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**Pauliina Peltonen & Pekka Lintunen**  
University of Turku

## **Word searches and fluency during problem-solving tasks: a mixed-methods study of L1 Finnish and L2 English interaction**

### **Highlights**

- L1 Finnish dialogues contained more solitary word searches (WSs) than L2 English dialogues.
- Correlations across L1 Finnish and L2 English WSs were weak and statistically nonsignificant.
- Collaborative WSs, in particular, contributed to maintaining interactional fluency.



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## Abstract

Word searches (WSs) have been widely studied in L1 and L2 interaction but have rarely been combined with fluency research. The present study bridges the gap between these research fields by examining WSs and their connections to fluency in L1 and L2 dialogue data. From a larger project, 50 participants' dialogues (25 L1 Finnish, 25 L2 English) were analyzed for WSs. The mixed-methods analyses focused on potential differences and connections in WS use across the L1 and L2 dialogues and the connections between WSs and fluency among selected participants. The results demonstrated differences especially in the use of solitary WSs across L1 and L2 and some connections between L1 and L2 WSs among individual participants, despite group-level connections not being statistically significant. The qualitative analyses illustrated the potential fluency-enhancing functions of collaborative WSs. The study has implications for L2 speech fluency research and L2 teaching.

**Keywords:** fluency, interaction, problem-solving, word search  
**Asiasanat:** sujuvuus, vuorovaikutus, ongelmanratkaisu, sanahaku

## 1 Introduction

Fluency is a key indicator of second language (L2) oral proficiency. While fluency is a widely studied construct, it has mostly been studied quantitatively from an individual's perspective based on monologue speech data and temporal measurements related to speech rate and pausing. However, there has been recent interest to explore the construct in dialogue contexts (e.g., Sato 2014; Peltonen 2017a, 2017b, 2020). Fluency researchers have also begun to study how individual speaking style in the first language (L1) influences L2 fluency by comparing L1 and L2 speech fluency patterns (e.g., De Jong et al. 2015; Peltonen 2018). This research strand has, so far, focused solely on monologue speech, leaving the influence of an individual speaking style on L2 speech performance unexplored in interactional settings. Furthermore, while word searches (WSs) have been studied especially from a conversation analytic perspective in L1 and L2 interaction (recently, e.g., Rydell 2019; Dressel 2020; Skogmyr Marian & Pekarek Doehler 2022; Tüma & Sherman 2022), they have rarely been the focus of fluency-oriented research, despite efficient and collaborative problem-solving during WSs having the potential to contribute to maintaining fluency especially in interactional settings (see, e.g., Peltonen 2020).

This exploratory study aims to fill these gaps in fluency research by examining L1 and L2 dialogue data from the same speakers and bridging fluency-oriented research with previous studies on WSs. In particular, our aim is to identify links between efficient problem-solving and speech fluency in interactional settings. The present study thus focuses on WSs in L1 Finnish and L2 English dialogues from university students of English. In line with the focus of this thematic publication, the present study focuses on elicited but freely produced speech. The study is part of

a larger project *Fluency and Disfluency Features in L2 Speech (FDF2)*; funded by the Research Council of Finland 2020–2024; decision number 331903). From the larger data set collected for the project, L1 Finnish (n=25) and L2 English (n=25) dialogues from the same participants (N=50) were analyzed in the present study. The following research questions were addressed:

- 1) RQ1: To what extent does the participants' use of WSs differ across their L1 and L2 dialogues?
- 2) RQ2: To what extent is the use of WSs connected across L1 and L2 dialogues?
- 3) RQ3: How are WSs connected with maintaining fluency in L1 and L2 dialogues among pairs with the highest frequencies of WSs?

The quantitative RQ1 was examined based on statistical analyses (Wilcoxon signed ranks tests). RQ2 was answered with a mixed-methods approach combining quantitative analysis (Spearman's rank-order correlations) with a qualitative analysis of the connections in WS use among selected participants' dialogues. The final RQ3, focusing on two pairs, was also examined with a mixed-methods approach: qualitative analyses were complemented with quantitative fluency measurements. Thus, overall, the study adopts a mixed-methods approach for examining fluency and WSs.

