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Towards a speech-gesture profile of discourse markers: The case of 'I mean'

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Abstract

Our study aims to develop a new corpus pragmatic approach for exploring the gesture patterns (i.e. functions and forms) co-occurring with the discourse marker 'I mean', including a comparison with previous research on another discourse marker (i.e. 'you know'). We selected and analysed 246 instances of 'I mean' and 88 gestures that co-occur with these instances from the supervisory sub-corpus of the Nottingham Multimodal Corpus (654 mins, 118,508 words). A functional framework for the analysis of speech functions was developed based on the emerging speech patterns surrounding 'I mean'. This included three functions: 'editing', 'introducing modifications' and 'ending modifications'. The co-occurring gestures were categorised into four functional types: pragmatic, referential, beat and deictic gestures. The main results of the speech analysis of 'I mean' suggest that 'I mean' tends to be used predominantly as a marker of 'editing' (163 instances, 66.26%) and 'introducing modifications' (80 instances, 32.52%), both of which emphasise the speaker's intention to present additional information. These findings largely resemble those of 'you know'; however, the functions of 'you know' are more varied. The analysis of the gesture patterns co-occurring with 'I mean' shows that both the 'editing' and 'introducing modifications' functions tend to co-occur with pragmatic gestures that serve a similar function of presenting and offering information (e.g., open hand palm up and open hand palm oblique gestures), mirroring the results of 'you know'. These results suggest a functional coordination between discourse markers and gestures.

Keywords: Corpus pragmatics; Multimodality; Discourse markers; 'I mean'; Speech functions; Gesture functions

1. INTRODUCTION

Discourse markers, such as 'you know', 'I mean', and 'well', are expressions that play a significant role sequentially/discursively and pragmatically rather than syntactically, and have been shown to be ubiquitous in communication

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(Schiffrin, 1987). Corpus-based research into, for example, the forms and functions of discourse markers has been extensive (Buysse, 2017; Huang, 2019; Öztürk and Durmuşoğlu Köse, 2021); however, speech-gesture patterning of discourse markers using a multimodal corpus approach is currently under-explored (Adolphs and Chen, 2021; Chen and Adophs, 2023(b)). This is problematic as spoken discourse is multimodal in nature and any description that is limited to textual transcriptions of spoken interaction runs the risk of missing the kind of nuances of linguistic functions that are realised by other modalities. Our article addresses this gap by examining and profiling the gesture patterns co-occurring with the discourse marker 'I mean'. We use the term 'gestures' following the definition provided by McNeill (2005: 3) to refer to "spontaneous, unwitting, and regular accompaniments of speech that we see in our moving fingers, hands, and arms", and Kendon (2004: 7) who refers to "the visible bodily action" that contributes to utterance meaning.

Current studies of discourse markers that draw on evidence from large spoken corpora are significant for understanding the multifunctionality of various lexical forms of discourse markers. For example, a single discourse marker 'you know' can serve diverse procedural, pragmatic and interactive functions such as introducing a proposition relating to previous speech, marking speech planning, inviting inferences, transitioning to quoted speech and managing turn-taking (Buysse, 2017). However, there is a notable gap in our understanding of the incidence and use of discourse markers within/across other modalities of interaction in the process of meaning-making.

Spoken interaction involves more than just speech, and includes other modes of expression such as the use of objects, space, colour, gesture, prosody, facial expression, eye gaze, and body posture (Jewitt et al., 2016; Van Leeuwen, 2005). The relationship between discourse markers and gesture is still under-researched, although see Chen and Adophs (2023b) and Debras (2021) for notable exceptions. Specifically, there is little research on the kinds of gestures that tend to co-occur with different discourse markers, and the way in which gestures contribute to the pragmatic function of discourse markers as part of a multimodal unit.

This study aims to bridge this gap, using a multimodal corpus pragmatic approach to investigate the gesture patterns that co-occur with discourse markers in a multimodal corpus (Knight, 2011). The study offers a new approach to the multimodal description of discourse markers, focusing specifically on the discourse marker 'I mean'. In terms of identifying gesture patterns, we start with analysing all gestures across the different speech functions of 'I mean', noting any emerging patterns. That is, our starting point for the analysis of gestures is their co-occurrence with transcribed text ('I mean') rather than with other modalities, such as prosody or facial expression. Ultimately, multimodal descriptions of language in use will need to embrace a much wider repertoire of modalities and contextual patterns to further advance our understanding of which aspects are the most salient when it comes to discourse functions. When automated approaches to identifying and analysing such patterns become more widely available, descriptive frameworks will be able to draw on corpus linguistic studies such as this one, alongside gesture research from different disciplinary areas, including semantics (Calbris, 2011), pragmatics (Kendon, 2004; Ladewig and Hotze, 2021), cognitive linguistics (Cienki, 2022) and psycholinguistics (Graziano and Gullberg, 2018).

The functions of gestures have been widely researched (Debras, 2017; Ladewig, 2014; Ladewig and Hotze, 2021; Lopez-Ozieblo, 2020). Kendon (2004) includes the following functions: 'referential', 'pragmatic' and 'interactive'. 'Referential gestures' (Kendon, 2004: 158) contribute to the semantic or propositional content of an utterance by either representing certain components of speech, or pointing to concrete or abstract objects in the discourse context. For example, a speaker might use a gesture to point to an object (such as a wristwatch) when asking for the time. The concepts of referential and representational gestures have been used in psycholinguistic studies that examine gestures that literally or metaphorically represent the visuo-spatial imagery of components (Goldin-Meadow and Alibali, 2013; Kita et al., 2017; Nicoladis et al., 2022).

'Pragmatic gestures' contain non-referential meanings, which have three pragmatic functions (Kendon, 2004: 158–159): 1) indicating an implied meaning, such as an 'air quote' gesture indicating the meaning of irony (i.e., modal function) (Cirillo, 2019); 2) performing speech acts such as a 'sweeping away' gesture realising the speech act of negating (i.e., performative function) (Bressem and Müller, 2017); and 3) marking discourse relationships such as a beat gesture emphasising the noteworthiness of information in discourse (parsing function). More recently, in addition to the three functions, Kendon (2017) added another sub-function to pragmatic gestures, which he calls 'operational', referring to those gestures that operate directly with the on-going talk, such as using a gesture to convey the meaning of negation along with the speech mode. Kendon (2017) suggests that this categorisation contains overlaps which is problematic. 'Interactive gestures' (Kendon, 2004: 159) mainly serve the purpose of negotiating turn-taking such as referring to a specific addressee, claiming the floor or assigning the next speaker. The functions of gestures in turn-taking have been widely explored in multimodal conversation analysis (Holler et al., 2018; Matsumoto and Canagarajah, 2020; Mondada, 2018).

Kendon's functional framework of gestures is widely used (León and Santana, 2021), and we have adapted it in our study with some adjustments focusing specifically on referential and pragmatic gesture types. We elaborate on the details of the adapted scheme in the Methods section below. We did not use the category of 'interactive functions'

due to the challenge of addressing the potential overlaps between interactive gestures on the one hand, and referential and pragmatic gestures on the other. For example, any referential or pragmatic gesture performed when a speaker is taking over a turn can be argued as serving the function of floor seizing (i.e., an interactive gesture).

In our analysis, we follow a similar approach to an earlier investigation of gesture patterns co-occurring with the discourse marker 'you know' (Chen and Adophs, 2023b). Here, we categorised the gestures co-occurring with 'you know' into different functional types, which enabled us to examine the functions and forms of gestures in each speech function. The current study thus also allows us to compare the speech-gesture relationship of two different discourse markers (i.e., 'you know' and 'I mean'), which are both associated with introducing further information or clarification (Buysse, 2017; Erman, 2001; Fox Tree and Schrock, 2002; Kiesling, 2020; Schiffrin, 1987; Stubbe and Holmes, 1995), albeit with different orientations: 'you know' being more listener-oriented and 'I mean' more speaker-oriented. These nuances in orientation can be explored further in relation to any emerging speech-gesture patterning.

