pederson et al., 1998).[2] Relative FoR (Levinson, 1996, pp. 369–371, 2003, pp. 43–47) conveys a ternary spatial relation, where the viewer's perspective is central to expressing the spatial relationship between the figure and ground (e.g., *to the left of* [i.e., on the viewer's left side of] *the tree*). Intrinsic FoR (Levinson, 1996, pp. 366–368, 2003, pp. 41–43) involves an object-centred binary relation, where the search domain is communicated in terms of the inherent asymmetrical features of the ground object (e.g., *behind the car*). Absolute FoR (Levinson, 1996, pp. 371–373, 2003, pp. 47–50) describes a binary relation (cf. Palmer, 2015), where the spatial relationship is expressed using geographical cues. Absolute systems hinge on fixed bearings that are external to the scene, which may be abstract notions, in the case of cardinal directions, or oriented according to natural axes provided by topographic features such as drainage lines or prevailing winds. In either case, a search domain is projected according to a conceptual 'slope' provided by static external coordinates (e.g., *south of/downstream from Kununurra*).

Research on gesture and narrative within Australian Aboriginal languages has revealed that Aboriginal people accurately represent landscape features and directions both lexically and gesturally, even when those targets are very far away (Blythe et al., 2016; Green, 2014; Haviland, 1993; Wilkins, 2003). Many Australian languages make prolific use of absolute FoRs, particularly cardinal directions in both vast and small localised spaces, which has led to them being regarded as prototypical 'absolute' languages. The dominance of cardinals has been invoked as evidencing the potential for humans to conceptualise space in completely abstract terms. Performance of speakers of Australian languages in non-linguistic rotation tasks is provided as evidence for language shaping spatial cognition and ultimately influencing non-linguistic behaviours (Levinson, 1997, 2003; Majid et al., 2004; Pederson et al., 1998). Levinson (1997) argues that the presence of abstract cardinal directions in Guugu Yimidhirr and accurate locational pointing shows that "gesture is deeply integrated into the system of directional reference [...] [which] demonstrates clearly that it is not simply a linguistic system but a broader communicative one" (p. 103). Consequently, within crosslinguistic research on pointing, there has been a tendency to classify people as 'absolute/geocentric

2. More recent research has elaborated on Levinson's original system (e.g., Bohnemeyer, 2011; Bohnemeyer & O'Meara, 2012; Danziger, 2010; Le Guen, 2011; Lum, 2018).

coders' or 'relative/egocentric coders' on the basis of the dominant FoR in the languages they speak.[3]

Much of the cross-linguistic research on language and cognition emanating from the Max Planck Institute for Psycholinguistics' Space project has treated speakers of various languages as relatively homogenous groupings. More recent research measuring performance in linguistic and non-linguistic rotation tasks has noted demographic variation (in terms of factors such as age, gender, occupation, rural/urban residences) both within and across speech communities that speak the same languages (Bohnemeyer, 2011; Bohnemeyer et al., 2015, 2014; Dasen & Mishra, 2010; Le Guen, 2011; Palmer et al., 2017), which suggests that attributing FoR preferences to 'languages' is unmotivated.

Although held up as prototypical 'absolute' languages (principally, due to the preponderance of cardinals and the apparent absence of relative terminologies),[4] it has been noted by Hoffman (2019) and Palmer et al. (2019), among others, that Australian languages exhibit substantial diversity with some groups, such as Gija, drawing on several types of absolute systems, and with at least one language – Murrinhpatha – using intrinsic terms and landmarks but neither absolute nor relative terminologies. The prolific use of pointing and deixis by both Murrinhpatha and Gija speakers make these groups of speakers ideal to test the association between accuracy in directional pointing and linguistic FoRs.

On the other hand, research suggesting low levels of accuracy of directional pointing in putatively 'relative' languages like English and Dutch seems to rest on a handful of 'dead reckoning' experiments (Baker, 1989; Levinson, 2003, pp. 225–243; Mishra et al., 2009) and an early multimodal paper from CA (Schegloff, 1984) in which directional points produced by speakers of American English are described as lacking directional acuity. Schegloff suggests that the pointing "behavior of recipients is compatible with this disengagement of gestures from 'actual direction'" (p. 280), which is consistent with metaphorical pointing, as described by Le Guen (2011a).

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3. Alternatively, pointers are classified as 'egocentric' or 'geocentric' coders according to results obtained through localisation experiments designed to elicit 'decentred' or 'transposed' points (Le Guen, 2011; Adamou, 2017; Calderón et al., 2019). These classifications tend to align with the FoR described as dominant in the languages under investigation.

4. Palmer et al. (2021) note that the traditional typologies do not consider the transverse and sagittal axes separately. Some Australian languages like Wagiman and MalakMalak do make use of sagittal terms (e.g., *ahead* and *behind*) within the relative FoR, even though the transverse terms (e.g., *left* and *right*) are unattested. Consequently, while transverse terminologies are either marginal or non-existent in many Australian languages, the relative use of sagittal terms may be substantially under-reported.

To the best of our knowledge, the only interactional research within the CA tradition that considers the bearing of the video camera in determining how participants' points are oriented with respect to the local geography are the methodology papers conducted by ourselves (Possemato et al., 2021; Blythe et al., in press). However, in pioneering research on pointing in narratives by Australian Guugu Yimidhirr speakers and by Mayan Tzotzil speakers, Haviland (1993, 2000, 2003) did consider the alignment of the camera. Both groups, incidentally, used gestures to convey detailed mental maps of their regions, despite the Tzotzil having only "paltry lexical or grammatical resources for talking about cardinal directions" (Haviland, 2000, p. 27).

Most of the research exploring the directional acuity of verbal and bodily conduct amongst speakers of Australian Aboriginal languages has been conducted with speakers of languages in which absolute FoRs are dominant (de Dear, 2019; Ellis et al., 2017; Green, 2014a, 2014b; Haviland, 1993, 1998; Levinson, 1997, 2003; Wilkins, 2003), the notable exception being Murrinhpatha, in which neither absolute nor relative FoRs are attested (Blythe et al., 2016). Very little research has been conducted on gesture within face-to-face conversation. For this reason, we use informal multiparty conversations to test the relationships between directional acuity and FoR. In the three languages we examine speakers have very different spatial terms to avail themselves of. English, which is generally regarded as a relative-dominant language due to the frequency of terms such as 'left' and 'right', also has a variety of absolute FoR types (including cardinal directions and riverine terminologies) and intrinsic FoR terms (some of which, like nautical terminologies, are highly elaborated). Gija, on the other hand, has no attested relative terms and instead has intrinsic terms, such as verticals ('top' and 'bottom'), as well as two types of absolute terminologies (cardinal directions and riverine expressions). Murrinhpatha appears to have only intrinsic terms, mostly 'in front' and 'behind'. This does not seem to make spatial reference a more challenging task for speakers, as landmarks and pointing gestures are frequently used to indicate the location of distant places (Blythe et al., 2016). As well as the lexical and grammatical properties of these languages, the extremely remote outback locations allow us to eliminate 'urban vs. rural' as a possible confound in coming to grips with the relationships between languages, directional accuracy and locational pointing.

In the next section we outline the languages, methods and corpora that we use in our analyses. From there we present three extracts each from our various conversational corpora in which we cross-examine the directions of locational points with GIS information. In each of these extracts we see participants displaying not only a profound and detailed knowledge of their own localised environment but also a strong sense of the locations of places that are far removed from where the conversations were being conducted. From there we look closer at the nexus

between points and parts of speech, to better establish whether and how points coincide with the FoR terminologies available in these languages. Finally, we discuss the theoretical implications of our findings.

A question for us in this study is the extent to which our non-Aboriginal participants who live in a very different environment to Schegloff's North American English pointers, behave like the people Schegloff described. Levinson has suggested that an outcome of having an absolute FoR as dominant is that speakers are required to pay attention to location at all times in order to produce grammatical utterances in the language. We propose a nuanced perspective on the connections between speech and visible bodily behaviour that encompasses speakers' interactional experience and the environment within which they have gained this, over and above the traditionally acknowledged effects of the lexico-grammatical resources for spatial location encoded in language. The deep cultural connection to country experienced by Aboriginal speakers underpins a culturally transmitted knowledge of place that is revealed through language use in many ways, besides FoR. Likewise, these outback English speakers' longstanding engagement with the environment has instilled in them a profound knowledge that enables them to match their Aboriginal counterparts in terms of lexical and gestural accuracy, all of which accords well with a sociotopographic account of language and gesture usage (Palmer et al., 2017).