## 2 Fluency in interaction

L2 speech fluency has traditionally been examined from an individual speaker's perspective. The bulk of L2 fluency research has thus focused on characterizing learners' utterance fluency (i.e., by measuring mostly temporal fluency-related features in a speech sample; Segalowitz 2010) based on monologue data rather than interactional data. However, the present study builds on an emerging line of research within L2 fluency studies that focuses on characterizing the nature of fluency in dialogues, i.e., between two participants (see, e.g., Sato 2014; Peltonen 2017a, 2017b, 2020; Van Os et al. 2020). While some previous L2 fluency studies have also analyzed dialogic data, they have mostly focused on comparisons across monologue and dialogue fluency (e.g., Witton-Davies 2014; Tavakoli 2016), placing less emphasis on the collaborative elements of fluency. Furthermore, while the theoretical background and most suitable measures for monologue L2 fluency have become relatively well established in the field, the definitions and measures associated with *interactional fluency* (i.e., collaborative, between-turn aspects of fluency; Peltonen 2020) are not equally well established (for discussion, see McCarthy 2010; Feng 2022).

Similarly to characterizations of monologue (utterance) fluency consisting of different but interrelated dimensions (see, e.g., Skehan's 2009 framework of speed, breakdown, and repair fluency), interactional fluency can also be characterized in terms of different components: temporal fluency (related to the frequency and dura-

tion of between-turn pauses) and cohesive devices (especially other-repetitions and collaborative completions; Peltonen 2017b; 2020). Thus, while individual fluency is mostly captured with measures related to the abovementioned dimensions of speed, breakdown (pausing), and repair (e.g., corrections) of an individual speaker in monologues (or with within-turn measures in dialogue settings), interactional fluency measures aim to capture the joint efforts of maintaining fluent speech across individual speakers' turn boundaries (Peltonen 2020, see also McCarthy 2010). Previous examinations of collaborative completions (see, e.g., Lerner 1996), in particular, have shown that they can be effectively used by participants to maintain fluency in interactive settings (Peltonen 2017a). Some of these collaborative completions occur in conjunction with WSs (ibid.), highlighting the usefulness of also examining the role of WSs in maintaining fluency in dialogues.

Overcoming lexis-related problems might, thus, contribute to maintaining individual fluency, but also interactional fluency, especially if these sequences are solved with the help of the interlocutor. This approach is connected to previous characterizations on the role of problem-solving mechanisms (see Dörnyei & Kormos 1998) or fluency resources (Peltonen 2020) in facilitating speech fluency: along with different kinds of stalling mechanisms (filled pauses [FPs], repetitions, filler words, and sound lengthenings), communication strategies (e.g., Gullberg 2011; Peltonen 2017b) used in conjunction with WSs (such as circumlocutions, approximations, all-purpose words or word coinage<sup>1</sup>; see, e.g., Dörnyei & Scott 1997) also have the potential to contribute to fluent speech. By examining WSs both qualitatively and quantitatively, the present study aims to complement previous studies by focusing on the role of WS in contributing to fluency in dialogues, covering both L1 and L2 dialogue (on previous fluency studies examining connections between L1 and L2 fluency based on monologue data, see, e.g., De Jong et al. 2015; Peltonen 2018).

### 3 Word searches

WSs have been characterized in previous literature as “mostly self-initiated, forward-oriented repair in which the progressivity of the speaker's turn is delayed because of an item (i.e., a word) is not readily available to the speaker” (Dressel 2020: 39; based on Schegloff et al. 1977). Based on this characterization, WSs can be viewed as impacting fluency negatively, causing delays and potential disruptions in the flow of speech.

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1 Circumlocutions include illustrations or descriptions of target items based on their characteristics, approximations include the use of alternative lexical items (e.g., superordinate or related terms) that are related in meaning to the target item, all-purpose words include general or “empty” lexical items (e.g., thing), and word coinage involves the creating of a non-existing word to refer to the target item (Dörnyei & Scott 1997; Peltonen 2020).

Yet, as argued above, especially collaboration in solving these sequences efficiently can, potentially, help in maintaining fluency from a broader interactional perspective. Dressel (2020: 39) describes WSs as consisting of three parts: onset of the search, the search-in-progress, and the resolution (or abandonment) of the search (following Chiarenza 2010). During the onset, a WS is initiated with the use of different resources, such as cut-offs, drawls (sound lengthenings) or FPs, such as *uh* or *um* in English or *öö* in Finnish (e.g., Schegloff et al. 1977; Goodwin & Goodwin 1986; Dressel 2020; Skogmyr Marian & Pekarek Doehler 2022); that is, from a fluency perspective, by using features that have mainly been considered as disfluencies. Yet, in the context of initiating a WS, they serve as important interactional signals.