2. RESEARCH ON DISCOURSE MARKERS AND I MEAN

Since Schiffrin's (1987) work on discourse markers such as 'oh', 'well', 'so', 'I mean' and 'y'know', extensive research into the functions of different discourse markers has been carried out in both L1 and L2 contexts. For instance, Erman (2001) investigates the uses of 'you know' in adolescent and adult L1 English speakers, Fox Tree and Schrock (2002) review the functions of 'you know' and 'I mean', and Clayman and Raymond's research (2021a, 2021b) explore in detail the significant role of 'you know' for speaker-recipient alignment in potentially problematic interactions such as repairs. Focusing on English learners, Buysse studies the functions of 'so' (2012), 'you know' (2017), 'actually' and 'in fact' (2020). Another major contribution to the field is Aijmer's work on discourse markers and pragmatic markers such as 'well', 'in fact' and 'actually' in English (2013), and 'well' (2011) in Swedish learners. More recent studies have investigated the combination and sequencing of discourse markers in talk (Crible and Degand, 2021; Koops and Lohmann, 2022; Lohmann and Koops, 2022). In addition, the learning and teaching of discourse markers has started to emerge as a key area of focus (Caprario et al., 2022; Sánchez-Hernández and Martínez-Flor, 2022).

Definitions of discourse markers have been discussed both in broad terms and in terms of more detailed and comprehensive criteria (Fox Tree and Schrock, 2002; Fraser, 1999; Schiffrin, 1987; Schourup, 1999). Fung and Carter (2007: 412–414), for example, suggest a set of criteria, covering five aspects: position, prosody, multigrammaticality, indexicality and optionality. According to Fung and Carter (2007), discourse markers typically occur in utterance initial position, and are prosodically independent or separated from the surrounding speech. They derive from various grammatical categories such as coordinate conjunctions (e.g., 'and'), adverbs (e.g., 'anyway') and interjections (e.g., 'oh', 'well'), which largely play a discourse-connecting or coherence function, signalling the relationship to the preceding and following utterances at a discourse level. However, discourse markers are regarded as optional semantically and syntactically (Fung and Carter, 2007).

The expression 'I mean' is one of the most extensively examined discourse markers in English (e.g., Maynard, 2013), with some of the most comprehensive descriptive functional frameworks proposed by Schiffrin (1987), Stubbe and Holmes (1995), Fox Tree and Schrock (2002), and Fernández-Polo (2014). Table 1 below presents an overview of the multiple functions of 'I mean' proposed by these studies.

As detailed in Table 1, Schiffrin (1987) proposes three broad functions of 'I mean' in English conversations: 1) speaker-oriented (e.g., marking modifications or self-repairs of one's own speech); 2) interactive (e.g., shifting interactional frames); and 3) pragmatic (e.g., indicating certainty of knowledge, foregrounding the prior content to be modified). Stubbe and Holmes (1995) explore the stylistic differences of 'I mean' in relation to various social dimensions (e.g., class, gender, etc.) in New Zealand English. They also note three functions of 'I mean' although these vary from the ones introduced by Schiffrin (1987): a speaker-oriented repair device (e.g., introducing modifications), marking informal-

Table 1
Functional frameworks of 'I mean'.

Sources	Functional frameworks
Schiffrin (1987)	1) speaker-oriented; 2) interactive; 3) pragmatic
Stubbe and Holmes (1995)	1) a speaker-oriented repair device; 2) a marker of informality (a positive politeness strategy); 3) a negative politeness strategy
Fox Tree and Schrock (2002)	1) interpersonal; 2) repairs; 3) turn management; 4) monitoring; 5) organisation
Fernández-Polo (2014)	1) correcting mistakes and dysfluencies; 2) enhancing clarity and explicitness; 3) organising text; 4) marking certainty and salience

ity of the context as a stylistic marker to reduce social distance (positive politeness), and distancing from potentially face-threatening speech (negative politeness). Fox Tree and Schrock (2002) synthesise the existing literature on the discourse markers 'you know' and 'I mean', and offer a comprehensive review of 'I mean' in which five functions are outlined, including interpersonal (e.g., mitigating impolite speech, marking informal speech style), repairs (e.g., filling a pause, stalling for time, forecasting modifications), turn management (e.g., turn holding/yielding), monitoring (e.g., drawing the addressee's attention) and organising (e.g., introducing topic changes). Finally, Fernández-Polo's (2014) study of 'I mean' focuses on academic presentations and identifies four functions, including correcting mistakes and dysfluencies (e.g., self-repairs and dysfluent speech contexts), enhancing clarify and explicitness to prevent possible confusion or misunderstanding, organising text (e.g., introducing topic changes, clarification and justification), and marking certainty and salience (e.g., noting commitment to an idea).

As outlined above, previous investigations of 'I mean' highlight a range of functions, including ideational, pragmatic, interpersonal, turn-taking and stylistic of this discourse marker. However, one common issue with many existing analyses is the lack of detailed criteria for addressing the potential overlaps between these functions. For example, an instance of 'I mean' in turn-initial position followed by a modification may serve multiple functions simultaneously such as foretelling a modification/clarification, turn-taking and marking informality.

Hence, one of the key research questions we address is whether a multimodal corpus pragmatic approach can provide a more nuanced classification and description of those speech functions of 'I mean' that are seemingly functionally polysemous. Our starting point for this approach is the development of detailed coding criteria based on the emerging speech patterns surrounding 'I mean' (see the Methods section below). We then use these coding criteria to mark up and examine the patterned use of 'I mean', before comparing the results with the previously analysed discourse marker 'you know'. This work provides a novel corpus pragmatic-based analysis of discourse markers.

3. METHODS

3.1. Corpus and data selection of speech I mean

Our study draws on the supervision sub-corpus of a large multimodal corpus collected in a UK university, the Nottingham Multimodal Corpus (NMMC) (Knight, 2011), which comprises video recordings of academic supervision meetings between eight supervisors and nine MA/PhD students. Some supervisors and students participate in more than one meeting. All participants are L1 English speakers. We selected 12 high-quality videos from the 13 meetings totalling over 654 min and 118,508 transcribed words. One video was excluded due to a speech-image alignment issue in the original data. Permission has been obtained from participants as part of the original corpus construction to use the data for research and dissemination purposes.

The data are naturally occurring in the sense that the recorded supervision meetings were scheduled outside of the study, and conversations were not altered as a result of the recordings. The meetings are mostly concerned with students' research projects and are therefore academic in content. The naturally occurring nature of the corpus is important in this context as we would expect it to underpin genuine discussion between the participants that is largely unaffected by the act of data gathering/recording. In other words, we would not expect them to alter their behaviour or style in this communicative context as might be the case in more experimental settings.

Previous research (Fung and Carter, 2007; Lin, 2016; Schiffrin, 1987) has linked the identification of 'I mean' functioning as a discourse marker to one important criterion: it has to be prosodically, semantically and syntactically independent so that its omission would not change the meaning of the utterance. Hence, those instances of 'I mean' that formulate essential semantic and syntactic components of speech, and/or form part of a larger multiword expression were excluded from our study (e.g., in sequences of '[do] you know/see what I mean'). Based on these principles, 246 instances of 'I mean' were identified for further analysis.

To select candidate instances of 'I mean', we first utilised *AntConc* (Anthony, 2022) to search for all instances in the supervision sub-corpus using the Key Word In Context (KWIC) function. As the corpus is fully transcribed, *AntConc* allows us to search for the cluster 'I mean' in all of the 12 transcribed files. We then identified the instances of 'I mean' in the video streams based on the time stamps in the speech transcripts using the multimodal annotation software *ELAN* (Lausberg and Sloetjes, 2009). Reference to the original video recordings for the selection of 'I mean', or any other discourse marker, is vital for the accurate selection of the candidate discourse markers. For instance, the audio output is needed to analyse whether an instance of 'I mean' is independent prosodically, separating it from the rest of an utterance (Fung and Carter, 2007). Pauses are also crucial for examining the position of 'I mean' in the utterance. In addition, pauses are commonly recognised as a feature of dysfluent speech (Hartsuiker and Lies Notebaert, 2010), which is essential information for examining the functions of 'I mean' (refer to 3.2 for detail). Therefore, where relevant, we transcribed and added annotations of pauses immediately before and after 'I mean' to the existing speech transcripts.