Methods, data, and the languages

We adopt a multimodal approach to conversation analysis (CA) in this study. This approach insists on analysing naturally occurring social interactions embedded in their social and cultural setting. Within this tradition questions about how actions are accomplished across sequences of talk are addressed by examining practices used to formulate actions (such as place reference) in terms of well-established organisational structures, namely turn-taking, sequence organisation, action formation and conversational repair. Interactions are transcribed in detail following Jefferson (2004) and Hepburn and Bolden (2017). Murrinhpatha conversationalists have been anonymised (with pseudonyms), whereas the names of the Gija and English participants have been retained, as per the wishes expressed on their consent forms. All conversations took place outdoors and were recorded using two video cameras.[5] The alignment of the cameras and the locations of the recordings were logged using a handheld Global Positioning System (GPS). Participants were not told where to sit nor what to talk about. Once the equipment was set up

5. Except for a few recorded before 2012, which were recorded using a single camera only.

and the recording had begun, the investigators then extracted themselves from the scene. The locations of the fieldsites where these languages are spoken are given in Figure 1.

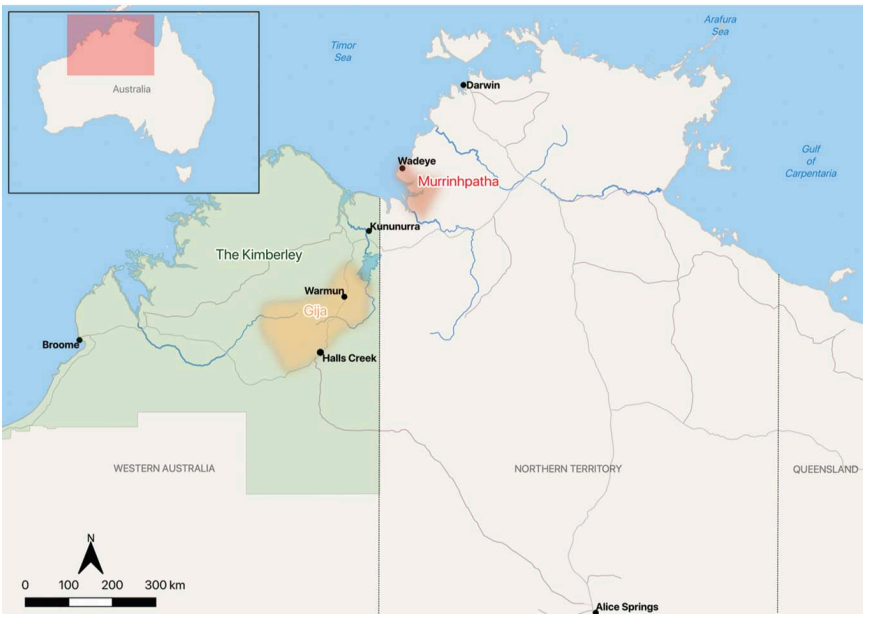

Figure 1. The three fieldsite locations: The Murrinhpatha conversations were recorded in the vicinity of Wadeye, NT, the Gija recordings were made in or near Warmun, and the English data was recorded in Halls Creek

Murrinhpatha is a non-Pama-Nyungan language of the Southern Daly family. It is head marking and polysynthetic, and constituent order is relatively free. Verbs are generally complex predicates consisting of an inflecting classifier stem and an uninflecting lexical stem (or coverb) which, along with a range of other inflectional morphemes, constitute a single phonological word (Mansfield, 2019). Murrinhpatha has a productive system of noun classifiers that do not display morphological concord. The language is one of the few Australian languages that children are still acquiring and the number of speakers (around 3000) is actually growing. Most Murrinhpatha speakers reside in Wadeye, although the language can also be heard in Darwin, Daly River, Peppeminarti, Nganmarriyanga, and in the Western Australian town of Kununurra. All recordings in this study were made in the vicinity of Wadeye.

Gija is a non-Pama-Nyungan language of the Jarragan language family (de Dear et al., 2020; Kofod, 1996; Kofod et al., 2022; McConvell, 2003). Like Murrinhpatha it is a head marking language with relatively free constituent order. Gija also has complex predicates although the verb structure is not polysynthetic. In this particular language, the three noun classes (masculine singular, feminine singular and neuter/non-singular) exhibit substantial concord. Gija is highly endangered. We believe there are 10 fluent speakers of the language who are at least 70 years of age, although younger people know and use a lot of Gija words when speaking the local creole language (Kriol). Although the conversationalists in our corpus are fluent Gija speakers, they regularly codemix Gija with Kriol.

Readers will doubtless be aware that English is a Germanic language that is fairly isolating and analytic, with a constituent order that is predominantly SVO (see Blair & Collins, 2000). In our Australian English corpus the conversationalists have lived in the Kimberley region for at least 15 years. For this study, the data we have chosen comes from a single conversation recorded in Halls Creek. Despite being a predominantly Aboriginal town, one third of Hall Creek's population (i.e., of 1546; Australian Bureau of Statistics, 2016) are non-Aboriginal speakers of Australian English.

Data for this article are sampled from transcribed sections of three multiparty conversational corpora. At least one hour of each corpus has been subject to detailed analysis of locational pointing. We distinguished between head points (including marked gaze behaviour, nods, and chin and lip protrusions) and manual points (produced with a single finger, multiple fingers or the whole hand). We recorded the overall scale of each point (i.e., how much of the body part was used), as well as other aspects of gestural morphology such as whether the gesture consisted of a single movement or was multi-phasal. We then entered GPS data into Google Earth to enable the alignment of satellite imagery with that of the cameras, and to accurately estimate the directions of points. This alignment was achieved by superimposing a compass, which was calibrated to the orientation of the camera, over video stills of pointing gestures. Arrows were inserted as a means of extending the trajectories of points, which enabled us to check absolute direction against the superimposed compass.[6] Pointing gestures were considered 'accurate' if they fell within 30 degrees either side of the correct location of the target entity as determined by satellite imagery.

Table 1 shows the overall frequency of locational pointing across the conversations that we have coded. We do not suggest that our sample is representative of the communities in question, as there may be biases arising from, for example,

6. Our methodology is explained in more detail in Possemato et al. (2021) and Blythe et al. (in press).

Table 1. The three language corpora used for the coding of pointing gestures

Language	Murrinhpatha	Gija	English
Gesture coding	65 minutes	66 minutes	60 minutes
No. of points sampled	195 points	118 points	142 points
Frequency of points	1 point every 20 seconds	1 point every 34 seconds	1 point every 25 seconds

topics of conversation. However, these figures suggest that these communities cannot be meaningfully differentiated in terms of pointing frequency.

In the next sections, we present examples of a range of types of points from all three languages, which coincide with verbal references to place. The co-production of speech and gesture is marked with square brackets and descriptions of pointing behaviour appear in italicised text in double parentheses. Screenshots of participants pointing are superimposed over satellite imagery to provide a geospatial representation of pointing gestures. In the accompanying graphics solid lines represent the actual vectors of pointing gestures produced by participants and the barred lines signify the vectors that we as analysts calculated using GIS. We introduce dotted lines in the final extract to depict 'drawing' in space, as distinct from the vectors cast from the apex of pointing gestures.

Locational pointing in Murrinhpatha conversations

Our first Murrinhpatha extract from Wadeye[7] illustrates a highly accurate sweeping point. In Extract (1), four women are discussing a widespread practice of displaying deference to affinal kin by holding the forearm whilst passing objects to them (Blythe, 2012; Blythe et al., 2018; Garde, 2013; Green, 2020). At line 4 Lily asserts this practice is adopted all over the 'top end' of the Northern Territory, waving her arm behind her in an arc between south-east and north-east.

