

Describing the Cookie Theft picture: Sources of breakdown in Alzheimer's dementia

Abstract:

Speech-language pathologists routinely use picture description tasks to assess expository discourse in clients with disorders such as aphasia and dementia. One picture description task – the Cookie Theft picture from the Boston Diagnostic Aphasia Examination – has come to dominate clinical settings more than any other task. In this article, I examine why this particular picture description task has proven to be so successful in assessing expository discourse in clients with language and cognitive disorders. Using data from the University of Pittsburgh Alzheimer and Related Dementias Study, recurrent cognitive-linguistic impairments in the Cookie Theft picture descriptions of clients with Alzheimer's dementia are explored. These impairments are mostly pragmatic in nature. It is argued that the sensitivity of the Cookie Theft picture description task to these impairments makes it an ideal assessment tool for any investigation which aims to identify pragmatic markers of neurodegenerative diseases such as the dementias.

Key words: Alzheimer's dementia; aphasia; Cookie Theft picture; discourse; executive function; pragmatics; speech-language pathology; theory of mind

1. Introduction

Picture description is a well-established method of assessing the expressive language skills of children and adults who attend clinics in speech-language pathology. Yet for too long, picture description tasks have been subordinated to formal language assessments, and to assessments which examine conversational and narrative discourse. The reasons for this lack of parity with other language assessments are clear enough. Unlike standardized language assessments, picture description tasks often lack normative data so that it is not possible to compare a client's performance on these tasks to peers of the same chronological age or mental age. Picture description tasks are often judged to lack the ecological validity of other language assessments. They do not resemble everyday communication in terms of number of participants (a single speaker during picture description rather than two or more speakers during conversational discourse) and their transmission of information which is already available to the hearer (the examiner, after all, views the picture that the client describes). Also, picture description tasks can produce a considerable amount of data, the transcription and analysis of which can be time consuming and labour intensive. Notwithstanding these drawbacks, I intend to demonstrate that the humble picture description task can provide clinicians and researchers with a wealth of information about the cognitive-linguistic skills of clients. Indeed, so valuable is this information that I will argue subsequently that picture description tasks have the potential to reveal pragmatic markers of conditions like the dementias, particularly when conducted alongside analyses of conversation. But first, I present a brief overview of the argument to be developed below.

Picture description tasks are not as straightforward as they might at first appear. Their purpose can vary considerably depending on the aims of an assessment (e.g. to perform a syntactic or pragmatic analysis of language). They may be performed in isolation or used alongside other assessments. Their internal structure can be very complex and can challenge the analytical skills of the most experienced clinicians and researchers. For these reasons, these tasks are examined in section 2. This section will focus on the particular picture description task that was used in the Alzheimer and Related Dementias Study at the University of Pittsburgh. That task is the Cookie Theft picture description, a sub-test in the

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

conversational and expository speech domain of the Boston Diagnostic Aphasia Examination—Third Edition (BDAE-3; Goodglass *et al.*, 2001). The cognitive-linguistic skills that can be assessed by means of this task will be considered in detail. In order to illustrate these skills, two picture descriptions that were produced by control participants in the Pittsburgh study will be examined in section 3. These participants had no neurological impairment. Their picture descriptions will be used as a point of comparison in section 4 when the descriptions produced by adults with Alzheimer’s dementia in the same study are examined. This examination will reveal a number of pragmatic impairments which tend to coalesce in the picture descriptions of clients with Alzheimer’s dementia. It is argued in section 5 that these impairments can serve as diagnostic markers of this type of dementia. This argument extends work first initiated in Cummings (2012) in clients with schizophrenia. That pragmatic impairments can function as diagnostic markers of the dementias has implications for the use of picture description tasks in clinical language assessments. These implications are also addressed in section 5.

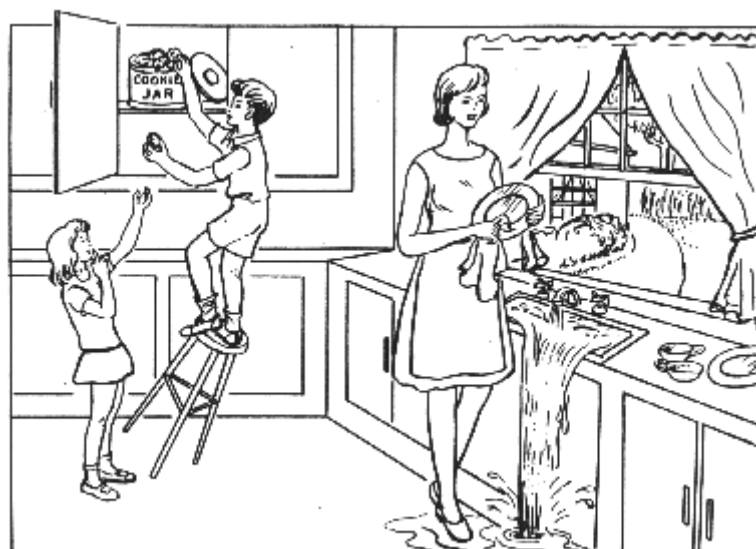
2. Picture description tasks

Picture description tasks are used extensively by speech-language pathologists in the management of clients with language disorders. These tasks may be used to supplement the results of formal language assessments. Alternatively, they may take the place of these assessments under certain circumstances (e.g. if a client cannot comply with formal testing because of cognitive difficulties). Aside from assessment, picture description tasks may also be used during therapy in order to elicit naming and sentence production in a connected speech context (Conroy *et al.*, 2009; Webster and Whitworth, 2012). Typically, the pictures used in these tasks are black and white line drawings, although colour photographs may also be used. The pictures depict scenes which are within the cultural experience of clients. For example, the picture description task in the Western Aphasia Battery – Revised (Kertesz, 2006) shows a family on a picnic. The Cookie Theft picture of the Boston Diagnostic Aphasia Examination—Third Edition (BDAE-3; Goodglass *et al.*, 2001) depicts a domestic scene, a mother and her two children in the kitchen of their house. At the outset of the task, clients are instructed by an examiner to describe everything that is happening in the picture. During the description, clients are only verbally prompted by the examiner when it is

Appears in: Cummings, L. (2019) ‘Describing the cookie theft picture: Sources of breakdown in Alzheimer’s dementia’, *Pragmatics & Society*, 10 (2): 151-174.

clear that they are omitting sections of the picture, or that they require assistance in order to complete the task. The description usually takes place under untimed conditions. Often, an audio-recording is made so that a detailed analysis of the language can be conducted at a later point in time.