Pauses longer than 0.2 s were marked with '//', and shorter than 0.2 s with '/'. All instances of 'I mean' were then exported from *AntConc* to *Microsoft Excel* for manual annotation and analysis of speech functions and gesture patterns.

3.2. Coding the speech functions of I mean

As the current research explores the functional coordination between each speech function of 'I mean' and its concurrent gestures, the categorisation of speech functions needs to be as consistent and as clear-cut as possible. To achieve this aim, without denying the role of broader discourse context for meaning interpretation, a corpus pragmatic approach was used to classify the speech functions of 'I mean' by observing the speech patterns immediately surrounding this discourse marker (Adolphs, 2008; Adolphs and Chen, 2021; Chen and Adophs, 2023b). The speech patterns emerging from the data then serve as the basis for functional analysis. The initial analysis of the speech functions of 'I mean' was conducted by examining the speech concordances and transcripts.

Three speech functions were identified in the data. These are 'editing', 'introducing modifications' and 'ending modifications'. For the first two functions, we adopted the same naming system and coding criteria developed in our study of 'you know' (Chen and Adophs, 2023b) to allow for comparisons to be made between the two discourse markers. In the study of 'you know', these functions are called the 'editing' and 'introducing (forthcoming information)'. We provide brief definitions of them here, and more detail of the coding criteria and results in the next section. The function of 'editing' refers to those instances of 'I mean' that occur in either dysfluent speech contexts or self-interrupted self-repairs, suggesting that the speaker is in the process of 'editing' their speech, or as part of speech planning. Whereas more or less similar uses have been explored in previous research on 'I mean' (Fernández-Polo, 2014; Fox Tree and Schrock, 2002; Kiesling, 2020), this particular definition is used by Erman (2001) and Buysse (2017) as well as in our own research into 'you know' (Chen and Adophs, 2023b). The function of 'introducing modifications' applies to those instances of 'I mean' that tend to occur in clause-initial positions and are used to mark forthcoming modifications, adjustments or clarifications, as observed by previous researchers (Caprario et al., 2022; Fuller, 2003; Schiffrin, 1987). The third function, 'ending modifications', applies to those instances that occur in clause-final position and mark the end of modifications. This last category has not been widely discussed in the literature; however, it emerges as a distinctive function of 'I mean' in our data.

3.3. Segmenting gesture phases and selecting gestures

All gestures were analysed and annotated in ELAN (2022), after which the annotations were exported to *Excel* for frequency analysis. Gestures in the present study refer to spontaneous and meaningful hand-and-arm movements (Kendon, 2004). As a gesture must be semantically or pragmatically meaningful, other hand-and-arm movements (e.g., physical actions, hair/head touching, posture changing, scratching, etc.) that did not contribute to the generation of meaning were excluded from analysis. In addition, the three instances in which the hands are not captured by the camera were also excluded.

The method used to analyse gestures is adapted from Kendon (2004), McNeill (2005) and Kita (Kita et al., 1998) in that each gesture was demarcated into four gesture phases: preparation, stroke, post-stroke hold and retraction. The stroke phase is usually the most effortful phase of a gesture and the only phase associated with the meaning of speech. A gesture *cannot* exist without a stroke phase, but can exist without other gesture phases. To prepare for the stroke, speakers may need to move and change the hand from a different position, location/space and hand shape to reach the starting point of the stroke phase, and these movements are defined as the preparation phase. After reaching the end of the stroke phase, the speaker may hold the gesture for a short while, which would be the post-stroke hold phase. In the end, the hand may relax and/or withdraw to a rest position, and this stage is known as the retraction phase.

As outlined above, the analysis of speech functions and gestures needs to be conducted separately to avoid any circularity. Hence, once a preliminary observation has been made of whether there may be a stroke co-occurring with 'I mean', the sound was turned off. That is, the analysis of the gesture phases was conducted by only observing the hand and arm movements *in mute*. This coding principle was also used in the inter-rater reliability tests (see Section 3.5 below). Once all the gesture phases were segmented in *ELAN*, we marked them in the speech transcripts with symbols in both *ELAN* and *Excel*: "[ ]" marks the start and end of the preparation phase, "{ }" refers to the stroke phase, "^^" refers to the post-stroke hold phase, and "**" the retraction phase. We designed these symbols in our study of 'you know'. They provide a useful coding scheme for representing and analysing the speech-gesture alignment in the speech transcripts (Chen and Adophs, 2023b).

We initially identified 98 instances of 'I mean' that are accompanied by the stroke phase, and excluded 36 instances of 'I mean' co-occurring with the other three (non-stroke) gesture phases. However, not all the 98 stroke phases were found to qualify for further analysis as they did not solely or primarily co-occur with 'I mean'. For example, in the

instance, *erm// {I mean I want to co}ver various areas // erm*, the stroke phase co-occurs with 'I mean' and other words. To address this issue, similar to the approach we developed for the analysis of 'you know' (Chen and Adophs, 2023b), we only include those stroke phases that either solely co-occur with 'I mean', or that co-occur with 'I mean' and no more than two other words. After applying this principle, we eventually identified 46 strokes only co-occurring with 'I mean' (e.g., *{I mean}^in^*groups* and out groups*), 26 instances co-occurring with 'I mean' and one other word (e.g., *you know it's {I mean we} *right at the* start of the year*), and 16 instances with 'I mean' and two other others (e.g., *{and I mean obviously} {//}^it's^you're doing it for financial reasons*). In total, 88 stroke phases were subjected to further analysis.

We consider this approach of data selection suitable for the research aim of the current study, which is to explore the gestures/strokes co-occurring with 'I mean' rather than before and after this discourse maker. In doing so, we acknowledge the possible limitation inherent in excluding those strokes that precede or follow the target discourse marker and which may be co-expressive of them (Chui, 2005; Harrison, 2010).

3.4. Coding the functions of gestures

After all of the qualifying strokes were identified, we described and analysed the functions of gestures according to four core functions: referential, pragmatic, deictic/pointing and beat gestures (see also Kendon 2004; McNeill 2005; Calbris, 2011). We used the same gesture coding scheme in our previous research into 'you know', allowing for comparative analysis between the two studies.

We adopt the term referential gestures proposed by Kendon (2004) as reviewed in the Introduction, which refers to gestures that contribute to the semantic or propositional meaning of an utterance. However, Kendon's (2004) referential gestures not only include those that model, depict or enact the visual-spatial features of the associated speech, such as outlining a movement direction or enacting a physical action, but also include pointing gestures. However, as suggested by several other researchers (e.g., McNeill, 2005; Mesh, 2021; Yasui, 2023), differing from most referential gestures, the pointing/deictic gestures can be analysed as a separate category due to their relatively stable forms (i.e., the hand points to a referent) associated with the function of specifying the meaning of a referent relating to time, space, and concrete/abstract objects. Hence, we follow this common practice and treat pointing gestures as a separate category. We acknowledge that the use of the term 'referential gesture' may be inconsistent; however, the definition utilised here suits the practical requirements of our analysis.

We also use the term pragmatic gestures proposed by Kendon (2004, 2017), which refers to gestures that do not make any semantic contribution, but function pragmatically or non-referentially. Beat gestures, featuring biphasic (up-down, left–right, etc.) movements of the hand, tend to be treated as a separate category from pragmatic gestures (Igualada et al., 2017; Morett et al., 2021), although beat gestures can also be argued to be serving the pragmatic function of underlining certain component(s) of an utterance. Classifying beat gestures as a sub-category of pragmatic gestures would be problematic in our analysis. This is because beat gestures tend not to involve a big change in the hand form (e.g. hand shape) but are superimposed onto different hand forms that have already been formulated. Beat gestures can have various hand forms while performing the beat/beat-like movements such as a palm-up/down hand, a fist or a pointing gesture. As we also analyse the recurrent gesture forms as the sub-categories of all the other pragmatic gestures such as open hand palm up, circular gestures (see Results for details), treating beat gestures as a sub-category of the pragmatic gestures would confuse the functional category (i.e., beat) with form-based categories (e.g., open hand palm up).