(1) Top end (20070728JBvid01c, 00:09:24.735–00:09:30.100)

```
1   Edna   [    °°kanyima°°    ( 0 . 5 )          ]
           kanyi-ma
           PROX-having
           With this.
    edn    [((holds right forearm with left hand))]
2   Mary   Aahhhh hha hha ha [ha ha]
3   Edna                     [xx xx]=
```

7. Abbreviations for morphological glosses are given at the end of the paper.

```
4   Lily   =[kanyethuwa mamwurran kanyire (.) top end.     ]
           kanyi=gathu  mam              =wurran
           PROX  =hither 3SG.S.8say/do.NFUT=3SG.S.6go.NFUT
           kanyi-re    top end
           PROX  -PERL  top end
           This side, they all do it {like that} this way {all over}
           the top end.
    lil    [fig.2 ((waves arm behind in an arc btw SE & NE))]
```

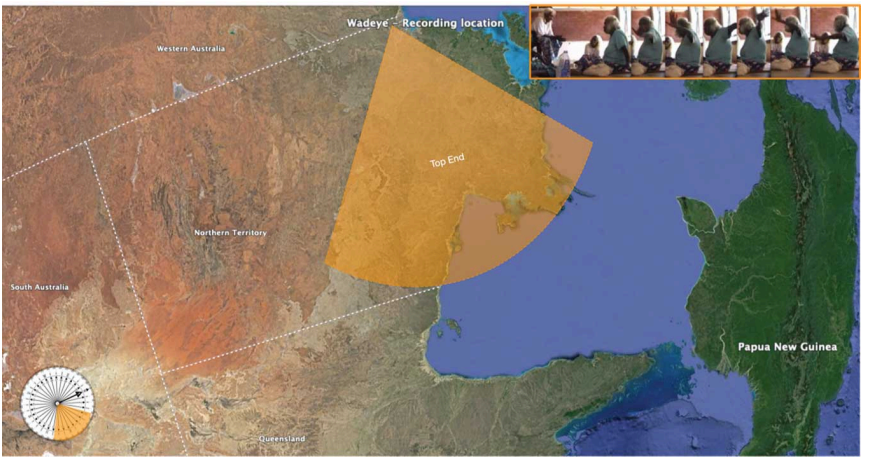

Figure 2. Lily waves her arm in an arc from south-east to north-east and back again

The 'top end' is a colloquial English term for the northern half of Australia's Northern Territory. This is precisely the region covered by the span of Lily's sweeping point, as shown in the series of stills in Figure 2 and as represented by the orange arc, overlayed onto the satellite image. This extract illustrates both the vast distances referenced by speakers in these communities, and their accurate locational gesturing over these distances.

In the next Extract (2) we see a directionally accurate head point (i.e., a shift in orientation led by the head) and a 'flutter point'. Flutter points, like this one, are not yet attested within the Gija or English collections. Extract (2) is part of an extended storytelling. Mary and Lily are co-telling the story of a boating mishap in the 1940s, when the women were children. As the tide receded, the boat became stuck in a channel north-north-east of *Da Ngarne*, where the conversation was recorded. Figure 3 shows the places referred to in the extract. The solid lines represent the projected vectors of the two points (1 and 2), while the barred lines are the calculated vectors linking the recording location (at *Da Ngarne*, origo) to the target locations (*Ku Palla* for point 1, in orange, and *Yirlwurndi* for point 2, in red).

(2) False trumpet shell site (20091121JBvid03, 00:09:03.440–00:09:09.230)

1 Lily [ngarra:: yibintharrkatka ngarra ku: palla damatha.]
ngarra yibim -dharrkat -ka ngarra
LOC 3SG.S.2lie.NFUT-get_bogged/stuck-TOP LOC
ku palla damatha
NC:ANM false_trumpet_shell really
it got stuck where that false trumpet shell totem site is located.
lil [1 fig.3 ((*head point* N))]
2 (0.7)
3 Mary [ngame- panguwathu ku pallare pirridha.]
ngamimarda (trunc't) pangu=gathu ku
other_side DIST =hither NC:ANM
palla -re pirri -dha
false_trumpet_shell-PERL 3SG.S.3stand.PIMP-PST
The othe- they were standing {this side} of there, where the false trumpet shells {are}.
mar [2 fig.3 ((*flutters an elevated flat hand point* N))]
4 Lily kuka nyindama[tha yungunirurr]dhadini;
ku -ka nyini damatha=gathu
NC:ANM-TOP ANAPH INTS =hither
yunguni -rurr-dha=dini
3SG.S.32.PIMP-pull-PST=3SG.S.1sit.PIMP
A strong current pulls from that {place/site}.
5 Rita [thangkardawangu]
thangkurda-wangu
what_place-thither
Which way?
6 Mary Aa?
OIR
Huh?
7 Rita yirlwurndi;
place_name
Yirlwurndi.
8 (0.3)
9 Mary yirlwurndigathu;
yirlwurndi-gathu
place_name-hither
This side of yirlwurndi.

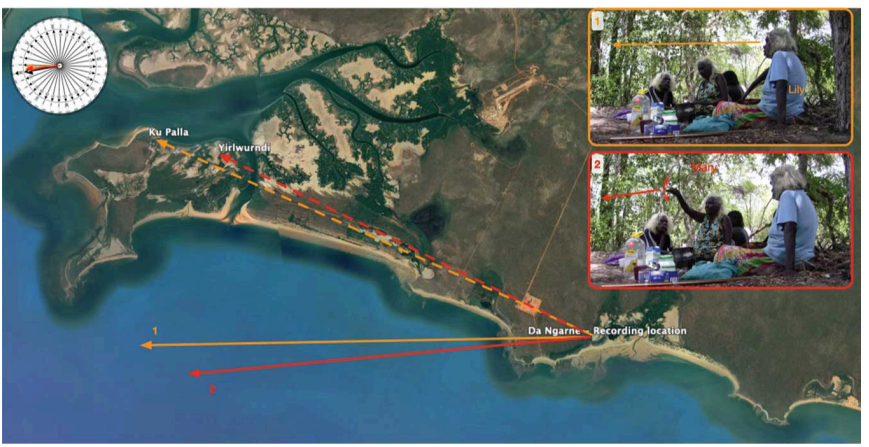

Figure 3. Lily's head point (1) at line 1 and Mary's fluttering hand point (2) at line 3

At line 1, Lily initially locates the place where the boat "got stuck" with a fairly accurate northerly head point (i.e., a shift in orientation in which she lifts her head and eyes, Figure 3, point 1) to *Ku Palla*, a totemic site for false trumpet shells (*Syrinx aruanus*). At line 3 Mary then specifies the exact location by producing an elevated flat hand point (Figure 3, point 2), with her whole arm extended, to the north. This action is accompanied by a fluttering movement of the fingers. These sagittally-oriented flutter points (or single flap points) often occur in the vicinity of the motion/orientation clitic =*gathu* ("hither"), which suggests that they index both direction and motion.[8] In this case, the action indicates that the target is to be found on the speaker's side of the stated landmark, *Ku Palla*.[9] Perhaps unaware of the location of this landmark, at line 5, Rita enquires which way it was to where the boat became stuck. When Mary initiates repair (*Aa?*, "Huh") at line 6, Rita then proffers *Yirlwurndi* as a candidate location. *Yirlwurndi* is the channel where the boat ran aground, which is between *Ku Palla* and *Da Ngarne* (Figure 3). This location is confirmed by Mary at line 9.

From where the women are seated (in a thinly wooded dry scleraphyll forest), the discrepancy between their two points and the vectors for the two landmarks (*Ku Palla* and *Yirlwurndi*) is only 30 degrees. Mary's elevated arm conveys that the landmark *Ku Palla* is some distance away (22km) from *Da Ngarne*. By contrast, the flutter point (plus =*gathu*, 'hither') indicates that the target location (*Yirlwurndi*) is in the same direction but is closer to where they are sitting (18 km) than the named landmark. In this way Mary's pointing gesture is carefully calibrated both in terms of distance and direction.

In the third Murrinhpatha extract from the same conversation, Lily recounts the unexpected appearance of a sailing boat in the 1940s that landed at *Tjindi*, the beach located west of where the women are seated at *Da Ngarne*. Lily, who was a schoolgirl at the time, alleges that the crew of the boat were from India. As she tells the story she points six times with her head in two distinct directions.

(3) The boat from India (20091121JBvid03, 00:16:58.498–00:17:05.450)

```
1   Lily    [da murndak ka:nyi:; (0.7) (daka pume- (.) puberturturtpardi.)]
            da     murndak kanyi
            NC:PL/T old     PROX
            da    -ka   pume  pube            -rturt-urt=pardi
            NC:Pl/T-TOP  STRI   3PL.S.14(bash).PIMP-float-RDP=3PL.S.4be.PIMP
            Here, a long time ago (0.7) (they were landing).
    lil     [1 fig.4    ((Lily gazes W))                                  ]
2           (1.0)
```

8. See Haviland (2000, p. 15) for a discussion of gestures that convey motion and orientation and Kendon (1988, pp. 46–47) for a description of 'trembling' actions in Warlpiri sign language.

9. The distal demonstrative plus =*gathu* might be freely translated as 'towards us from there'. Murrinhpatha speakers also perform 'flick' points that coincide with the opposed motion/orientation clitic =*wangu* (thither), 'away'.