One picture description task more than any other has dominated work in speech-language pathology. This is the Cookie Theft picture description task from the Boston Diagnostic Aphasia Examination. The BDAE was first published by Harold Goodglass and Edith Kaplan in 1972, and was later revised in 1983 and then again in 2001. The international reach of this assessment has been considerable, with Spanish, French, Hindi and Finnish versions of this language battery now available (Strauss *et al.*, 2006). The Cookie Theft picture description task has been a sub-test in the conversational and expository speech domain of the BDAE since it was first published in 1972. Clients are shown a drawing of a mother who is drying dishes next to the sink in the kitchen (see Figure 1). She is not paying attention and has left the tap on. As a result, water is overflowing from the sink. Meanwhile, two children are attempting to take cookies from a jar when their mother is not looking. One of the children, a boy, has climbed onto a stool to get up to the cupboard where the cookie jar is stored. The stool is rocking precariously. The other child, a girl, is standing next to the stool and has her hand outstretched ready to be given cookies. Examinees are instructed “Tell me everything you see going on in this picture”. The examiner may point to neglected features of the picture and ask for elaboration if the client’s response is less than might be expected given his or her apparent potential. The examiner attempts to record the examinee’s response verbatim as much as possible. Audio-recording and transcription are recommended to facilitate scoring in standard and extended administrations of the BDAE.



Appears in: Cum
Alzheimer’s dem

akdown in

Figure 1: The Cookie Theft picture from the Boston Diagnostic Aphasia Examination

(From the Boston Diagnostic Aphasia Examination – Third Edition by Harold Goodglass, Edith Kaplan and Barbara Barresi. Used with permission of PRO-ED, Inc.)

The Cookie Theft picture has been used by investigators to elicit language in clients with a range of clinical conditions. These clients include adults with corticobasal syndrome, behavioural variant frontotemporal dementia, and semantic variant primary progressive aphasia (Ash *et al.*, 2016), adults who have sustained right-hemisphere stroke and left-hemisphere stroke (Agis *et al.*, 2016), and adults with mild cognitive impairment and Alzheimer’s disease (Kavé and Levy, 2003; Mueller *et al.*, 2016). The use of this task with such diverse clients is testimony to the capacity of the Cookie Theft picture to reveal complex cognitive-linguistic impairments. The question naturally arises of which features of this task are particularly suited to an examination of these impairments. These features may be enumerated as follows:

(1) *Salience of information* – The Cookie Theft picture contains information of varying degrees of salience. The instruction to examinees to describe ‘everything you see going on in the picture’ confers greatest salience on the actions of the three characters in the scene. Unsurprisingly, this is the information which examinees usually convey at the start of their descriptions. Less salient information is represented by background details such as the plants and trees in the garden, the clothes worn by the characters, and the items of crockery next to the sink. Clients with no neurological impairment acknowledge the reduced salience of these details by conveying this information towards the end of their descriptions and only after the most salient information has already been conveyed. The Cookie Theft picture reinforces this distinction between information of high salience and low salience by placing most of the background details in the picture beyond a physical barrier represented by the wall and window of the kitchen.

Appears in: Cummings, L. (2019) ‘Describing the cookie theft picture: Sources of breakdown in Alzheimer’s dementia’, *Pragmatics & Society*, 10 (2): 151-174.

(2) *Semantic categories* – The Cookie Theft picture contains people, objects and actions that can be described by using words from a range of semantic categories. Examinees must be able to use words for animate entities such as *mother* and *girl* and inanimate entities such as *window* and *plate*. Some words used to describe the picture express abstract concepts (*the mother is daydreaming*), while other words express concrete concepts (*the boy is falling*). People and objects in the picture can be described in general and specific terms. The adult female in the picture may be described as *woman* or *lady* (general terms) or as *mother* (specific term). Similarly, the individual who is stealing the cookies may be described as *child*, *boy* or *son*, with *child* the most general term and *son* the most specific term. Features of the garden may also be described in more or less specific terms. The vegetation may be called *plant*, *tree* or *shrub*, with *plant* the most general term and *tree* and *shrub* more specific. Even actions in the picture can be described in more or less general terms. The mother in the picture may be described as *doing the dishes* (general description) or as *drying the plate* (specific description). The inclusion of people, objects and actions that can be described at different levels of generality or specificity enables clinicians to investigate the interrelationships between terms within semantic networks.

(3) *Referential cohesion* – In order to describe the Cookie Theft picture, an examinee must be able to introduce people and objects into the description and later refer to them through the use of pronouns. The most efficient way in which this can be achieved is for an examinee to use an indefinite noun phrase for the first mention of a person or object and then use personal pronouns like *he*, *she* and *it* for subsequent reference to the entity denoted by the noun phrase (so-called anaphoric reference). An example of the type of referential cohesion between sentences that can be achieved by means of anaphoric reference is: *A boy is on top of a stool. He is stealing cookies*. Because there are two female characters – the mother and the girl – in the Cookie Theft picture, it is particularly important that examinees are able to use anaphoric reference to achieve referential cohesion. If both of these characters are salient in the prior discourse context of a hearer, and the examinee uses the personal pronoun *she*, it is unclear whether the mother or the girl is the intended referent of the pronoun. The same referential confusion can occur in relation to the description of objects in the Cookie Theft picture. The stool, the sink, and the cookie in the

picture may all be referred to by the use of the pronoun *it*. If there is not a single, identifiable referent of this pronoun, a hearer will not be able to establish which of these objects the examinee is describing. We will see in section 4 that referential cohesion is an area of particular difficulty in the picture descriptions of clients with Alzheimer's disease.

(4) *Causal and temporal relations* – Although the Cookie Theft picture is a static scene, there are several events in the picture that are linked through causal and temporal relations. An examinee must succeed in capturing these relations in order to give a complete description of the picture. An examinee who is able to state that the sink is overflowing *because* the mother left the tap on, is able to give a fuller account of the events in the picture than one who omits this causal relation in a description. Also, certain events in the scene must take place before other events in order for a description of the picture to make sense. The children in the picture must establish that their mother is not paying attention to them *before* they attempt to steal the cookies – the theft of the cookies would not be possible under any other circumstances. A description which reflects the actual temporal order of these events conforms to our knowledge of how events unfold in time in the real world. Descriptions in which causal and temporal relations between events are inadequately represented are often judged by hearers to be less coherent and more difficult to understand in consequence. In section 4, we will see some of the difficulties that causal and temporal relations can pose for adults with Alzheimer's dementia during Cookie Theft picture description.

(5) *Mental state language* – The Cookie Theft picture provides a rich context in which to study mental state language and the cognitive processes associated with this language. This is important because many of the clinical populations that speech-language pathologists assess and treat can have impairments of theory of mind (ToM). ToM is the cognitive ability to attribute mental states to one's own mind and to the minds of others with the purpose of explaining or predicting behaviour. There are two types of mental state. Cognitive mental states include *knowledge* and *beliefs*, while affective mental states are emotions like *happiness* and *anger*. Events and actions in the Cookie Theft picture are only explicable to the extent that characters are entertaining certain mental states. For example, the boy is

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

climbing the stool because he *wants* to get cookies from the jar in the cupboard. The little girl has her arm held upwards because she *wants* the boy to give her a cookie. Water is overflowing from the sink because the mother is *daydreaming* and is not paying *attention*. As a result, she has *forgotten* to turn off the tap. Words like *wants*, *daydreaming*, *attention*, and *forgotten* are mental state language. A client who is able to produce this language during a picture description task has intact ToM skills. We will see in section 4 that mental state language is noticeably lacking from the picture descriptions that are produced by adults with Alzheimer's dementia.