3.5. Inter-rater reliability tests

Inter-rater reliability tests have been conducted for both speech functions (see Section 3.2) and gesture analysis. For the speech functions, one coder was provided with the speech coding scheme and asked to analyse 20% of the data (53 instances of 'I mean' out of 246) independently. The rate of agreement was 86.79% (46 out of 53). Also, without the presence of the researchers, three further coders were recruited and trained to analyse the functions of the 88 stroke phases (29/29/30 strokes for each coder) according to the framework (i.e., referential, pragmatic, deictic/pointing and beat gestures), and cross-checked the recurrent gesture forms in the pragmatic gestures. The agreement rate for gesture analysis was 88.63% (78 out of 88).

4. RESULTS

Table 2 below shows the number of discourse markers and gestures/strokes analysed from all speakers in the dataset. For the naming system in the first column, the letter 'S' stands for 'supervision', the following number is the sequence of the video in the supervision meeting sub-corpus, and 'FM' are the genders of the supervisor and student.

Table 2
Number of discourse markers and gestures from each speaker in the selected videos.

Speakers	Number of discourse markers	Number of gestures/strokes
S01FM-SUP	12	3
S01FM-STU	8	4
S02MM-SUP	12	6
S02MM-STU	9	1
S03MF-SUP	25	11
S03MF-STU	11	3
S05MM-SUP	7	2
S05MM-STU	37	16
S06FF-SUP	28	2
S06FF-STU	1	1
S07FF-SUP	6	0
S07FF-STU	1	0
S08FF-SUP	6	3
S08FF-STU	0	0
S09FF-SUP	11	4
S09FF-STU	0	0
S10FF-SUP	0	0
S10FF-STU	1	1
S11MF-SUP	24	13
S11MF-STU	10	2
S12MF-SUP	7	1
S12MF-STU	16	8
S13MF-SUP	8	2
S13MF-STU	6	5
Total	**246**	**88**

'SUP' means the supervisor and 'STU' is the student. For instance, 'S03MF-SUP' means the supervisor in the third supervision meeting between a male supervisor and a female student. S04 is the meeting that was excluded from the analysis due to the sound-image alignment issue. A particularly low number of instances of both 'I mean' and gesture use were identified from S07 to S10 because the supervisors and students are mainly working collaboratively on a laptop. Hence, less talking and gesturing was involved. Due to the uneven distribution of the discourse markers and gestures from the different participants and the small dataset, caution is required when trying to generalise the findings to a larger group of speakers in a similar context. The main aim of the current study is thus to develop and apply a new multimodal approach to analysing discourse markers which, in turn, provides the foundations for further research that draws on much larger datasets and possibly automated analysis in the future.

Table 3 below summarises the distribution of the occurrences of 'I mean' and concurrent gestures across the three speech functions. The function of 'editing' accounts for the largest number in the corpus (163 instances, 66.26%). The gesture analysis shows that 59 of these instances co-occur with a stroke phase. 80 instances of 'I mean' in the corpus fall within the functional category of 'introducing modifications' (32.52%). Of these, 29 co-occur with a stroke phase. Three instances of 'I mean' function to end modifications, none of which are accompanied by a stroke phase.

In total, the percentage of strokes that co-occur with 'I mean' accounts for 35.77% (i.e., 88 strokes) out of 246 instances of 'I mean' in the corpus. This is a slightly higher frequency than that identified with the discourse marker 'you know' (18.45%, 74 strokes out of 401 instances) (Chen and Adophs, 2023b), which may suggest a closer gesture association for self-referential discourse markers. As above, the small number of instances involved does not allow for generalisations to be made in this context and we merely point out the different results as a potential avenue for further corpus-based exploration.

4.1. Editing

4.1.1. Speech function

The function of 'editing' subsumes two frequent types of discourse contexts in which 'I mean' tends to occur: dysfluent speech contexts and self-repairs (see also Chen and Adophs, 2023b). Similar functions have been proposed as outlined in Section 2 (Fernández-Polo, 2014; Fox Tree and Schrock, 2002; Stubbe and Holmes, 1995). A dysfluent speech context is defined as one where 'I mean' is followed (i.e., within three words) by at least one feature of dysflu-

Table 3
Instances of 'I mean' and gesture in each speech function.

Speech function	Number	Percentage of each function	Number of stroke phase	Percentage of stroke phase in each function
Editing	163	66.26%	59	36.20%
Introducing modifications	80	32.52%	29	36.25%
Ending modifications	3	1.22%	0	0.00%
Total	246	100.00%	88	35.77%

ency such as unfilled pauses longer than 0.2 s (marked by '//'), filled pauses (e.g., *er*), repetitions, unfinished words (marked by '='), incomplete sentences and false starts (Carter and McCarthy, 2017). Dysfluent speech is frequently observed in spoken language and has been extensively studied in terms of its role in speech planning (Corley and Stewart, 2008; Hartsuiker and Lies Notebaert, 2010). However, if an instance of 'I mean' is preceded but not followed by a dysfluent feature, it was not coded as 'editing' in our study. This is because the speech planning stage may already have been completed by the time the speaker uses the discourse marker 'I mean'. Such instances seem more justifiable to be coded as 'introducing modifications'.

Fig. 1 contains the first 5 instances of 'I mean' (in bold) occurring in a dysfluent speech context. Speech excerpt 1 shows the expanded discourse context of the instance S05MM-STU06 in which 'I mean' is surrounded by dysfluent speech and functions like a filler that buys the speaker some time for speech editing.

Speech excerpt 1 (S05MM-STU06): an instance of 'I mean' followed by dysfluent speech

< STU > Cos yeah I mean yeah that's what really interested me cos *that that's the difference isn't it+*
<SUP > Yes.
< STU > +between the the gallery thing+
< SUP > That's right.
< STU > +erm that's cos ***I mean*** *that's erm* cos *that is real erm that's sort of little mini site-specific performances so then you've got to consider the the semiology+*
< SUP > Yes.
< STU > +of each+
< SUP > Each. Yes.
< STU > +individual space.
< SUP > Yes.

The second sub-category of speech pattern in the 'editing' function is self-repair (Dressel, 2020; Rautiainen et al., 2022), in which speakers self-interrupt in the *middle* of an utterance and re-start the speech *fluently*. Self-repair 'I mean' must be in a clause-medium position to show clear evidence of self-interruption followed by self-repair. In addition, although the speech before these uses of 'I mean' may or may not be fluent, the repair part instantly following 'I mean' (within three words) does not contain any dysfluent speech, which would otherwise be coded as occurring in the dysfluent speech context.

The first five instances of self-repair 'I mean' in *Excel* can be seen in Fig. 2, followed by a speech excerpt of the instance S01FM-SUP03 that exemplifies the expanded context of such uses. In this example, the supervisor self-interrupts after saying "I don't get", and then self-repairs led by 'I mean'. The function of 'editing' (including 128 instances of dysfluency and 35 instances of self-interrupted self-repairs) accounts for the largest number of all the uses of 'I mean' in the dataset with 66.26% (163 out of 246 instances).

Speech excerpt 2 (S01FM-SUP03): an instance of 'I mean' leading self-repair

Item	Speech	Speech function
S01FM-STU02	So// **I mean** a= as we've said before I just need to go through each of the and some of them for example the pronouns	editing (dysfluency)
S01FM-STU04	**I mean** e= not just in the MA dissertation	editing (dysfluency)
S01FM-STU05	or **I mean** I mean then it does link back to my MA dissertation doesn't it	editing (dysfluency)
S01FM-STU07	So the conferences were good// **I mean**// the the other thing that came out of the conference//	editing (dysfluency)
S01FM-STU08	So **I mean** it's just yeah it's I've got to decide who I'm gonna try and send it to	editing (dysfluency)

Fig. 1. Instances of 'I mean' followed by dysfluent speech within three words.