3 Lily [(da) djiyethu tjarndu punnidha;]
da dji=gathu tjarndu punni -dha
NC:Pl/T DEM=hither boat 3PL.S.7go.PIMP-PST
They were coming in from there by boat.
lil [**2** fig.4 ((*head points WNW*))]
4 (1.0)
5 Gracie Aa¿
Huh?
6 (0.3)
7 Lily [tjarndu punnidha (ku) da:: Indiyagathu.]
tjarndu ku da indiya =gathu
boat NC:ANM NC:Pl/T place_name=hither
a boat load of people from India
lil [**3** fig.4 ((*head points WNW*))]
8 (2.2)
9 Mary Mm hm hm.
10 Lucy wurdanbunparl.
wurdan -wun -parl
3SG.S.29.NFUT-3PL.DO-be_pushed_along_by_water
They were washed in {by the sea}.
11 (0.9)
12 Lily nandji manandji kama na, (0.3) tjarndu.
nandji ma- nandji kama na tjarndu
NC:RES NEG-NC:RES INDEF TAG boat
It didn't have a what's its name {engine}, did it (0.3)?,
the boat.
13 (2.8) ((two extraneous lines removed))
14 Lily [Bere (.) wurrinidha::: (.) pepe djungu]
bere wurrini -dha pepe dji=wangu
Right! 3SG.S.6go.PIMP-PST down DEM=thither
Well, it ca:::me in down that way…
lil [**4** fig.4 ((*head points W*))]
15 [pirridha tjarndu nyi:ni.]
pirri. -dha tjarndu nyini
3SG.S.3stand.PIMP-PST boat ANAPH
and stopped down there.
lil [**5** fig.4 ((*head points WNW*))]
16 (0.2)
17 Rita ˚˚tjarndu ngalla;˚˚
tjarndu ngalla
boat big
A big boat?
18 Lily bere (.) tjarndu [da Ind^iya˘gathu;]
Bere tjarndu da indiya =gathu
DM boat NC:PL/T place_name=hither
Well, the boat {came} from India.
lil [**6** fig.4 ((*head points WNW*))]

Lily commences her story with a place reference (Dingemanse et al., 2017). At line 1 she gazes west (Figure 4, point 1) toward *Tjindi*, stating that the boat landed 'here' (*kanyi*). At line 3 she then lifts her chin and head points west-north-west (Figure 4, point 2) adding that they came in 'from there' (*djiyethu*) by boat. Gracie initiates repair with the open interjection *Aa?* ('Huh?') at line 5. Lily elaborates by explaining that the people in the boat arrived from India, repeating the head point west-north-west (Figure 4, point 3). She continues the story at lines 10 and 11, explaining that the engineless boat was washed in. At lines 14 and 15 Lily again uses head points to demarcate the location where the boat landed (west, Figure 4, point 4) from the direction the boat came from (west-north-west, Figure 4, point 5). When Rita inquires (at line 17) whether the boat was large, Lily sidesteps the

Figure 4. Lily points twice with her head west to Tjindi (points 1& 4) and four times west-north-west towards 'India' (points 2, 3, 5, & 6)

question, but reiterates at line 18 that it came 'from India' (*Da Indiyagathu*) – with a final point (Figure 4, point 6) toward the west-north-west.

Lily's four west-north-westerly points are in exactly the same direction, as are the two westerly points to *Tjindi*. If we extend the trajectory of the west-north-westerly points around the globe, we eventually reach the Indian subcontinent (see Figure 5, left), so these points are accurate. Nevertheless, it is perhaps more likely that Lily, who has never left the Northern Territory, has another location in mind. Between 1942 and 1945, the Dutch East Indies (now the Republic of Indonesia) was under Japanese occupation during the second world war. It is more likely that the boat she refers to came from the East Indies, rather than India.[10] Even so, the trajectory of her points passes straight through the Indonesian archipelago (Figure 5, right). Thus, regardless of whether she meant India, or Indonesia, her points remain entirely accurate.

We have seen a range of different manual and head points produced by Murrinhpatha speakers, all of which are directionally accurate or displaced by no more than approximately 30 degrees. As the transcripts indicate, these points are all placed in the vicinity of locational formulations that include reference to landmarks, demonstrative pronouns and/or motional/orientational clitics (=*gathu*, "hither" and =*wangu*, "thither"). In the next section we turn to conversations from the Gija corpus.

10. Brother John Pye, who was stationed at the Port Keats mission (now Wadeye) during the war, recounts an incident in early 1943 where a boat containing Dutch, Indonesian and Japanese people arrived on the coast. The Australian Airforce, who were stationed near the mission, rounded up the crew and took them to Darwin (Pye, 1972, p. 33).

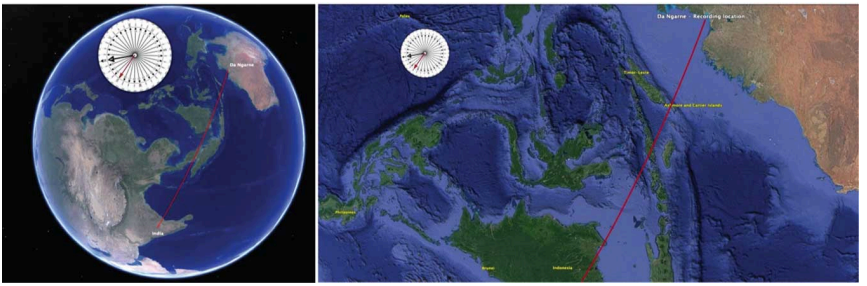

Figure 5. The trajectory of Lily's four north-westerly points ultimately reach India (left), by way of Indonesia (right)

Locational pointing in Gija conversations

In the first Gija Extract (4) we will see an extremely accurate head point to a distant location. Just prior to this extract, Mabel has been speaking about an art competition in Broome. Eileen then asks Mabel who it was that won the competition.

(4) Bidyadanga (20160607JB01, 00:10:23–00:10:35)

```
1           (1.2)
2   Eileen  °mm° (0.3) yangoorra win woomberrayidbe (.) mam:.
            yangoorra win woomberra-yid-be          mam
            who.ns    win 3NS.S_MID-become_PAST-3NS.S  mum
            mm, who won it mum?
3           (0.7)
4   Mabel   tha:rran brom (.) ola ^waje[neyim;^ (    0.7    )    ]
            tharran brom   ola   wajeneyim
            that    from   3PL   what's_'is name
            That mob from all the what's it called (0.7)
    mab                                 [fig.6 ((head points WbS))]
5   Mabel   gaboobirri berrem.
            gaboo-birri  berrem
            what -3NS.IO  PROX
            What's it {called}.
6           (2.2)
7   Eileen  bidyadanga:; H
            bidyadanga
            place_name
            Bidyadanga?
8           (.)
9   Mabel   Mm.
            Mm.
10          (0.3)
```

Mabel attempts to answer the question by referring to the community that the painters came from but has difficulty recalling its name. At the beginning of line 4 Mabel is gazing downwards while scratching her head. However, as she produces the Kriol word search term *wajeneyim* ('what's its name'), she lifts her head momentarily and glances west-by-south (Figure 6) before moving her body back to its original position; at which point she produces a Gija word search formulation *gaboobirri berrem* ('What is it called?', line 5). Then in response at line 7,

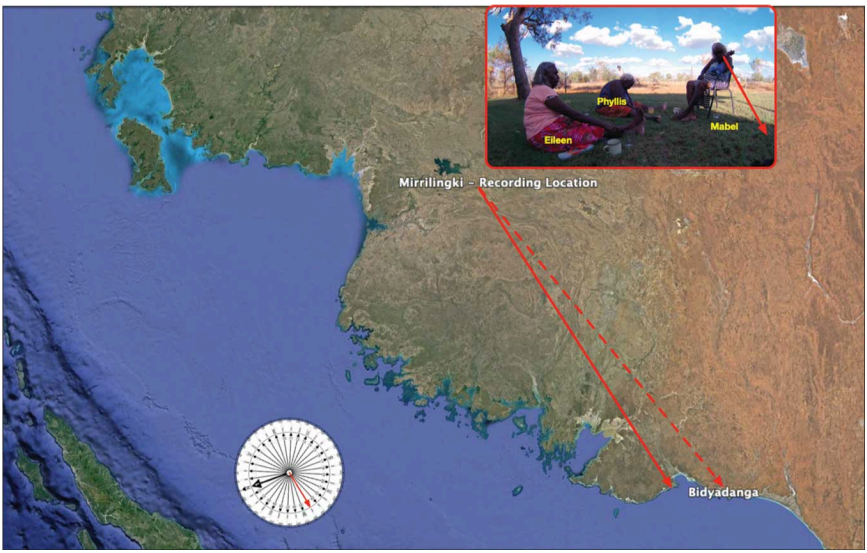

Figure 6. Mabel head points west-by-south, towards Bidyadanga

Eileen, who has observed Mabel's head point, correctly proffers the name of the 700 km distant community *Bidyadanga*, as a candidate for the location of the winners of the competition. Then at line 9, Mabel promptly aligns with Eileen's proffer ('Mm.'). We calculate the vector of Mabel's head point (i.e., the apex of her re-directed eye-gaze) to be only 7 degrees displaced from the vector of the actual target, *Bidyadanga* (as indicated by the solid and barred lines, respectively, in Figure 6).