(6) *Structural language and speech* – Like the assessment that contains it, the Cookie Theft picture may also be used to assess a client's structural language skills and motor speech production. Impairments of phonology, syntax, and semantics are often apparent during picture description tasks, and can compromise the efficient transmission of information about the picture to a hearer. Clients with aphasia and dementia may have considerable word-finding difficulties or anomia. Their picture descriptions may contain many filled and unfilled pauses as clients attempt to search for, and retrieve, particular words. When lexical retrieval is unsuccessful, non-specific vocabulary like *someone*, *stuff* and *thing* may be used in place of target lexemes. Aside from word-finding difficulties, limited syntax in a client may find some grammatical constructions avoided altogether or produced with errors. An examinee may use declarative sentences with simple subject-verb-object word order, and avoid passive constructions which demand syntactic movement in the sentence. Phonological errors such as phonemic paraphasias (e.g. *tair* for *chair*), neologisms ('new words'), and circumlocutions (talking around a target word) may also be apparent during Cookie Theft picture description. Finally, picture description tasks like the Cookie Theft picture also provide an invaluable context in which to assess motor speech production skills and the intelligibility of a client's connected speech (Patel and Connaghan, 2014).

(7) *General cognition and perception* – The Cookie Theft picture description task can only be successfully completed by an examinee who is able to attend to, and perceive, all aspects of the picture. In clients with neurological impairments, many of the general cognitive and perceptual skills that this requires are not intact. Adults who sustain a traumatic brain injury

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

may present with executive function deficits in which a range of cognitive skills including attention, memory, and planning are compromised. These adults may not recall that they have described a part of the scene (e.g. the sink is overflowing) and may describe it for a second or third time. As a result, the description may contain repetitive language that contributes no new information. Executive function deficits may also be found in adults with dementia. If cognitive skills such as planning and organization are compromised, adults with dementia may be unable to convey information in a logical order or present a coherent description of the scene. The description may appear fragmented and disorganized in consequence. Adults who sustain a right-hemisphere stroke may experience visual perception deficits which cause them to have difficulty perceiving and processing information in the left visual field. Clients with so-called left-sided neglect may be unable to describe features on the left of the Cookie Theft picture. This may lead them to omit any description of the boy and girl who are stealing cookies. Impairments of general cognition and perception may also explain some of the picture description difficulties of the adults with dementia in section 4.

It emerges that the Cookie Theft picture description task has the potential to reveal a wide range of cognitive-linguistic skills and deficits in adults with conditions such as aphasia and dementia. Given this potential, it is unsurprising that so many clinicians and investigators over the last four decades should have felt compelled to use this task in clinical language assessment. But the potential of any assessment tool can only be fully realized when it is in the hands of an analyst who knows how to use it to the best extent possible. For this to happen, the features described in this section must be applied to an analysis of *actual* Cookie Theft picture descriptions. Just such an analysis will be undertaken in section 3. The stage will then be set to examine the picture descriptions of adults with Alzheimer's dementia in section 4.

3. Cookie Theft picture description in healthy adults

It is often claimed that picture description tasks are not a valid clinical language measure because there is a lack of normative data on the performance of adults with no neurological impairment on these tasks. Some normative data from healthy adults are available for the

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

Cookie Theft picture description task. Williams et al. (2010) recorded Cookie Theft picture descriptions from 222 healthy adults aged between 20 and 89 years. The descriptions of these adults were typically 45 seconds long but could extend to 2 minutes. The picture descriptions of the 87 adults with acquired brain damage in the same study took between 13 seconds and 10 minutes. The Pittsburgh study which is central to this article also recorded Cookie Theft picture descriptions of healthy adults (Becker et al., 1994). In this study, 104 normal elderly individuals served as control subjects to 208 adults with dementia. Normative data from healthy adults make a range of comparative analyses possible. These analyses typically involve quantitative issues. For example, normative data can be used to establish if individuals with dementia produce the same number of informative utterances in their picture descriptions, or generate descriptions with the same degree of lexical diversity, as adults with no neurological impairment. In this section, the picture descriptions of just two of the 104 healthy adults in the Pittsburgh study will be examined. The emphasis will be on a qualitative analysis of each description with a view to illustrating the various cognitive-linguistic skills examined in section 2. A qualitative analysis will throw into stark relief the different limitations of the picture descriptions of adults with dementia in section 4. It will also demonstrate the utility of the Cookie Theft picture description task in areas which traditional language assessments have been poorly equipped to explore.

The first picture description to be examined was produced by a 75-year-old man. His utterances are introduced by PAR, and the utterances of the investigator are indicated by INV:

- 1 INV: And tell me everything you see happening in that picture.
- 2 INV: Everything that's going on there.
- 3 PAR: You mean right now tell you?
- 4 INV: Yeah mhm.
- 5 PAR: Uh the boy is stealing cookies out of the jar.
- 6 PAR: And he's on a stool that's falling down.
- 7 PAR: And the girl is laughing at him.

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

- 8 PAR: And the mother is washing dishes but she's preoccupied.
- 9 PAR: And the water is flowing over the sink.
- 10 PAR: And uh there's trouble galore.
- 11 PAR: The wind is blowing the uh curtains.
- 12 PAR: Um (..) she is not paying any attention to her kids.
- 13 PAR: And um the boy in addition to stealing he's trying to give the girl a a cookie.
- 14 PAR: And uh the whole thing is goin(g) to collapse.
- 15 PAR: Uh but aside from that they seem to be a fairly happy family.
- 16 INV: (laughs)

This description of the Cookie Theft picture is well structured and informative. The speaker recognises that not all aspects of the picture are equally important, and that some information should be given prominence over other information. Accordingly, in lines 5 to 9 he describes the two main events in the picture – the theft of the cookies and the mother's activities at the sink. It is only after this highly salient information has been conveyed that the speaker introduces background information in line 11 – the wind is blowing the curtains. The speaker's lexical choices suggest that he has use of a range of semantic categories. He uses high frequency words such as *boy* and *family*, and low frequency words like *preoccupied* and *galore*. The speaker's lexical choices are specific. For example, he uses *mother* rather than *woman* or *lady* to refer to the adult female in the picture, and *boy* and *girl* rather than *child*. A further example of lexical specificity is the use of *stool* rather than *chair* or *seat*. The speaker's description can be readily followed by a hearer on account of the use of referential cohesion between utterances. The speaker achieves this cohesion through the use of anaphoric reference. A character is first introduced into the description by means of a definite noun phrase. Subsequent reference to this noun phrase, and the individual it denotes, is achieved by means of pronouns:

Uh the boy is stealing cookies out of the jar. And he's on a stool that's falling down. And the girl is laughing at him.