<$F> +so I think we did that if if you I can understand why you got that from a corpus conference/ but I I don't get ***I mean*** *we can talk to Jess about this anyway and and check that she she agrees with it but I think that if you're using a a mixed method approach//+*
¤<1456077><$M > Uh
¤<1457479><$F> +then the corpus isn't everything you're using the corpus as a starting point to indicate the bits that are really interesting that you then go an follow up with more qualitative analysis.

4.1.2. Gesture patterns

Table 4 below shows the number of gesture types in the 'editing' function and their corresponding percentages, among which the pragmatic gestures are the most frequent (43 instances, 72.88%). The number of beat gestures co-occurring with 'I mean' in this function are far fewer compared to pragmatic gestures (10 instances, 16.95%), though more than the remaining two types. Only three instances each of the deictic and referential gestures align with 'I mean'. We present examples of each gesture type, and analyse the functional relationship between them and 'I mean' as 'editing' markers below.

Since the pragmatic gestures occur most frequently in the dataset, we carried out further analysis of recurrent gesture forms to explore the specific functions they perform. To that end, we identified all the gesture forms that occur at least twice across all the pragmatic gestures (see Table 5 below).

The open hand palm oblique gesture (Kendon, 2004: 215, the first instance in Fig. 3) is the most frequently occurring gesture form in the 'editing' function with 21 instances. The open hand palm up gestures (Müller, 2004, the second instance in Fig. 5), also known as a form in the Open Hand Supine gesture family proposed by Kendon (2004), are also frequent with eight instances. When coding, we distinguished the two with reference to the palm of 'oblique' gestures mostly facing left, right or towards the speaker, and the palm of 'up' gestures mostly facing up or at least semi-up.

In terms of form and use, there is little research on the open hand palm oblique gesture. A notable exception is a discussion of its use as a variation of pointing gestures by Kendon (2004: 215), which aims to present comments regarding an object, or the relationship between an object and an interlocutor. In this sense, the open hand palm oblique gesture seems to resemble the use of the open hand palm up gesture, which is much more extensively researched and acknowledged as having the function of showing, presenting and offering (Clift, 2020; Kendon, 2004; McNeill, 2005; Müller, 2004; Streeck, 2009). McNeill (1992) suggests that a conduit metaphor is embodied in the palm-up, cupped hand, through which abstract ideas can be passed onto an interlocutor in a similar way to concrete objects. Hence, the pragmatic function of presenting in both open hand palm oblique and palm up gestures coordinates well with 'I mean' as 'editing' markers: as 'I mean' suggests the speech editing process, awaiting further modifications to come, the gestures make salient the intention of offering further information.

The bounded space (McNeill, 2005) and circular gestures (Chen and Adolphs, 2023a; Ladewig, 2014) (see Fig. 4 below) only occur 4 times, respectively. The former features in formulating a bounded space between the hands and the latter performing rotational movements. Regarding their meaning, the bounded space gestures can be analysed as a metaphoric gesture with the meaning of holding and presenting abstract ideas between the hands as if holding concrete objects (McNeill, 1992, 2005). They can carry the function of introducing ideas or articulating conclusions. Circular gestures have been widely acknowledged as embodying the meaning of continuity or on-going activities/actions (Calbris, 2011; Chen and Adolphs, 2023a; Ladewig, 2014). They might also have an intention of going back to information that has been previously given, but that is now going to be modified (Calbris, 2011). Hence, the meaning of both bounded space and circular gestures is mostly consistent with the function of 'editing' as the intention of continuing the presentation of more information is highlighted in both gesture forms.

Fig. 5 below shows examples of the open hand palm down and vertical gestures, which are known as two variations of the Open Hand Prone gesture family initially proposed by Kendon (2004). Palm down gestures are characterised by an open palm facing downwards, and the palm vertical ones with an open palm facing away from, rather than towards, the speaker. Both gestures carry the meaning of negation (e.g., rejecting, stopping, etc.), which is metaphorically embodied in the downwards and holding-away positioning of palms as if stopping something or someone from arising or approaching (Bressem and Müller, 2014; Calbris, 2011; Harrison, 2010, 2021; Kendon, 2004). However, none of the four palm down and vertical away gestures co-occurring with 'I mean' in our data are surrounded by any discourse context of negation.

One interpretation for the co-occurrences of the two gesture forms with 'I mean' as 'editing' markers is that the gestures perform the function of preventing the listener from interrupting the speaker while the speaker is still organising their speech (see also Inbar and Shor, 2019 for further discussions on covert negation). An alternative interpretation is that the open hand palm down and vertical gestures can also embody the meaning of presenting information as the current discourse context suggests. As pointed out by Calbris (2011), the discourse context primes the activation

Item	Speech	Speech function
S01FM-STU01	but I could eith= **I mean** as I see it there's there's there's two ways of doing it	editing (self-repair)
S01FM-SUP03	but I I don't get I mean we can talk to Jess about this anyway and and check	editing (self-repair)
S03MF-STU04	Erm largely// er th= **I mean** there's quite a bit of metaphorical use in the patient narratives about their experiences	editing (self-repair)
S03MF-SUP13	// Why **I mean** is it part of a sort of CDA type analysis are you looking for ideology	editing (self-repair)
S03MF-SUP2	But that's all **I mean** you're right that most of the metaphor or well a lot of	editing (self-repair)

Fig. 2. Instances of 'I mean' as self-repairs.

Table 4
Number and percentage of gesture types in 'editing'.

Gesture types	Number of instances
pragmatic	**43**
beat	**10**
pointing/deictic	3
referential	3
Total	59

Table 5
Number of recurrent gesture forms of pragmatic gestures performing an 'editing' function.

Recurrent form	Number of instances
open hand palm oblique	**21**
open hand palm up	**8**
bounded space	4
circular	4
open hand palm down	2
open hand palm vertical	2
others (only occur once)	2
Total	43

of certain element(s) of a gesture to be more relevant than others. In this case, it may well be the 'open palm' element that is activated in both gestures, and the palm down and vertical elements are less relevant in this context of use. Further research is needed to explore the possible uses of open hand palm down/vertical gestures drawing on larger datasets of similar contexts.

To summarise, the recurrent gesture forms largely carry pragmatic functions that are coordinated with 'I mean' in the 'editing' function. Participants in the supervisions use speech to indicate the speech editing process, and the gestures suggest the intention to continue presenting further information to modify, clarify or adjust the speech.

For the remaining gesture types (i.e., beat, pointing, referential gestures) (see Fig. 6), beat gestures occur with a relatively large number, although they are far less frequent than pragmatic gestures. These gestures are typically composed of biphasic up-down, left–right, etc. movements of the hand (Kushch et al., 2018); however, where the hand moves to one direction abruptly and forcefully, such instances were also coded as beat or beat-like gestures (i.e., the one-direction movement as the stroke). They tend to follow the rhythm of speech and co-occur with prosodic prominences that are realised by higher pitch and/or louder voice and serve the function of underlining the prominent components in discourse (Llanes-Coromina et al., 2018; McNeill, 1992; Pi et al., 2021). Hence, when co-occurring with 'I mean' as 'editing' markers, the beat gestures in our data seem to also stress such an intention of offering further modifications during speech editing.

The number of pointing and referential gestures is only small with three instances for each. Both gesture types seem to perform the function of foregrounding the key information of an utterance. For instance, in Fig. 6, while saying 'I mean', the deictic gesture (the pen points to the sentence written on the paper) refers to 'this (sentence)', which is the focal point of the following utterance. Similarly, the referential gesture (both hands move towards each other) represents the meaning of 'smaller (amounts of data)', which is the primary information of the utterance.