In the second extract from Gija (5), we see location-based reference to a group of people. Mabel is telling the other women how she was impressed by a group at Catholic mass who were performing didgeridoo-accompanied songs. She remarks that she thought the performers were the 'Port Keats mob' and coordinates verbal reference to this location with an elevated index-finger point that is directed north-north-east (lines 3–4).

(5) Port Keats mob (20160607JB01, 00:09:40–00:09:47)

```
1  Mabel    doo [doo] doodoo doodoo deg yirr[an ]i=
                                  deg yirrani
                                  see 1NS.EX.S.say/do.PST
            “doodoo doodoo doodoo” (sound of didjeridoo)
                                  We looked.
2  Eileen       [mtk]                    [mtk]
                 mtk                      mtk
3  Mabel    =maidi berarr[garri ngidji.
            maidi berrarrgarri ngi   -d          -ji
            maybe come_out     3SG.M.S-go/come.PRES-3SG.M.S
            all the boys were coming out.
   mab                  [fig.7 ((Mabel index-finger points NNE ->
```

```
4  Mabel    ai: bin regin ^poo:d [gidj] m]ab.
            ai bin  regin pood gidj  mab
            I  PST  think place_name mob
            I thought it was the Port Keats mob.
            ------------------------->))]
5  Eileen                          [mtk ]
                                    mtk
6           (0.2)
7  Eileen   Mm¿
            Mm¿
8           (0.5)
```

Figure 7. Mabel points north-north-east, towards Kununurra and Wadeye

As indicated in Figure 7, Mabel's point has two possible locational targets: Kununurra, where a number of Murrinhpatha speakers are known to reside, and Wadeye, formerly known as Port Keats, where Murrinhpatha is the local language (de Dear, 2019, pp. 50–51). Both locations are positioned to the north-north-east of the participants, so this point is very accurate, regardless of the referential ambiguity. Interpretation of Mabel's pointing gesture relies on shared knowledge of the places that referred-to persons inhabit, which is a regular practice in other small-scale communities of speakers and signers (e.g., de Dear et al., 2019; de Vos, 2012; Green & Wilkins, 2014, p. 249; Haviland, 2000, p. 19; Le Guen, 2011, p. 279; Levinson, 2007; Sicoli, 2016).

Our final extract from Gija (6) illustrates how number features of target referents (i.e., *dual* or *plural*), which are expressed verbally through Gija morphology, are echoed within pointing gestures. In Extract (6) Mabel is talking about a pair of wild dogs living in the bush that she thinks are the mother and father of her own dog, living in her camp. She points to where the two dogs live.

(6) Camp dogs (20170426JB01, 00:15:23–00:15:39)

```
1   Mabel    ngoorroon dErrerreb [garri yarraniyin yooloo,          ]
             ngoorroo-n   derrerreb-ngarri yarra-      niyin    yoorloo
             DIST     -LOC  make_camp-SUB    1NS.INC.S-be/stay.PAST downstream
             When we camped over there downstream
    mab                           [1 fig.8 ((index-finger point ESE))]
2   Shirley  [mh
             mh
3   Helen    [eh
             eh
4            (0.3)
5   Mabel    ((signs 'nothing'))
6   Mabel    [ngabooganydoo gooragaldoo,     ] (0.3)
             ngaboo-ga    -ny-doo goora -ga    -l-doo
             father-3SG.KIN-M -DU   mother-3SG.KIN-F-DU
             His father and mother,
    mab      [2 fig.8 ((2-finger points ESE))]
7   Mabel    [joolAnyboorrooyoo dany mA:nbiny,]
             joola-ny-boorroo-yoo da -ny manbe-ny
             dog  -M -3NS.BENE-DU  RECN-M  black-M
             that black dog is theirs (the two of them).
    mab      [3 fig.8 ((2-finger points ESE)) ]
8   Shirley  mm,
             mm,
9            (1.4)
10  Mabel    hhh .h
             hhh .h
11  Helen    GAbiya berra:yindi-°yoo.°
             gabiyi   -iya   berra-iyi       -nde -yoo
             where_to?-INTENS 3NS.S-go/come_PAST-CONT-DU
             Where did the two of them go?
12           (1.0)
13  Mabel    [^^diye:na boorroonbende. h=]
             da -iya -n -a  boorroo-n          -be  -nde
             RECN-INTS-LOC-TOP 3NS.S  -be/stay.PRES-3NS.S-CONT
             They are living there h
    mab      [4 fig.8 ((hand points EbS))]
14  Helen    ^aa^ gaagembi.
             aa gaage     -m -bi
             ah poor_thing-NS-TOP.NS
             Ah, poor things.
15           (0.6)
16  Mabel    gOOWA:lejoorroon, h::
             goowale         -joorroo-n
             small_round_hill-?      -LOC
             along the little round hills. h::
17           (1.0)
```

At line 1, Mabel points with a single index-finger east-south-east to where she and her family had been camping (Figure 8, point 1). At line 6, she introduces the two wild dogs as the mother and father of her own black dog. Her two-fingered pointing gestures[11] in lines 6 and 7 (Figure 8, points 2 and 3) are directed towards the

11. Green (2014a, pp.154–155) raises the issue of directional precision in deictic two-finger pointing as a form of dual reference to distant entities vs. those in close range. Although pointing of this type has not been analysed beyond the sand-story context, she goes on to say that "we might predict that the directional precision achieved… is more useful at close range" (Green, 2014a, p.155). It is noted that previous records of pointing to distant entities has been linked to a wide-handshape rather than one or two fingers (Green, 2014a, p.154; Wilkins, 2003).

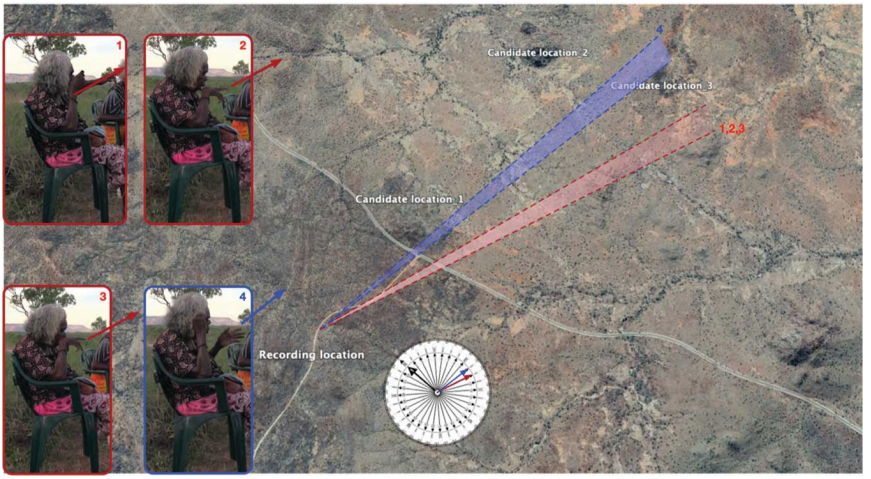

Figure 8. Mabel points east-south-east and east-by-south; from the satellite imagery, we identify three groups of small round hills (line 16) that may or may not have been the targets of Mabel's points

location where the parents were seen, in the same area as in line 1 (i.e., to the east-south-east). These two-fingered points mirror the dual number of the *-doo/-yoo* suffix, which surfaces on each of the kin formulations in line 6, and on *joolany-boorrooyoo* ('their dog') in line 7.[12] When Helen asks, at line 11, where the two of them went, Mabel's multimodal response ('They are living there', plus point 4 in Figure 8) is interpretable as plural because the third person non-singular subject of the verb *boorroonbende* lacks the dual morpheme. Similarly, Mabel's sagittal point, directed east-by-south, is performed with an open hand with five fingers extended – not two.[13] A likely inference to be drawn from this is that the mother and father of her black dog are not alone 'living there' (line 13), 'along the little round hills' (line 16) – they probably have other puppies. This extract provides an instance of multimodal reference to non-singular entities as inhabitants of distant places being performed with a particularly granular attention to the morphological marking of number.