The speaker also represents causal relations between people and events in the picture. The sink is overflowing *because* the mother is preoccupied, and the children are able to steal the cookies *because* their mother is not paying attention to them. The description is rich in mental state language. The mother is described as *preoccupied* and as not paying *attention* to her kids. The speaker concludes his description by stating that the family seems to be fairly *happy*. This language not only confers coherence on the description – actions and events are explained in terms of characters’ mental states – but it also indicates that the speaker is able to attribute cognitive and affective mental states to the different actors in the picture. The speaker uses a range of structural language skills. In terms of grammar, he is able to produce relative clauses (*he’s on a stool that’s falling down*), and use negation (*she is not paying any attention to her kids*), postpositive determiners (*trouble galore*), and ditransitive verbs (*to give the girl a cookie*). His knowledge of the semantics of prepositions is clearly evidenced in the use of one-, two-, and three-word prepositions (*over the sink; out of the jar; in addition to stealing*). Finally, the speaker’s general cognitive and perceptual skills are also on display in this description. In line 13, the speaker exhibits recall of information first conveyed in line 5 when he states that in addition to stealing cookies the boy is giving the girl a cookie. Accurate recall of this earlier utterance indicates intact working memory. In line 7, the speaker states that the girl is laughing at the boy. Of any actor in the scene, it is the girl’s actions which are perceptually most ambiguous in the picture. Her hand and arm positions are variously interpreted by healthy adults as laughing, eating a cookie, and telling the boy to be quiet.

The second picture description is produced by a 72-year-old woman. It is slightly longer than the description just examined. There are important similarities and differences between these descriptions which will be discussed below:

- 1 INV: That you see going on in that picture.
- 2 INV: All the action that you see happening there.
- 3 PAR: Um the boy reaching uh standing on a stool which is tipping.
- 4 PAR: With one foot over the um edge of the stool.
- 5 PAR: And his heel is on the the heel of that foot is on the toe of his other foot.

Appears in: Cummings, L. (2019) ‘Describing the cookie theft picture: Sources of breakdown in Alzheimer’s dementia’, *Pragmatics & Society*, 10 (2): 151-174.

- 6 PAR: Um he's taking a cookie out of the cookie jar.
- 7 PAR: And has one in his left hand too.
- 8 PAR: Looks as if he's going to hand it to his sister who has her arm up.
- 9 PAR: She has her finger (.) in front of her face.
- 10 PAR: Um looks as if she's laugh saying be quiet.
- 11 PAR: And the mother is at the the sister is standing on the floor.
- 12 PAR: The mother is at the kitchen sink drying a dish a plate.
- 13 PAR: The water is running over eh spilling over from the sink onto the floor.
- 14 PAR: It's running full tilt out of the tap.
- 15 PAR: Um the mother is not looking.
- 16 PAR: She's facing away from everything.
- 17 PAR: Um she has a dish cloth in her right hand dish towel in her right hand.
- 18 PAR: Um you can see outside.
- 19 PAR: There's a cup, two cups and a plate on the counter beside.
- 20 PAR: So she's either I guess she's finished washing those maybe.
- 21 PAR: Um she's standing with one foot flat on the floor.
- 22 PAR: And the next foot up as if she's standing on the toe not resting on her heel.
- 23 INV: Okay.
- 24 INV: Alright.

The first point to note is that this speaker is less fluent than the first speaker. There are numerous fillers like *uh* and *um* which often occur before nouns and verbs (e.g. *with one foot over the um edge of the stool*). This might indicate mild lexical retrieval difficulties in this woman of 72 years of age. Even in a healthy elderly adult, such difficulties are quite common. On several occasions, an utterance is reformulated mid-stream. Some of these reformulations involve lexical items, while others involve grammatical structure. Some of the lexical reformulations appear to be motivated by the need to achieve greater lexical specificity (e.g. in line 12 when *plate* replaces *dish*). The presence of these reformulations suggests some language processing difficulties on the part of this speaker. This is also not uncommon in healthy elderly speakers. Reformulations occur at the following locations:

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

Lexical reformulations:

Line 3: Um the boy reaching uh standing on a stool which is tipping

Line 10: Um looks as if she's laugh saying be quiet

Line 12: The mother is at the kitchen sink drying a dish a plate

Line 13: The water is running over eh spilling over from the sink onto the floor

Line 17: Um she has a dish cloth in her right hand dish towel in her right hand

Grammatical reformulations:

Line 5: And his heel is on the the heel of that foot is on the toe of his other foot

Line 11: And the mother is at the the sister is standing on the floor

Line 19: There's a cup, two cups and a plate on the counter beside

Line 20: So she's either I guess she's finished washing those maybe

Aside from these mild structural language difficulties, there is also a wide range of cognitive-linguistic skills on display. In terms of information management, the most prominent events in the scene are first to be described. In lines 3 and 6 to 8, the speaker describes how the boy is taking cookies out of the jar and handing them to his sister. In lines 12 to 17, the mother's activities at the sink are described. It is only later in the description that background details are introduced. In line 18, there is the first mention of outside the house, while in line 19 the objects on the counter next to the sink are described. The prominence given by this speaker to the main events in the picture is consistent with the description of the first speaker and the picture descriptions of healthy adults in general. However, there is also an aspect of information management which appears anomalous. In lines 4 and 5 and then again in lines 21 and 22, there is an excessively detailed description of the position of the feet of the boy and mother, respectively. This contributes little relevant information to the description and suggests that this speaker may experience some difficulties with information management during a picture description task.

Aside from information management, this speaker displays a range of semantic categories through her lexical choices. Her vocabulary is specific in her use of *mother* over *woman* and *sister* over *girl*. As mentioned above, the need for lexical specificity appears to motivate

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

some of the speaker's reformulated utterances. The speaker appears to be aware when an object can be described in more specific terms and reformulates her utterances accordingly. Her lexical choices across grammatical categories like noun, verb and adjective indicate that she has concepts such as personhood, action and attribute represented within semantic memory. Like the first speaker, this speaker achieves referential cohesion through the use of anaphoric reference. However, lexical substitution is also used to achieve cohesion between utterances:

Anaphoric reference:

Looks as if he's going to hand it to his sister who has her arm up she has her finger (.) in front of her face um looks as if she's laugh saying be quiet

Lexical substitution:

Um he's taking a cookie out of the cookie jar and has one in his left hand too

In lines 6 to 8, anaphoric reference and lexical substitution are used together to achieve cohesion across several utterances:

Um he's taking a cookie out of the cookie jar and has one in his left hand too. Looks as if he's going to hand it to his sister who has her arm up

The speaker makes skilled use of these cohesive devices, with the result that the description is relatively easy for a hearer to follow. In terms of causal relations, the hearer is left to draw a causal inference between the mother not looking in line 5 and the sink overflowing in line 13. Other inferences are explicitly drawn by the speaker. For example, in line 20 the speaker draws an inference to the effect that the mother has finished washing the cups and plate on the counter beside the sink. Like the first speaker, this speaker also makes use of mental state language. In lines 15 and 18, the speaker expresses perceptual states when she describes the mother as not *looking* and she states *you can see outside*. In line 20, a cognitive state verb is used in *I guess she's finished washing those maybe*. Alongside the mild language difficulties of this speaker are many instances of intact grammar. The speaker

uses relative clauses (*his sister who has her arm up*), subordinate clauses (*I guess she's finished washing those maybe*), and negation (*the mother is not looking*). Other grammatical features include an *-ing* participle clause in line 12 (*The mother is at the kitchen sink drying a dish a plate*) and an infinitive clause in line 8 (*he's going to hand it to his sister*). There are a number of semantic roles including agent (*the mother is not looking*) and patient (*the water is running over*). Finally, in terms of general cognitive and perceptual skills, the description is well planned and organized for the most part, suggesting intact executive function skills. In line 10, there is further evidence of the perceptual ambiguity described above. The speaker describes the girl as laughing only to revise this by saying she is telling the boy to be quiet.