Gesture type: pragmatic

Speech function: editing

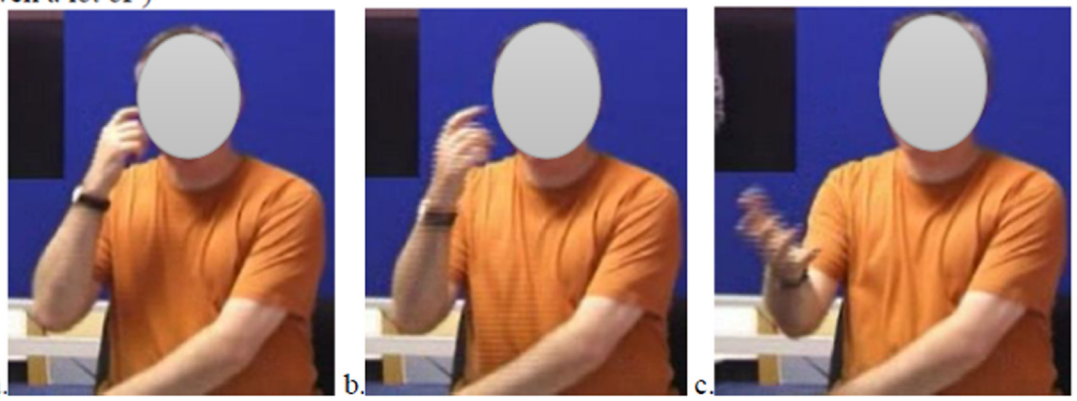
Gesture form: open hand palm oblique

Item: S01FM-STU02 ('So// {I mean a=} {as we've said} *before* I just need to go through each of the and some of them for example the pronouns')

a-c: the stroke phase co-occurring with 'I mean a='

Gesture form: open hand palm up

Item: S03MF-SUP2 ('But that's all {I mean you're} {right} *that* most of the metaphor or well a lot of')



a-c: the stroke phase co-occurring with 'I mean you're'

Fig. 3. Examples of open hand palm oblique and open hand palm up gestures.

4.2. Introducing modifications

4.2.1. Speech function

In addition to the 'editing' function, another commonly recognised function of 'I mean' is that of 'introducing modifications' (Fernández-Polo, 2014; Fox Tree and Schrock, 2002). The function of 'introducing' further information is also frequent for 'you know' (Chen and Adophs, 2023b). In our coding scheme, we define the function of 'introducing modifications' as instances in which 'I mean' occurs at the *beginning* of a (sub-)clause followed by *fluent* speech (i.e., no dysfluent features within three words). Before 'I mean', there might be other discourse markers (e.g., *so*), conjunctions (e.g., *or*, *and*, *but*) or (un)filled pauses and short response tokens (e.g., *yeah*). These are spoken features that tend to be common at the beginning of utterances but do not contain any actual propositional information.

Fig. 7 shows the first five instances of 'I mean' in this function in our data. Speech excerpt 3 (S09FF-SUP03) is an example of the discourse context of 'I mean' used to mark the forthcoming modification in clause-initial position followed by fluent speech. In this case, the supervisor is telling the student that she does not need to spend more time reading the literature, but she then modifies her speech and says that the student can still read "on a few issues". Differentiated from the 'editing' function, in which the speakers use 'I mean' to buy time or repair their own speech, when 'I mean' is used to introduce modifications it tends to clarify, expand or explain a point to avoid misunderstanding or miscommu-

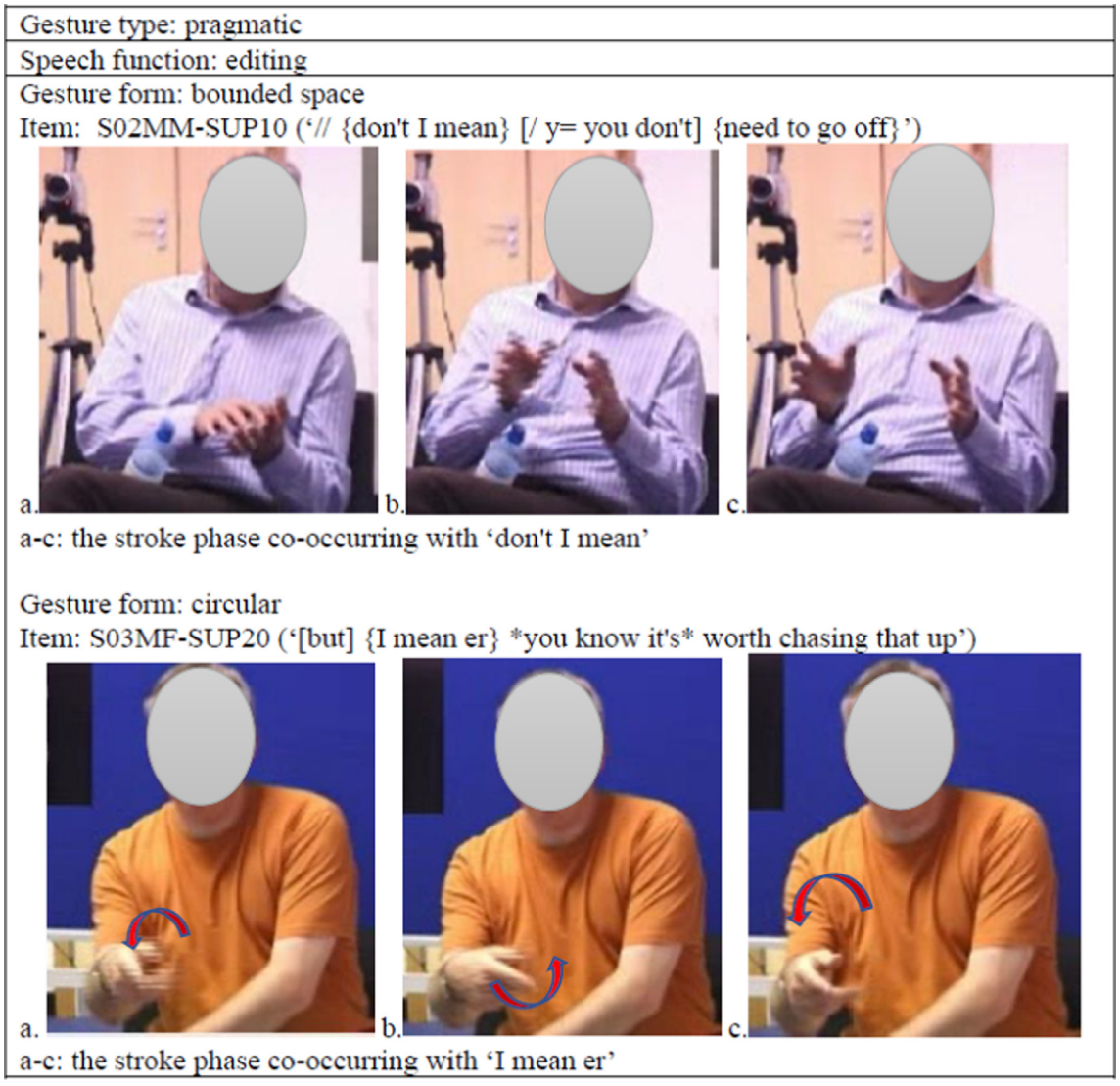


Fig. 4. Examples of bounded space and circular gestures.

nication. Eighty out of 246 instances (32.52%) of 'I mean' have been identified in the category of 'introducing modifications'.

Speech excerpt 3 (S09FF-SUP03): an instance of 'I mean' as 'introducing modifications'

<$1 > Your literature review is good erm most of what you need+
<$2 > Yeah.
<$1> +to do is just to erm develop what you have so I don't think you need to really spend more library time/ ***I mean*** *maybe on a few issues you know like if you can find more dyslexia+*
<$2 > Yeah.
<$1> +and automaticity+
<$2 > Yeah.
<$1> +you know great but I don't think you need to be you know doing a lot more library research at this point+
<$2 > Okay.

Gesture type: pragmatic

Speech function: editing

Gesture form: open hand palm down

Item: S13MF-STU03 (‘[//] {It} ^is^. {I mean} ^// be^cause if you think about erm social sciences’)

a. b.

a-b: the stroke phase co-occurring with ‘I mean’

Gesture form: open hand palm vertical

Item: S08FF-SUP06 (‘in the right di[rection] {I mean} ^so^ {it do}^es^// work like we saw the’)

a. b. c.

a-c: the stroke phase co-occurring with ‘I mean’

Fig. 5. Examples of open hand palm down and open hand vertical gestures.