These Gija points, like the Murrinhpatha points, are often complex gestures that convey semantic information such as number, or the relative orientation of

12. Gija effectively makes a three-way number distinction: singular, dual and plural. The 'non-singular' noun class is underspecified. The dual inflection is expressed through the addition of a dual suffix to a non-singular stem (e.g., at lines 7 and 11). In the absence of a dual suffix, 'non-singular' is inferable as plural.

13. Wilkins (2003) also describes the use of 'wide hand' points for plural referents amongst Arrernte people.

a target from a named landmark. Furthermore, these points are highly accurate over vast distances, which suggests that both Gija and Murrinhpatha speakers have memorised many topographic details of the rural environments in which they live. We now turn to the non-Aboriginal residents of Halls Creek, who also display a great knowledge of their environment and a capacity to point accurately over equally vast distances.

Locational pointing in an Australian English conversation from outback Western Australia

The participants in our study have lived in the northern Australian outback for most of their lives and in this particular town for at least 15 years. Our extracts come from a single long conversation between four long-term male residents of Halls Creek, which is mainly about the roads of the Kimberley region (an area three times the size of England). Two major unsealed roads that run more or less east from Halls Creek are called the Duncan (Road) and the Tanami (Track/Road), and these appear in a number of stories and discussions (see Stirling et al., 2022).

In the first Extract (7), Warren is asking about a group of contractors, who have parked some equipment near where they are sitting, in the yard at Jamie's place just outside of Halls Creek.

(7) The Duncan and the Tanami (20180719LSJB01, 00:50:13–00:50:24)

```
1   Warren   Who's the my- who the- (.) mob thata- (.) got their
2            ^stuff parked up there.
3            (0.6)
4   Jamie    Uh:::m Broome Contracting.
5            (.)
6   Warren   ˇA:h yeh-.ˇ They all work out in thuh Tanami.
7   Jamie    Ye[ah;=they bin doin' work  o]ut in th' Duncan, (.)
    jam        [1 fig.9 ((head point ENE))]
8            Cro- [mm ^mm (   0.3   )  Tanami],=everywhere.
    jam             [2 fig.9 ((head point SSE))]
```

Evidently the contractors in question have been working on both the Duncan and the Tanami roads. Jamie, who has a cup of tea in his right hand, knows about them, and as he says, "they bin doin' work out in th' Duncan" he produces a head point (with the white of his eyes visible on the video) over his shoulder (Figure 9, point 1) towards the east-north-east. This directionally accurate head point aligns with where the Duncan Road intersects with the Great Northern Highway. He then says "Tanami, everywhere" (line 8), and points his head south-south-east towards the Tanami Road (Figure 9, point 2). Although the second head point is

Figure 9. Jamie head points to the Duncan Road (1) and to the Tanami Road (2)

harder to map onto the referent than the first, it does represent a best fit line to the Tanami's first stretch.

In the next Extract (8), Dave asks Warren whether he knows a way to transport his timber factory to Adelaide 'for nothing', hinting at the possibility of Warren helping him move the factory on one of his trips.

(8) Adelaide (20180719LSJB01, 00:26:06.757-00:26:32.777)

```
1   Dave    warr^en,
2           (0.5)
3   Dave    you know a bit about- (0.4) you know a lot about (.)
            truck=an'
4           things like that don't [you.
5   Warren                         [o:h not really˘ .hmf °°i'm no-°°
6   Dave    $come o[n$]
7   Warren         [i-] i'm not a truckie mpf. he he h. hh.
8           (0.7)
9   Dave    nah but [shif]ting stuff around the place
10  Warren          [wh- ]
11  Warren  what do you- (.) what do you w^ant
12  Dave    w-
13  Warren  >what's happe[ning<]
14  Dave                  [if i ] want to [shift the timber factory,
            (1.0)
    dav                                   [ ((thumb-points behind --->
15          from here] (0.9) [ down- (0.5) f- down               ]
    dav         -->))]       [1 fig.10((index-finger points SSE))] (.)
16          [(0.2) to adelaide o- o- yeah adelaide will do,] (0.7) uhm f'r
    dav     [2 fig.10 ((index-finger points SSE))        ]
17          nothing, >how would i do it<?
18  Warren  h. ha [ha ha
19  Malcolm       [ha [ha ha ha ha
20  Jamie             [hh. ah ah [ah
21  Warren                       [>put it in< a wheelbarrow.
22          (0.2)
```

Figure 10. Dave points south-south-east to Adelaide (1) and (2)

After an initial thumb-point behind his shoulder to the timber factory, Dave produces a small index finger point south-south-east as he launches a word search in line 15 (Figure 10, point 1). In the subsequent line Dave points again in the same direction (Figure 10, point 2), this time accompanied by the place name, Adelaide. Figure 10 shows that despite the target being some 2,133 kilometres away from the recording location, Dave's point is remarkably accurate (to within 5 degrees).

In the final extract, (9), Warren is arguing that bituminising the Tanami would bring great benefits to Halls Creek, because tourists would then be able to complete a circuit from Darwin on fully sealed roads, taking in Alice Springs and Halls Creek, as well as other unspecified Kimberley towns. At present the famously dusty and corrugated Tanami Track is the only stretch of the circuit to have not yet been bituminised. Warren makes his case by using an elaborate series of gestures in which he essentially draws a detailed map of the proposed tourist 'loop' in the air. As before, we use solid lines in the following graphics to represent participants' projected vectors, and barred lines to represent the actual directions to the target locations being specified. We also introduce dotted lines to represent the various stretches of road that Warren is 'drawing' in space. These drawings are displaced or 'transposed' points (e.g., Haviland, 1993; Le Guen, 2011)[14] that depict the key roads and highways connecting various landmarks. Each named landmark constitutes the origo for the following displaced point, such that each point is 'read' in relation to the other points in the sequence. The end points of

14. The origo for these transposed points is external to the space occupied by the current conversation's participants.

these road depictions correspond to towns or cities. We examine these end points for directional accuracy.

(9) A complete loop (20180719LSJB01, 00:42:15–00:42:27)

```
1   Warren  [Halls- ˇI reckon Halls Creek'll explode if they
    war     [1 fig.11 ((draws twice in the air from SEbE ->
2           ever bitumise that road [from ^Alice], co]s-
    war     ---------->   toward himself))      ]
3   Dave                            [Oh o' ^course.  ]
4           (0.2)
5   Dave    Yea[h.
6   Warren     [C's people do a complete*loop,<they ca-
7           they can [fly: in tih Darwin,           ]
    war        [2 fig.11 ((index-finger points NEbN))]
8           [·hhh down thuh centre; (0.2) Alice:,        ]
    war     [3 fig.11 ((draws in air from NEbN southward))]
9   Dave    [Yep-
10  Warren  [Hall's Creek, (.)                                    ]
    war     [4 fig.12 ((draws in air from Alice Springs to Halls Creek))]
11          [induh th'         Kimber]ley,
    war     [5 fig.12 ((IF pts NWbW))]
12  Dave    [Yeah;
13  Warren  [back    tih    Darwin ] [an' oud again.          ]<so
    war     [6 fig.12 ((IF pts NE))] [((flicks hand outwards))]
14          ['t's a complete loop;          ]
    war     [fig.13 ((draws loop in the air))]
```

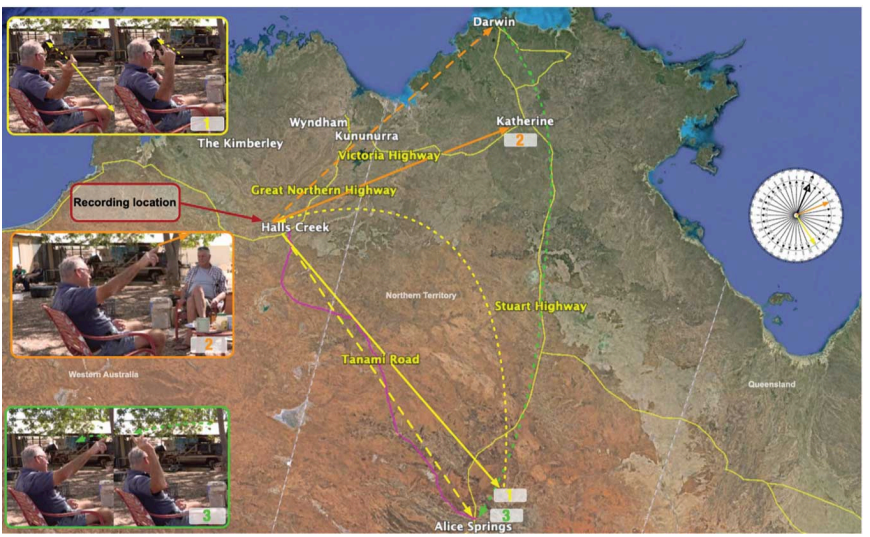

Figure 11. Warren draws a line in the air from Alice Springs to Halls Creek (1, yellow), then points with his finger toward Darwin (2, orange), and then draws a line from Darwin down to Alice Springs (3, green)