In this section, just two of the 104 Cookie Theft picture descriptions produced by healthy adults in the Pittsburgh study have been examined. This examination has revealed a rich array of cognitive-linguistic skills on the part of both speakers. The evaluation of the skills that the Cookie Theft picture description task is able to provide is by no means fully comprehensive – more in-depth assessments are clearly required in order to explore these skills in detail. Nevertheless, it is difficult to imagine how any other form of language evaluation could assess the same range of skills as the Cookie Theft picture description task. It remains to be seen if the evaluative merits of this task in healthy adults also hold for adults who have neurological impairments. In the next section, several of the picture descriptions produced by adults with Alzheimer's dementia in the Pittsburgh study will be examined. This examination will reveal a small and consistent set of largely pragmatic anomalies in the picture descriptions of these adults. These anomalies will be illustrated by using excerpts from these adults' descriptions. Later, in section 5, it will be argued that the pragmatic anomalies revealed by the Cookie Theft picture description task have the potential to serve as diagnostic markers of Alzheimer's dementia.

4. Cookie Theft picture description in adults with Alzheimer's dementia

In the Pittsburgh study, investigators recorded picture descriptions in 208 adults with dementia. These descriptions provide a particularly rich context in which to explore the impact of neurodegenerative disease on cognitive-linguistic skills. What we find is a consistent pattern of cognitive-linguistic impairments, the full extent of which only becomes

apparent during the planning and execution of extended discourse in a task such as picture description. In this section, three picture descriptions of adults with dementia who participated in the Pittsburgh study will be examined. A number of mostly pragmatic language skills will be shown to be particularly sensitive to the neurodegenerative effects of Alzheimer's disease on language and cognition. Having demonstrated the disruption of these skills in the picture descriptions of adults with Alzheimer's dementia, the stage will then be set to examine their diagnostic significance in section 5.

The following picture description was produced by an 83-year-old man with probable Alzheimer's dementia. His description contains several anomalies which set it apart from the descriptions of healthy elderly adults in the Pittsburgh study:

- 1 INV: Take a look at that picture.
- 2 PAR: Yeah.
- 3 INV: I want you to tell me everything that you see happening in that picture.
- 4 INV: Everything that's going on in there.
- 5 PAR: Everything's that's.
- 6 INV: Happening.
- 7 PAR: Not according to Hoyle huh?
- 8 INV: Just everything that's happening.
- 9 PAR: Well here's a little boy up on the ladder.
- 10 PAR: The ladder or the ch the s s the stool the stool was falling.
- 11 INV: Mhm.
- 12 PAR: And there's something else up on the shelf there is falling.
- 13 PAR: And uh and he's going to fall (.) (be)cause the stool is (.) it's tilted too much.
- 14 PAR: Uh here (.) here's a lady that's washin(g) dishes.
- 15 PAR: And all the water is comin(g) over the sink.
- 16 PAR: It's overflowing.
- 17 PAR: That's about it.
- 18 INV: Okay good.

Considerable information is omitted in this short description of the Cookie Theft picture. The speaker describes only two events – the boy is on a ladder (or stool) which is falling, and the mother is washing dishes at a sink which is overflowing. There is no mention of the girl in the scene and background details such as features of the garden are omitted altogether. There is no elaboration of the boy’s purpose in climbing onto the stool (he wants to get the cookies) or how the children’s actions are passing unnoticed by their mother. The speaker’s language is also quite repetitive. The action of falling is stated three times in lines 10, 12 and 13. In lines 15 and 16, the speaker repeats the fact that the sink is overflowing. The speaker’s lexical selections are also revealing. He uses terms which have a semantic or functional relation to the target word. This is evident in the use of *lady* to refer to the mother, and the use of *ladder* to refer to the stool (although the speaker subsequently corrects this to become *stool*). In line 12, the speaker uses *something* in relation to the cookie jar, suggesting some word-finding difficulty. The speaker does not use mental state language. This possibly explains his failure to describe the mental state (desire) that motivates the boy’s actions. Alongside these cognitive-linguistic impairments are some preserved language skills. The speaker succeeds in representing causal relations when he states that the boy is going to fall *because* the stool is tilted too much. Also, there is evidence of referential cohesion such as in the utterances: *All the water is coming over the sink. It’s overflowing*. In summary, then, this speaker has impairments in the areas of information management (omission and repetition) and lexical retrieval. His language use is also devoid of inference and any attribution of mental states to the actors in the scene.

The speaker in the second picture description is a 74-year-old man with probable Alzheimer’s dementia. Like the first speaker, his description is short and omits considerable information. However, as we will see below, these are not the only features which set this picture description apart from the descriptions of healthy adults in the Pittsburgh dementia study:

- 1 INV: Picture that has a lot of action going on there’s a lot of things going on in the picture.
- 2 INV: Tell me what you see going on in the picture.
- 3 PAR: Well she’s washin(g) dishes.

Appears in: Cummings, L. (2019) ‘Describing the cookie theft picture: Sources of breakdown in Alzheimer’s dementia’, *Pragmatics & Society*, 10 (2): 151-174.

- 4 PAR: He's climbin(g) up to get cookies.
5 PAR: He's gonna fall.
6 PAR: And she's laughin(g).
7 INV: Okay.
8 PAR: And she's spill runnin(g) the water over.
9 INV: Anything else?
10 PAR: That looks like someone down out there or somethin(g).
11 PAR: I don't know what that is.
12 INV: Okay.

The brevity of this description is related to the omission of all but the most prominent actions in the picture – the boy is climbing up to get cookies and the mother is washing dishes. Background details such as the crockery next to the sink and features of the garden are not described. Even the main actions are captured in a somewhat superficial way. For example, we are not told that the boy is climbing up onto *a stool* to get cookies, or that running is *spilling out of the sink*. As well as the omission of information, the order or sequence of information is problematic. The actions of the mother are first to be described in line 3. Then in lines 4 and 5, the speaker leaves the mother to describe the actions of the boy. In line 6, the girl's behaviour is described. Then in line 8, the speaker returns to the mother to give a further description of what she is doing. The failure of this speaker to complete the description of one action before moving onto the description of another action detracts from the coherence of his discourse.

Alongside problems with information management, this speaker has considerable difficulty with referential cohesion. His difficulties in this area are so marked that in the absence of the picture, it would not be possible for a hearer to follow what he is describing. From the outset, pronouns are used to refer to the actors in the scene. But in the absence of preceding noun phrases, it is difficult to establish the referents of these pronouns. The pronoun *she* is used in lines 3, 6 and 8, and has an ambiguous referent in the two female actors in the scene. This is further complicated by the fact that the referent changes across the utterances in these lines without the speaker explicitly signalling this shift in reference.