4.2.2. Gesture patterns

The 29 stroke phases co-occurring with ‘I mean’ as ‘introducing’ markers (Table 6) consist of pragmatic (28 instances) and pointing (1 instance) gestures. Thus, compared to the ‘editing’ function, the instances of ‘I mean’ here have an even clearer tendency to co-occur with pragmatic gestures. Only one pointing gesture is used in this function, which performs a similar function of specifying and underlining the information that is being modified, and is therefore consistent with the use of ‘I mean’ as ‘introducing modifications’. In the rest of this section, we focus on the analysis of the recurrent gesture forms of pragmatic gestures co-occurring with ‘I mean’ as an ‘introducing’ marker.

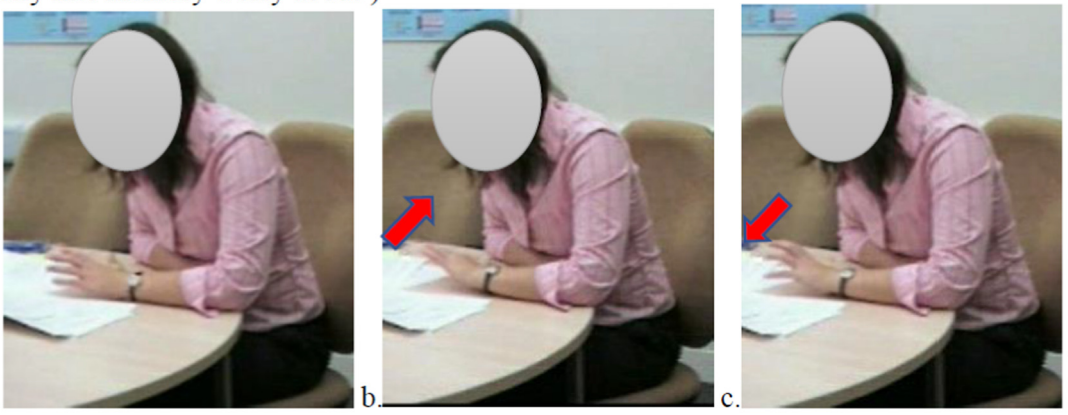
Following the same coding scheme outlined in 4.1.2, the number of recurrent gesture forms used as pragmatic gestures where ‘I mean’ functions as an ‘introducing’ marker are shown in Table 7. Although the same recurrent gesture forms occur here as the ones in the ‘editing’ function, there are nuanced differences between the two. For example, distinctive from the ‘editing’ function, in which the open hand palm oblique gestures are much more frequent than

Gesture type: beat, pointing and referential

Speech function: editing

Gesture type: beat gesture

Item: S09FF-SUP02 (‘{I mean s=} *// you know* it’s kind of a side issue that people who’re really into memory worry about’)

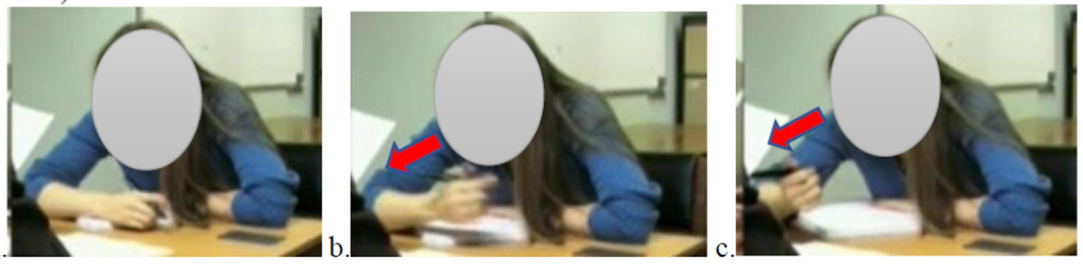


a. b. c.

a-c: the stroke phase co-occurring with ‘I mean s=’

Gesture type: pointing

Item: S10FF-STU01 (‘{I mean} ^should I= should I make sentences as complicated as this or //^’)



a. b. c.

Gesture type: referential

Item: S12MF-SUP05 (‘smaller amounts of {data rather than} ^large yeah^ {I mean} ^you you can^ obviously these days erm support what’)

a. b. c.

a-c: the stroke phase co-occurring with ‘I mean’

Fig. 6. Examples of beat, pointing and referential gestures.

the others, both open hand palm up (12 instances) and oblique gestures (11 instances) seem to have a strong association with 'I mean' in the 'introducing' function.

The higher frequency of occurrences of the open hand palm up gesture here is noteworthy and can be explained by the meaning and form, or the palm orientation, of the gesture itself. As outlined above, the open hand palm up gesture has long been recognised as carrying the meaning of showing, offering and presenting (Clift, 2020; Kendon, 2004; Müller, 2004), which is coordinated with the function of 'introducing modifications'. Furthermore, whereas the palm of the open hand oblique gestures faces left, right or to the speaker, the palm of the open hand palm up gestures faces upwards, which seems to demonstrate more assurance, confidence or assertion on the part of the speaker. Again, this coincides with the context of the 'introducing' function of 'I mean' in which the speakers are more prepared and confident to modify their speech than in the 'editing' function.

The number of other gesture forms are minimal with three bounded space gestures, and only one open hand palm vertical and one circular gesture. As discussed previously, the pragmatic functions of these gestures and 'I mean' as 'introducing' markers are well coordinated as these gesture forms can all convey the intention of providing further information, although, as analysed previously, the function of the open hand palm vertical gesture might not be as clear as the other two.

4.3. Ending modifications

4.3.1. Speech function

The speech function of 'I mean' is rarely discussed as a marker of 'ending modifications', probably because those uses of 'I mean' do not occur very often or they are treated as a variation of modifications or clarifications. However, we classify this function as a separate category as it differs in use and position from the 'editing' and 'introducing' functions in our data.

These instances of 'I mean' occur *after* modifications or clarifications have been made rather than preceding them. Hence, we differentiate them from 'introducing modifications'. Fig. 8 shows all three instances in this category. The instance S11MF-SUP19 in speech excerpt 4 shows the discourse context of such uses of 'I mean', in which it occurs after the speaker has further clarified the speech, 'the computational thing' explaining 'quantitative or corpusy thing'.

Speech excerpt 4 (S11MF-SUP19): an instance of 'I mean' as 'ending modifications'

<SUP > Or whether you're gonna try and do a more sort of quantitative or corpusy thing er you know computational thing I mean with+
<STU > Yeah.
<SUP> +with with the body of text that you've got.

Due to the very limited number of instances in this category, no gestures have been identified.

5. DISCUSSION AND CONCLUSION

Our analysis has allowed us to make a number of observations relating to concurrent gesture patterns in each speech function of 'I mean'. Where possible and appropriate, we conduct comparative analyses of the findings of the current research with those of 'you know' (Chen and Adophs, 2023b). As suggested by previous research based on text-based (monomodal) corpora (Fox Tree and Schrock, 2002), results indicate that the two markers have a very high level of similarity in how they are used, though nuanced distinctions also exist with 'I mean' being more speaker-oriented and 'you know' more listener-oriented (Stubbe and Holmes, 1995).

For the analysis of the 246 instances of the spoken discourse marker 'I mean', we adopted a corpus pragmatic approach (Adolphs and Carter, 2013; Chen et al., 2021; Knight, 2011; Rühlemann and Clancy, 2018) and built up a functional framework based on the speech patterns immediately surrounding 'I mean'. Among the three functions iden-

Item	Speech	Speech function
S01FM-STU03	**I mean** in groups and out groups stuff like that is something that	introducing modifications
S01FM-STU06	or I mean **I mean** then it does link back to my* MA dissertation doesn't it	introducing modifications
S01FM-SUP1	**I mean** you know that yourself from previous stuff that you've done	introducing modifications
S01FM-SUP12	but **I mean** you did them so well for the upgrade	introducing modifications
S01FM-SUP5	yeah but **I mean** that's something we can sort over the next six months anyway	introducing modifications

Fig. 7. Instances of 'I mean' as 'introducing modifications'.