At lines 1 and 2 of Extract (9) Warren claims if the Tanami Track is sealed then "Halls Creek will explode" with tourists. As he does this, he points accurately (to within 6 degrees) toward Alice Springs (Figure 11, solid yellow line, insert 1)

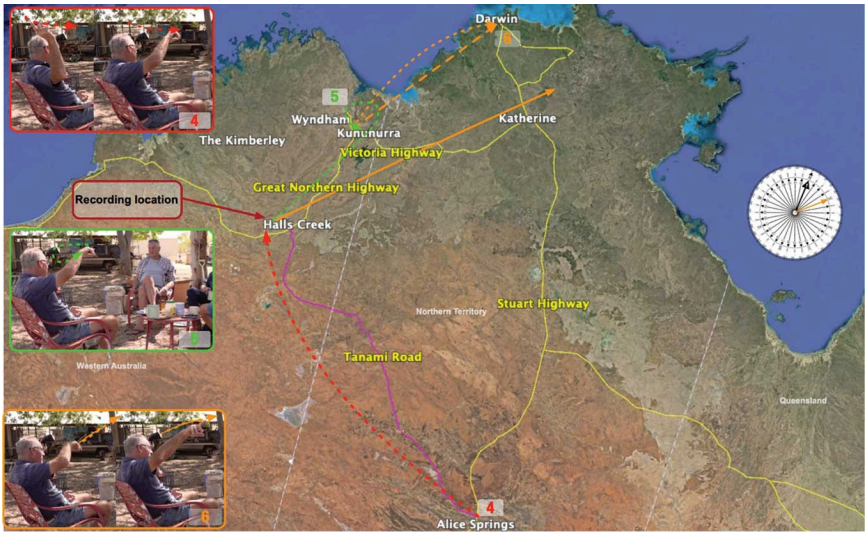

Figure 12. Warren draws a line in the air from Alice Springs to Halls Creek (4, red), draws a winding line in the air towards the towns of Kununurra and Wyndham (5, green), then draws a line from Kununurra to Darwin (6, orange)

and then draws an arc in the air toward himself in Halls Creek (Figure 11, dotted yellow line, insert 1). Warren goes on to describe the loop that tourists will be able to drive on if they fly into Darwin. His mention of Darwin (line 7) coincides with an index finger point to Darwin (Figure 11, solid orange line, insert 2) which is accurate to within 20 degrees (cf. the barred orange line). From here Warren draws the 1500km stretch of the Stuart Highway between Darwin and Alice Springs (Figure 11, dotted green line, insert 3; transcript line 8) followed by the 1000 km long Tanami Track (Figure 12, dotted red line, insert 4; transcript line 10), culminating in Halls Creek a few kilometres away from where the men are currently seated. Warren's fifth point (Figure 12, dotted green line, insert 5), that he describes as "induh the Kimberley" (line 11) roughly captures the winding section of the Victoria Highway running between Kununurra and Wyndham, as well as a bituminised northern section of the Gibb River Road. The final leg of the loop (Figure 12, dotted orange line, insert 6; transcript line 13) conflates the 535km stretch of the Victoria Highway from Kununurra to Katherine with the 317km stretch of the Stuart Highway between Kununurra and Darwin. Finally, Warren (at line 14) provides a multimodal recap of the just described "complete loop" by drawing a spiral in the air (Figure 13). His deft and accurate depiction of this 3000km circuit gives the distinct impression that Warren knows each of these roads like the back of his hand.

Figure 13. In summary, Warren redraws the loop

The four men in these extracts display a profound knowledge of their surrounding environment, having driven vast distances in this region. As long-term residents of the Kimberley, they have gained detailed and accurate knowledge of the placement of roads, towns and non-natural landmarks such as mines. Their capacity to point accurately over very large distances is remarkably similar to the Gija and Murrinhpatha speakers we recorded. How typical this topographic knowledge is for non-Aboriginal people living in the Kimberley remains to be determined, but these four men at least display pointing behaviour that is a far cry from the urban American pointers described by Schegloff (1984).

In the next section we discuss the implications of these data for the claim that the capacity to point with directional precision is associated with linguistic factors such as preferred spatial frame of reference.

Discussion

Over the last few decades research on spatial reference has built on Levinson's (1996, 2003) FoR typology, spawning new frameworks that capture a wider range of rotational properties exhibited by the world's languages (e.g., Bohnemeyer & O'Meara, 2012; Danziger, 2010; Palmer et al., 2021). At this stage we are less concerned about which FoR typology best accommodates the place reference data in our corpus than with the nature of the nexus between FoR terminology and pointing. In the previous sections we used a qualitative approach to show that, irrespective of which FoR might dominate within the three communities, language alone does not predict the ability to point accurately. All conversationalists display an impressive capacity to accurately indicate locations, both within their local vicinities and far beyond the regions in which they reside. This suggests that the

linguistic FoR options available within these speech communities do not seem to bestow substantial advantage when it comes to correctly orienting pointing gestures, learning the locations of places, and generally remembering the lay of the land. If, on the other hand, absolute FoRs were to bestow speakers with a cognitive advantage in being able to remember and store locational information, as has been alleged, we would expect Gija speakers to be more accurate than the English speakers, who in turn, should be more accurate than Murrinhpatha speakers. However, this is not evident in our data.

While the above approach does not suggest a strong relationship between linguistic FoR type and directional accuracy, a remaining issue concerns the relationships between pointing and FoRs; that is, how closely points align with FoR terminologies (if at all), vis-à-vis deictic expressions such as demonstratives, prepositions and directional clitics. In Table 2 we examine the pointing gestures sampled in the three datasets and the stretches of talk with which they coincide, which is taken as the basis of speech-gesture alignment. Table 2 is arranged such that the proportions of points co-occurring with demonstratives and other 'deictic' items may be compared with the proportions coinciding with absolute FoR terminology, as well as with terms associated with relative and intrinsic FoRs. We present this latter group, however, as terminology associated with the transverse, sagittal and vertical axes, rather than with specific referential frames, because these three axes can equally be linked to a variety of spatial FoRs.[15]

Across the three datasets we see that the proportion of points coinciding with demonstratives far exceeds the proportion of terms associated with any linguistic FoR, which is somewhat unsurprising given the close relationship between demonstratives and pointing (e.g., Levinson et al., 2018). In fact, locational points are more likely to align with motion deictics ('hither'/'thither'), spatial case morphology (allative, ablative, etc.) and with spatial prepositions[16] than with any of the FoR terminology. Gija, which has two types of absolute terminology was the only collection in which there was a substantial coincidence of locational pointing with absolute FoR terms. Despite the Australian English speakers having the greatest range of FoR terminology to draw upon, their points seldom coincided with either absolute or relative FoR terms. The figures of 13% and 16% in Gija and English respectively for the 'vertical' axis terms is likely to be incidental

15. For example, the English transverse terms 'left' and 'right' may be used within a relative/egocentric FoR, or within an intrinsic FoR, or with the direct FoR (Danziger, 2010). Likewise, the Murrinhpatha terms *thakuny* 'left' and *batbat* 'right' are intrinsic/direct terms that are unattested within a relative/egocentric FoR. This approach allows us to remain agnostic as to how FoRs should best be conceptualised for these languages.