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

In line 3, *she* refers to the mother, in line 6 it refers to the girl, and in line 8 it refers to the mother again. The referential ambiguity that is created significantly reduces the comprehensibility of the speaker's description. Like the first speaker, this speaker also appears to have lexical retrieval difficulties. Specific lexemes like *mother*, *boy* and *girl* are not used to refer to the three actors in the scene. The use of non-specific vocabulary like *someone* and *something* in line 10 also suggests that this speaker has word-finding difficulties. With the exception of the speaker's reference to his own lack of knowledge in line 11, the description is devoid of mental state language. The absence of this language limits the expression of causal relations between events (e.g. *The sink is overflowing because the mother has forgotten to turn off the tap*). In summary, this speaker has problems with information management (omission and order of information), lexical retrieval and mental state language, like the first speaker. However, there are also additional difficulties with referential cohesion.

The third picture description is produced by a 66-year-old woman with probable Alzheimer's dementia. Unlike previous descriptions, the investigator has to prompt this adult repeatedly with direct questions:

- 1 INV: I'd like for you to look at this picture and tell me what you see going on there.
- 2 INV: What's happening in that picture?
- 3 PAR: (.) they're baking.
- 4 INV: (.) what else is going on?
- 5 PAR: Making a mess out of the place.
- 6 INV: How?
- 7 PAR: By not putting by not no neatness.
- 8 INV: (.) do you see anything else happening there?
- 9 PAR: Yes there's a few accidents.
- 10 PAR: The little boy is sta standing on a chair which is crooked.
- 11 PAR: The lady has water running out of her (.) sink.
- 12 PAR: And (.) towel in her hand which is dangerous.
- 13 PAR: Cookies are coming down the cookie jar is coming down.

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

14 PAR: And the place is very pretty.

15 INV: Okay good.

This speaker displays many of the same difficulties as the previous two speakers. The pronoun *they* in line 3 lacks a clear referent. It is uncertain whether the speaker is referring to all three actors in the scene, or just two of the three actors. General lexemes such as *place* and *lady* are used in place of specific lexemes like *kitchen* and *mother*, respectively. Like other speakers with Alzheimer's dementia, this speaker uses *chair* to describe the stool that the boy is standing on. Considerable information is omitted. For example, the speaker fails to state that the boy is standing on the stool in order to get cookies, or that the mother is drying dishes. The order in which information is presented is also problematic. In line 10, the speaker describes the boy's action. She leaves this action incomplete in lines 11 and 12 when she describes what the mother is doing. In line 13, there is further information about what the boy is doing. No background details such as features of the garden are described. There is no use of mental state language and no attempt is made to relate events and actions in causal and temporal terms. For example, although the speaker states that the woman is letting water run out of the sink, there is no explanation of this fact in terms of the mother's inattention and distraction (both mental states) in the situation.

This speaker also produces grammatical errors which were not seen in the descriptions of the other speakers. In line 5, a lexical verb is used with no noun or pronoun as the subject of this verb: *making a mess out of the place*. The utterance in line 7 is grammatically incomplete. In line 9, the copular verb *is* has a singular form rather than a plural form, although this may simply reflect the dialect of the speaker. A determiner and main verb are missing in front of the noun *towel* in line 12. Also in line 12, there is a grammatical ambiguity related to the relative clause *which is dangerous*. Presumably, the speaker wants to communicate that it is the water overflowing from the sink which is dangerous. However, the delayed use of the relative clause leads a hearer to understand that it is the towel in the mother's hand which is dangerous. These grammatical problems reduce the overall comprehensibility of the speaker's description. The speaker may also have some perceptual difficulties. For example, in line 3 the actors in the scene are described as baking. Although

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

this description is incorrect, it is at least explicable. Notwithstanding the 'cookie jar' label, the cookie jar could be perceived to be a jar of flour, and the mother is washing dishes, which is common during baking. In summary then, this speaker also displays problems with information management, lexical retrieval and referential cohesion. There are, however, additional problems with grammatical structure and perception of the actions in the picture, both of which were not evident in the descriptions of the other speakers with Alzheimer's dementia.

In this section, three picture descriptions of adults with Alzheimer's dementia have been examined. What has emerged from this examination is that these adults have a number of cognitive-linguistic impairments which are brought into sharp focus during picture description. Some of these impairments (e.g. poor information management) are consistent across speakers with Alzheimer's dementia. Other impairments (e.g. grammatical difficulties) vary across speakers. In the next section, we examine further the impairments that are revealed by the Cookie Theft picture description task. It will be argued that within this constellation of impairments are pragmatic deficits which can serve as diagnostic markers of Alzheimer's dementia.

5. Pragmatic impairments: diagnostic markers of Alzheimer's dementia

In section 4, we identified a group of cognitive-linguistic impairments which characterized the expository discourse of adults with Alzheimer's dementia. These impairments included poor information management, lexical-semantic deficits, poor referential cohesion, a lack of mental state language, and grammatical deficits. Several distinctive deficits fell within poor information management including the omission, repetition and incorrect sequencing of information. Lexical-semantic deficits also involved several anomalies including word-finding difficulties, the use of general lexemes over specific lexemes, and the selection of words which have a semantic or functional relation to the target word. Some of these same impairments have been identified in other clinical studies which have used the Cookie Theft picture description task. For example, Hux *et al.* (2008) identified the repetition of information in the picture descriptions of adults with acquired brain injury, while missing information was a key feature of the picture descriptions of adults with Alzheimer's

dementia who were studied by Giles *et al.* (1996). Where the present study goes further than these other investigations is in identifying a core set of pragmatic deficits which, it is argued, have the potential to serve as diagnostic markers of Alzheimer's dementia. These deficits sit at the centre of a constellation of cognitive-linguistic impairments in the expository discourse of adults with Alzheimer's dementia. It is their central position in this constellation which confers diagnostic significance on these deficits. Other, less central impairments in the constellation can also disrupt discourse in adults with Alzheimer's dementia, albeit with less consistency. This model is outlined briefly below.

Neurologists and geriatricians are faced with a considerable challenge when attempting a diagnosis of dementia. Currently, a diagnosis is reached by means of a probabilistic weighting of genetic and protein biomarkers, neuroanatomical features, and behavioural symptoms. The challenge arises because there is a high degree of overlap in the initial presenting symptoms of the dementias. Also, there is a lack of a definitive, non-surgically invasive biomarker to make an *in vivo* diagnosis of dementia (Reilly *et al.*, 2010). Against this backdrop, clinicians are increasingly looking to behavioural features of the dementias to serve as diagnostic markers. A group of features which, I contend, has the potential to serve as diagnostic markers is the pragmatic language impairments of individuals with dementia. In this article, we have seen how adults with one form of dementia – Alzheimer's dementia – consistently struggled with certain aspects of expository discourse. These adults had difficulties managing the informational content of discourse. They tended to omit important information. They also repeated information and presented information in an order which made it difficult for a hearer to follow the actions and events described (at least in the absence of the picture). These problems with information management resulted in picture descriptions which were markedly under-informative in comparison to the descriptions of healthy adults in the same study. Although some picture descriptions of adults with dementia in the Pittsburgh study were more informative than others, in general none succeeded in capturing the rich content represented within the Cookie Theft picture.