Table 6
Number and percentage of gesture types in 'introducing modifications'.

Gesture types	Number of instances
pragmatic	**28**
pointing/deictic	1
Total	29

Table 7
Number of recurrent gesture forms of pragmatic gestures performing an 'introducing modifications' function.

Recurrent forms	Number of instances
open hand palm up	**12**
open hand palm oblique	**11**
bounded space	3
open hand palm vertical	1
circular	1
Total	28

tified, we show that 'I mean' tends to be used first and foremost as a marker of 'editing' (163 instances, 66.26%) and 'introducing modifications' (80 instances, 32.52%). Only three instances of 'I mean' are used as markers of 'ending modifications'. Similar findings have been found in the research into 'you know' (Chen and Adophs, 2023b), in which speakers tend to use 'you know' as a device for indicating speech 'editing' (167 instances out of 401, 41.65%), and 'introducing' further information (118 out of 401, 30%).

However, at least in the current corpus, not only have we identified fewer instances of 'I mean' than 'you know' (401 instances), but the speech functions of 'I mean' were also found to be less varied. A number of functions performed by 'you know' are not performed by 'I mean' in our corpus such as 'marking reported speech' and 'approximating'. The former refers to those instances of 'you know' that mark direct or reported speech, and the latter to those that mark approximative speech (e.g., 'you know that sort of thing'). The higher frequency and wider range of 'you know' in the corpus compared with 'I mean' may be the result of the more listener-oriented nature of supervision meetings (Stubbe and Holmes, 1995).

In terms of gesture, the analysis of the gesture types and recurrent gesture forms identified in the 'editing' and 'introducing' functions of 'I mean' are largely consistent with those of 'you know' (Chen and Adophs, 2023b). These include, firstly, the apparent tendency of both 'editing' and 'introducing' functions of 'I mean' to co-occur with pragmatic gestures rather than the other three types (i.e., beat, referential and pointing). 43 pragmatic gestures (72.88%) are identified out of the 59 gestures analysed in the 'editing' function of 'I mean', and 28 out of the 29 gestures (96.55%) in the 'introducing' function. These results are similar to those seen with 'you know' (Chen and Adophs, 2023b): of the 36 gestures analysed in the 'editing' function, pragmatic gestures occur most frequently with 25 instances (69.44%); of the 23 gestures in the 'introducing' function, 16 of them are pragmatic gestures (69.57%).

In addition, beat gestures were found to be more closely associated with the 'editing' function of 'I mean' (10 instances out of 59, 16.95%) rather than the 'introducing' function; no beat gesture has been identified among the 29 gestures analysed in the 'introducing' function. This may well be the result of the distinctive contexts of uses of the two functions. The patterns of co-occurrence of beat gestures with 'I mean' are consistent with those co-occurring with 'you know' where they co-occur more frequently with the 'editing' function (7 instances out of 36, 19.44%) than the 'introducing' function (3 instances out of 23, 13.04%) (Chen and Adophs, 2023b). When co-occurring with the 'editing' function, the beat gestures can serve a role of emphasising the intention of providing further information in speech planning.

Item	Speech	Speech function
S02MM-SUP06	I think that's rubbish frankly **I mean**// They the you know the whole erm	ending modifications
S11MF-STU07	I think it's still I mean it's still it's all incorporated isn't it so **I mean**//	ending modifications
S11MF-SUP19	quantitative or corpusy thing er you know computational thing **I mean**	ending modifications

Fig. 8. All the instances of 'I mean' as 'ending modifications'.

There are few referential and pointing gestures with the 'editing' and 'introducing' functions that co-occur with 'I mean'; no referential gesture occurs in the 'introducing' function. Despite their low numbers, our analysis suggests that the functions of the pointing and referential gestures identified here also resemble those in the research into 'you know' (Chen and Adophs, 2023b). In the data, both of these gesture types contain the focal information of the utterances following the discourse markers, and hence play an important role in foretelling and foregrounding the content of the forthcoming speech during speech editing and introducing (Chen and Adophs, 2023b).

Further examination of the forms of pragmatic gestures in the 'editing' and 'introducing' functions of 'I mean' revealed that almost all recurrent gesture forms seem to indicate and emphasise the intention of providing further information. This result also aligns with the research into 'you know' (Chen and Adophs, 2023b). The open hand palm oblique and up gestures are more frequent than the other gesture forms. However, more open hand palm up gestures occur in the 'introducing' function (12 instances out of 28, 42.85%) than in the 'editing' function (8 instances out of 43, 18.60%), which may be related to a higher degree of self-confidence or self-assertion on the part of the speaker as they are more prepared for the up-coming utterance.

Furthermore, the number of the open hand palm up gestures in both 'editing' and 'introducing' functions of 'I mean' exceed those of 'you know'. That is, more open hand palm up gestures are identified in the 'editing' function of 'I mean' (8 out of 43, 18.60%) than is the case with 'you know' (3 out of 25, 12%). Also, more palm up gestures occur in the 'introducing' function of 'I mean' (12 instances out of 28, 42.85%) than those of 'you know' (5 out of 16, 31.25%). This may again be the result of the more speaker-oriented nature of 'I mean' compared to 'you know' (Stubbe and Holmes, 1995). Speakers may be more confident, well-prepared and assured when they are using 'I mean' to lead the forthcoming modifications, clarification or adjustment. This is because, as 'you know' may indicate the expectation of activating the listener's knowledge to establish mutual ground, 'I mean' relies more on the speaker's knowledge to avoid misunderstanding, confusion or miscommunication.

In addition to the main findings of the current study outlined above, the research into 'I mean' also suggests other findings that are worth further consideration concerning the meaning and function of recurrent gesture forms, all of which align with the results of 'you know' (Chen and Adophs, 2023b). For example, many open hand palm oblique gestures have been found to co-occur with the 'editing' and 'introducing' functions of 'I mean'. This suggests an alignment with the function of presenting information. In addition, despite the low number of the open hand palm vertical and palm down gestures (both of which commonly function as gestures of negation) in our data, their co-occurrences with both 'I mean' and 'you know' may well indicate the function of presenting and offering.

These observations start to suggest patterning beyond purely textual functions that have emerged from spoken corpus analysis since the 1990s. While this is an important step towards making the argument for the importance of multimodal descriptions of language, we acknowledge that our dataset is limited in size and contextual variety (insofar as it is restricted to academic supervisions only). Other limitations of our study relate to the fact that while we have extended current approaches to the analysis of discourse markers that are mainly based on transcribed interaction to include an analysis of gestures, we have not included other important elements that contribute to meaning in discourse, such as prosody, gaze, or head movements. We see these limitations as fruitful directions for future research in this area, and we suggest that the approach we have developed here for exploring discourse markers may serve as a foundational framework for other studies of multimodal units of meaning across a range of areas of (applied) linguistics and gesture studies.

As the first study that explores the speech and gesture relationship of the discourse maker 'I mean' drawing on a multimodal corpus pragmatic approach, we hope that the current research provides useful foundations for establishing analytical frameworks for both speech and gesture that can support consistent and reliable coding, and gaining new knowledge of the gesture patterns co-occurring with this marker. In addition, a comparison with the gesture patterns co-occurring with 'you know' shows that the nuanced meanings of different discourse markers can be further explored in the gestural mode alongside their spoken mode. We see our research therefore as contributing to a paradigm shift towards multimodal corpus research which embraces the speech-gesture relationship in different areas such as cognitive linguistics and construction grammar, multimodal corpus linguistics, and especially multimodal corpus pragmatics (Adolphs and Chen, 2021; Chen and Adophs, 2023b; Knight, 2011; Debras, 2021; Hinnell, 2018; Kok, 2017; Zima, 2017).

6. DECLARATIONS OF INTEREST

None.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

Yaoyao Chen: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Svenja Adolphs:** Writing – review & editing, Supervision, Resources, Data curation, Conceptualization, Writing – original draft, Investigation. **Dawn Knight:** Writing – review & editing, Validation, Resources, Data curation, Conceptualization, Writing – original draft, Investigation.

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Data availability

The authors do not have permission to share data.

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