16. These prepositions included *into, onto, up to, to, over*, and *through*.

Table 2. The proportions of points coinciding with demonstratives and other 'deictic' items (pale yellow), absolute FoR terminology (yellow), and terms associated with relative and intrinsic FoR (orange); some points aligned with more than one item from these category items

	Murrinhpatha	Gija	English
No. of points sampled / **Directional items**	195 points	118 points	142 points
Demonstratives	46% (n=90)	47% (n=56)	30% (n=43)
Spatial cases and/or deictic motion items	27% (n=48) Motion/orientation clitics	19 % (n=23) Spatial cases and motion clitics	20% (n=28) Spatial prepositions
Cardinals	not applicable	19% (n=22)	2% (n=3)
Drainage terms	not applicable	6% (n=7)	nil
Prevailing winds	not applicable	not applicable	nil
Transverse axis terms	nil	not applicable	0.7% (n=1)
Sagittal axis terms	1% (n=2)	1% (n=1)	5% (n=7)
Vertical axis terms	0.5% (n=1)	13% (n=15)	16% (n=23)

to these terms frequently co-occurring with demonstratives (e.g., 'up here' and 'down there'). Thus, none of these groups differ substantially from each other in terms of how closely pointing gestures are aligned with parts of speech. The three languages differ considerably in their demonstrative systems, which undoubtedly interact with pointing far more intimately than do linguistic FoRs.[17]

The overall classification of English as a relative-dominant language is unsupported by the conversational data we are considering, where no particular FoR can be said to dominate. For the provision of angular vectors conversationalists mostly drew on deictic systems as a method of drawing attention to critical information encoded in "foreground" pointing gestures (Cooperrider, 2017). Just as Haviland (2000) notes the scarcity of directional terms in Tzotzil conversation, where "[t]alk about direction is dominated by local geography rather than by celestial absolutes" (p. 27), pointing and reference to landmarks far outweighs the

17. Demonstrative usage and pointing in Murrinhpatha and Gija are discussed in greater detail in Blythe et al. (2016) and de Dear (2019), respectively.

use of FoR items in all three datasets. This is perhaps to be expected since pointing provides infinitely greater precision than do most linguistic FoRs, which (rather crudely) tend to divide planes into halves (e.g., left/right, offshore/inland) or quadrants (e.g., north/south/west/east). The overall accuracy of these locational points cannot be explained in terms of a mechanism whereby one FoR is said to dominate another.

The prevalence of composite practices comprising spoken deictics and pointing gestures renders most place references in the corpora linguistically underspecified, yet quite accurate when gesture is taken into consideration. In these configurations spatial information is spread across the vocal-aural and visuospatial modalities, where deictics serve to direct co-conversationalists and analysts alike towards angular information encoded in pointing gestures. In terms of FoRs, our data indicate the inadequacy of analysing lexical resources exclusively. Spatial representations (in the context of place reference, at least) are often produced through multiple semiotic devices, encompassing speech (grammar, lexicon), but also gesture. These practices echo arguments for adopting views of "language" as inherently composite (Enfield, 2009), comprising interdependent speech and gesture components (McNeill, 1992, 2005), whereby gesture is considered part of "languaging" (Kendon, 2017, p. 168). The conversations analysed here indicate the benefits of adopting a data-driven, multimodal approach to best capture the complex interplay of interdependent semiotic materials used to instantiate place, and potentially influence spatial cognition (Le Guen, 2011b).

We are not suggesting that there are no relationships between FoRs and directional accuracy. The interpretation of transposed (decentred) points hinges on establishing an origo that is somewhere other than where the talk is taking place. This may need to be achieved through a particular FoR. However, the vast majority of the points in our conversations are not transposed, which suggests that localisation tasks may not be a reliable indicator of how pointing behaviour and FoR usage actually transpires within naturalistic settings. Instead, we offer an emic approach that is easily replicable and that uses the most natural data available. We show that a non-experimental conversation analytic approach can be successfully deployed for research on how gesture intersects with spatial systems and spatial cognition.

Conclusion

Foundational research on spatial FoRs insists on a Whorfian connection between language and cognition, which scaffolds a cross-modal link between preferred linguistic FoR and non-linguistic behaviour (Levinson, 2003; Majid et al., 2004;

Pederson et al., 1998). This is often explicated by juxtaposing spatial representations among speakers of languages with contrasting linguistic FoR options. However, the Australian Aboriginal and non-Aboriginal conversationalists in our study are fairly aligned in their methods of spatial reference despite speaking typologically diverse languages with different FoR terminology to draw upon. Findings support a more restrained approach to investigating spatial representations, noting correlations rather than direct consequences between speech and gesture. Furthermore, the inadequacy of analysing lexical resources independently of gesture highlights theoretical implications for the study of spatial FoRs. Regardless of 'dominant' FoR, speakers from each language group displayed detailed knowledge of salient features of the environment through the production of directionally accurate pointing gestures across vast distances. For these particular long-term residents of the northern Australian outback, shared knowledge of distant entities and "the communicative expectations and cultural conventions of [each] speech community" (Le Guen, 2011a, p. 296) appear to shape methods of spatial representation, which resonates with a sociotopographic account of language and gesture usage (Palmer et al., 2018a, 2018b; Palmer et al., 2017). How locational pointing operates in contexts of inter-generational language change (Meakins et al., 2016) and within other groups of speakers in these remote communities, and the potential for changes in spatial acuity enacted by Aboriginal persons in non-outback settings are questions for future research.

Abbreviations

ANAPH	anaphoric demonstrative
DEM	demonstrative
DIST	distal demonstrative
DO	direct object
DU	dual
DM	discourse marker
EMPH	emphatic
F	feminine
FUT	future
INC	inclusive of the addressee
INDEF	indefinite
INTS	intensifier
IO	indirect object
LOC	locative
NC:ANM	'animate' noun classifier
NC:PL/T	'place/time' noun classifier
NEG	negator
NFUT	non-future
NS	non-singular
PIMP	past imperfective
PL	plural
PRES	present tense
PROX	proximal demonstrative
PST	past
RECN	recognitional demonstrative
S	subject
SG	singular
STRI	same turn initiation of repair
TAG	tag particle
TR	transitive
TOP	topic

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Joe Blythe is an interactional linguist specialising in Australian Indigenous languages. His research interests include gesture and embodiment, turn-taking, spatial cognition, language evolution, kinship concepts and social identities – particularly as instantiated within everyday conversation and as acquired by children. He leads *Conversational Interaction in Aboriginal and Remote Australia*, a comparative project investigating conversational style in four Australian Aboriginal languages and in English varieties spoken by non-Aboriginal people in the Australian outback. He is also an investigator on *OzSpace: Language and Landscape in Indigenous Australia*, a comparative project examining the relationships between topography and spatial grammar in Australian Indigenous languages.

Francesco Possemato is a postdoctoral associate at the Communication and Assistive Device Lab (CADL) at SUNY at Buffalo. Before this, he was the Research Assistant for the *Conversational Interaction in Aboriginal and Remote Australia* project. He is the co-investigator for the *Aphasia, correction, and micro-collaboration* project (Macquarie University), and the external investigator for the *Students' flourishing through Italian classroom interaction* project (La Trobe University). Francesco completed his Ph.D. at the University of Sydney, exploring L2 classroom multiparty interactions. His research addresses language and social interaction in a variety of contexts, including atypical and AAC-mediated interactions, and L2 and bilingual conversations.

Lesley Stirling is a Professor of Linguistics and Head of the School of Languages and Linguistics at the University of Melbourne. She has published on discourse and grammar, the language Kala Lagaw Ya, healthcare communication, communication and autism, and spatial language. She is author of the monograph *Switch-reference and discourse representation* and co-editor of a special issue of the journal *Narrative Inquiry* on "Narrative in 'Societies of Intimates'". Her major current research is in interactional linguistics and the analysis of conversation and narrative. She leads the storytelling subproject of the Australian Research Council project *Conversational Interaction in Aboriginal and Remote Australia*.

Rod Gardner is an Honorary Associate Professor with the University of Queensland. He has used Conversation Analysis over a range of interactional topics, including response tokens in English conversation, and classroom interaction in the first year of schooling (with Ilana Mushin). He has written two state-of-the-art articles on CA approaches to classroom interaction, and is currently working with the other authors of this study on *Conversational Interaction in Aboriginal and Remote Australia*.

Ilana Mushin is a Professor of Linguistics at the University of Queensland. Her research interests include the pragmatics of evidentiality and epistemics, and the relationship between interaction and grammar in Australian Languages, especially Garrwa. She is the author of *Evidentiality and epistemological stance* (John Benjamins, 2001), *A grammar of (Western) Garrwa* (Mouton De Gruyter, 2012), and a number of papers on Garrwa conversation, co-authored with Rod Gardner. She currently leads the Knowledge Management part of the Australia Research Council project *Conversational Interaction in Aboriginal and Remote Australia*.

Frances Kofod is a consultant linguist who has worked with Jarragan languages Gija, Miriwoong, and Gajirrabeng since the 1970s. She was instrumental in setting up Mirima Dawang Woorlabgerring Language and Culture Centre in Kununurra, which focuses on the maintenance of Miriwoong language and culture. She has been involved in many linguistic and cultural projects with Gija people based at Warmun since first working with that language at the school in 1987–1988. In recent years she has produced several Gija language books with Gija people for Warmun Art Centre. She has recently completed a Gija to English Dictionary, published by Aboriginal Studies Press.

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