Contributing to the reduced informational content of these speakers' descriptions were marked lexical-semantic deficits. A general lexeme like *woman* or *food* conveys less

information than a specific lexeme like *mother* or *cookie*, respectively. Also, lexical choices like *ladder* for *stool* and *dishwasher* for *sink* serve only to convey incorrect information about the scene. Lexical-semantic deficits made a significant contribution to the problems with informational content of the adults with dementia in the Pittsburgh study. These same deficits also made it difficult for speakers to achieve referential cohesion across the utterances in their descriptions. For example, the use of anaphoric reference requires that a speaker first use a specific lexeme (e.g. *mother*) to which subsequent pronouns refer (e.g. *she is drying dishes*). If specific lexemes are not used, as was the case for two of the three speakers examined in section 4, subsequent pronominal reference fails. If a hearer cannot relate a statement which has a pronominal subject to a prior referent in the discourse, then there is a further reduction in the informational content that the speaker is able to convey. Also, the picture descriptions of adults with Alzheimer's dementia nearly always lacked mental state language. We saw that in the absence of this language, speakers were unable to give causal explanations of events in the picture and motivations for the characters' actions. This limited yet further the informational content of their picture descriptions. In short, lexical-semantic deficits, poor referential cohesion, and a lack of mental state language are problematic precisely for the reason that they limit the informational content that a speaker is able to convey in expository discourse.

The model that this pattern of cognitive-linguistic impairments suggests is represented by the diagram in Figure 2. At the centre of the model are problems with informational content. These are variously manifested in the omission, repetition, and incorrect sequencing of information. Reduced informational content is the single most important impairment in the expository discourse of adults with Alzheimer's dementia. This impairment is a direct consequence of a number of other anomalies in the discourse of these adults, namely, lexical-semantic deficits, poor referential cohesion, and a lack of mental state language. No single one of these anomalies can account for the problems with informational content in the picture descriptions of these adults. Rather, it is their interaction which leads to a diminution of the informational content that speakers with Alzheimer's dementia are able to convey. On the periphery of the model are other cognitive-linguistic impairments that contribute to the reduced informational content of

adults with dementia. However, these impairments occur less frequently in the picture descriptions of these adults than features such as poor referential cohesion. They include grammatical deficits, perceptual impairments, and a lack of inferences. Perceptual impairments can lead to neglect or misinterpretation of part of the picture. The derivation of inferences is not a requirement of Cookie Theft picture description – the speaker is instructed, after all, to give a description of the actions (i.e. explicit information) in the picture. However, as we saw in the descriptions of healthy adults in the Pittsburgh study, speakers who are able to draw inferences based on the picture achieve an altogether richer representation of the actions and events that are depicted within it.

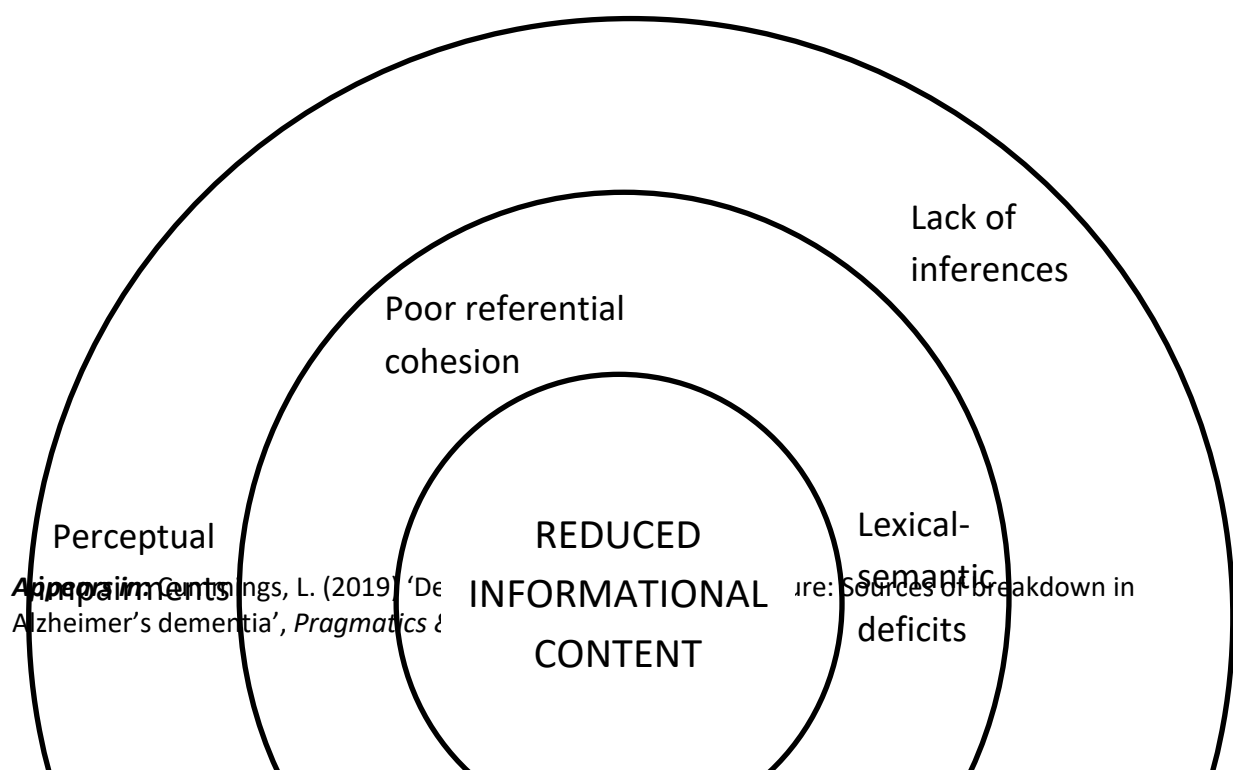


Figure 2: Cognitive-linguistic impairments in the expository discourse of adults with Alzheimer's dementia

As we move from the periphery to the centre of the model in Figure 2, we move closer to the impairments that have diagnostic significance in Alzheimer's dementia. These impairments are consistent features of the picture descriptions of the adults with dementia in the Pittsburgh study. It is their consistency which allows these features to function as diagnostic criteria or markers of this form of dementia. It is conceivable that if the cognitive-linguistic impairments of speakers with other forms of dementia during expository discourse were similarly displayed, a quite different constellation of difficulties might emerge. For example, the adults with Alzheimer's dementia in the Pittsburgh study almost always produced information that was relevant to the picture. However, for speakers with other forms of dementia (e.g. HIV dementia), there are marked difficulties in producing relevant information during conversation and discourse production tasks (McCabe *et al.*, 2008). The adults in the Pittsburgh study also produced relatively few grammatical errors. But in adults with the agrammatic or non-fluent variant of a form of dementia called primary progressive aphasia, grammatical errors and omissions are common (Grossman, 2012). Across different sub-types of dementia, the constellation of impairments displayed in Figure 2 will shift, as

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

certain cognitive-linguistic impairments assume prominence in the centre of the model, while other impairments recede into the background and occupy the periphery of the model. In each case, it will be the impairments at the centre of the model that assume significance as diagnostic markers. For adults with Alzheimer's dementia, those impairments are largely pragmatic in nature.

It has been argued in this paper that the Cookie Theft picture description task is uniquely positioned over other forms of language assessment to reveal impairments in the expository discourse of adults with cognitive and language disorders. The wide array of cognitive-linguistic impairments that this task has highlighted in adults with Alzheimer's dementia in the Pittsburgh study is testament to this fact. The demonstrable utility of picture description tasks in examining these impairments should now lead, I believe, to a re-envisioning of the role of these tasks in clinical language evaluation. To date, that role has been as a supplement to formal assessments of language skills in areas such as syntax and semantics. But if the discussion of this paper has demonstrated anything, it is that an assessment of these skills in isolation of the expository, procedural and narrative discourses in which they are used is of limited value. This is particularly true in conditions such as dementia where neurodegenerative processes affect language and cognitive systems, and one system cannot be examined in the absence of the other system. To this end, a productive way forward would be to invert the standard components of a clinical language evaluation so that discourse production tasks like the Cookie Theft picture description assume centre stage. It is only once these tasks have been conducted that the need for further assessment of formal language and cognitive skills even becomes apparent. If clinicians can achieve this inversion of priorities during assessment, then the complex interplay of cognitive-linguistic impairments in conditions such as dementia will be better understood. Only then will we begin to develop robust models of these impairments and effective methods of treatment. And only then will the true merits of picture description tasks like the Cookie Theft picture description be fully recognized.

BIBLIOGRAPHY

Agis, Daniel, Maria B. Goggins, Kumiko Oishi, Kenichi Oishi, Cameron Davis, A. Wright, Eun Hye Kim, Rajani Sebastian, Donna C. Tippett, Andreia Faria, and Argye Hillis. 2016. "Picturing the Size and Site of Stroke with an Expanded National Institutes of Health Stroke Scale." *Stroke* 47 (6): 1459-1465.

Ash, Sharon, Kylie Ternes, Teagan Bisbing, Nam Eun Min, Eileen Moran, Collin York, Corey T. McMillan, David J. Irwin, and Murray Grossman. 2016. "Dissociation of Quantifiers and Object Nouns in Speech in Focal Neurodegenerative Disease." *Neuropsychologia* 89: 141-152.

Becker, James T., François Boiler, Oscar L. Lopez, Judith Saxton, and Karen L. McGonigle. 1994. "The Natural History of Alzheimer's Disease: Description of Study Cohort and Accuracy of Diagnosis." *Archives of Neurology* 51 (6): 585-594.

Conroy, Paul, Karen Sage, and Matt Lambon Ralph. 2009. "Improved Vocabulary Production after Naming Therapy in Aphasia: Can Gains in Picture Naming Generalise to Connected Speech?" *International Journal of Language & Communication Disorders* 44 (6): 1036-1062.

Cummings, Louise. 2012. "Establishing Diagnostic Criteria: The Role of Clinical Pragmatics." *Lodz Papers in Pragmatics* 8 (1): 61-84.

Giles, Elaine, Karalyn Patterson, and John R. Hodges. 1996. "Performance on the Boston Cookie Theft Picture Description Task in Patients with Early Dementia of the Alzheimer's Type: Missing Information." *Aphasiology* 10 (4): 395-408.

Goodglass, Harold, Edith Kaplan, and Barbara Barresi. 2001. *Boston Diagnostic Aphasia Examination – Third Edition*. Baltimore, MD: Lippincott Williams & Wilkins.

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

- Grossman, Murray. 2012. "The non-fluent/agrammatic variant of primary progressive aphasia." *The Lancet Neurology* 11 (6): 545-555.
- Hux, Karen, Sarah E. Wallace, Kelli Evans, and Jeff Snell. 2008. "Performing Cookie Theft Picture Content Analyses to Delineate Cognitive-Communication Impairments." *Journal of Medical Speech-Language Pathology* 16 (2): 83-99.
- Kavé, Gitit, and Yonata Levy. 2003. "Morphology in Picture Descriptions Provided by Persons with Alzheimer's Disease." *Journal of Speech, Language, and Hearing Research* 46 (2): 341-352.
- Kertesz, Andrew. 2006. *Western Aphasia Battery-Revised*. San Antonio, TX: Pearson.
- McCabe, Patricia J., Christine Sheard, and Chris Code. 2008. "Communication Impairment in the AIDS Dementia Complex (ADC): A Case Report." *Journal of Communication Disorders* 41 (3): 203-222.
- Mueller, Kimberly Diggle, Rebecca L. Kosciak, Lyn S. Turkstra, Sarah K. Riedeman, Asenath LaRue, Lindsay R. Clark, Bruce Hermann, Mark A. Sager, and Sterling C. Johnson. 2016. "Connected Language in Late Middle-Aged Adults at Risk for Alzheimer's Disease." *Journal of Alzheimer's Disease* 54 (4): 1539-1550.
- Patel, Rupal, and Kathryn Connaghan. 2014. "Park Play: A Picture Description Task for Assessing Childhood Motor Speech Disorders." *International Journal of Speech-Language Pathology* 16 (4): 337-343.
- Reilly, Jamie, Amy D. Rodriguez, Martine Lamy, and Jean Neils-Strunjas. 2010. "Cognition, Language and Clinical Pathological Features of Non-Alzheimer's Dementias: An Overview." *Journal of Communication Disorders* 43 (5): 438-452.

Appears in: Cummings, L. (2019) 'Describing the cookie theft picture: Sources of breakdown in Alzheimer's dementia', *Pragmatics & Society*, 10 (2): 151-174.

Strauss, Esther, Elisabeth M. S. Sherman, and Otfried Spreen. 2006. *A Compendium of Neuropsychological Tests: Administration, Norms, and Commentary*. Third Edition. New York: Oxford University Press.

Webster, Janet, and Anne Whitworth. 2012. "Treating Verbs in Aphasia: Exploring the Impact of Therapy at the Single Word and Sentence Levels." *International Journal of Language & Communication Disorders* 47 (6): 619-636.

Williams, Caroline, Andrew Thwaites, Paula Buttery, Jeroen Geertzen, Billi Randall, Meredith Shafto, Barry Devereux, and Lorraine K. Tyler. 2010. "The Cambridge Cookie-Theft Corpus: A Corpus of Directed and Spontaneous Speech of Brain-Damaged Patients and Healthy Individuals." In *Proceedings of the Seventh Conference on International Language Resources and Evaluation (LREC'10)*, ed. by Nicoletta Calzolari, Khalid Choukri, Bente Maegaard, Joseph Mariani, Jan Odijk, Stelios Piperidis, Mike Rosner, and Daniel Tapias, 2824-2830. Valletta, Malta: European Language Resources Association (ELRA).