During the search itself, various verbal (lexical and non-lexical) as well as multimodal resources (e.g., gestures) are used to contribute to the marking of WS as a discrete activity (e.g., Dressel 2020: 39). Verbal resources include, for instance, the abovementioned silent pauses (SPs) and FPs as well as repetitions (e.g., Dressel 2020; Skogmyr Marian & Pekarek Doehler 2022). Lower intensity can also be used to mark the WS as distinct from the surrounding talk (e.g., Dressel 2020). Kurhila (2006: 103–104), for instance, has documented how interrogatives in conjunction with WSs are often spoken with a quieter or lower voice compared to the surrounding talk. Along with solitary searches, during which speakers display their ongoing WS (e.g., with a “thinking face”; Goodwin & Goodwin 1986) but do not invite their interlocutor to participate, WSs can also be collaborative (“joint search” in Dressel 2020), i.e., involve the interlocutor (see, e.g., Brouwer 2003; Hayashi 2003; Kurhila 2006; Svennevig 2018; Rydell 2019; Tüma & Sherman 2022). Participants can invite their interlocutors to collaborate in the WS with interrogative utterances, such as *what is it*, combined with gaze directed to the interlocutor (e.g., Kurhila 2006). A WS can also start as a solitary search and, especially if not successful, can continue as a collaborative WS engaging the interlocutor (e.g., Kurhila 2006). Collaborative WSs come close to collaborative completions (e.g., Lerner 1996), i.e., completions of another speaker’s turn, which can be used to solve problems in conjunction with WSs, especially in L2 interaction (e.g., Taguchi 2014).

The WS is completed and resolved when the word (or a paraphrase, e.g., Skogmyr Marian & Pekarek Doehler 2022) that is the object of the search is provided by the participant initiating the search or their interlocutor (e.g., Dressel 2020). The WSs can, therefore, be self-completed or other-completed and thus collaboratively solved (e.g., Rydell 2019: 62). In the case of collaborative WSs, if the interlocutor provides the solution, it can be prosodically try-marked with rising intonation (e.g., Lerner 1996). This try-marked solution can then be subsequently confirmed by the first speaker with a repetition (e.g., Peltonen 2017a). WSs can also be left unsolved and abandoned without a solution (“let it pass” strategy; see, e.g., Rydell 2019: 62).

Previous early studies on WSs in L1 interaction have been conducted especially among speakers of English (e.g., Goodwin & Goodwin 1986; Lerner 1996) as well as

other L1s, such as Japanese (e.g., Hayashi 2003; see also Greer 2013 on Japanese/English bilingual interaction). More recently, the scope of WS research has extended to other L1s and methodologically often involves the use of multimodal conversation analysis (CA). For instance, Dressel (2020) examined WSs during joint storytelling in L1 French conversations and distinguished solitary and collaborative (joint) searches. For both types, multimodal resources, gaze in particular, were important in inviting (joint) or not inviting (solitary) participation (Dressel 2020). In the present study, while the focus is on verbal resources, the videos of the interactions were also consulted in the WS analysis.

Along with studies on WSs in L1 interaction, WSs have been of interest to L2 researchers. In particular, WSs have been examined among native and non-native-speaker interactions in L2 classrooms (Brouwer 2003; Koshik & Seo 2012; Duran et al. 2022) and outside classrooms, for instance, in workplaces (Svennevig 2018) or other institutional contexts (Kurhila 2006). Recently, the scope of WS studies has expanded to cover L2 interaction in various settings and among different L2s, including L2 English/English as lingua franca conversation (Binti Abdullah 2017; Siegel 2016), L2 French conversation (Skogmyr Marian & Pekarek Doehler 2022), paired L2 Swedish speaking tests (Rydell 2019), and speaking tasks in L2 English classrooms (Tüma & Sherman 2022). Some studies have even incorporated both L1 and L2 interaction (see, e.g., Chiarenza 2010 on L1 and L2 Italian), allowing for comparisons across L1 and L2 WS patterns, but these are relatively rare. Overall, previous studies have shown that WSs are performed in a similar manner in the L1 and the L2 (Kurhila 2006), but WSs can occur more often and be more elaborate in the L2 (Gullberg 2011). Previous studies have also highlighted the role of WSs as providing learning opportunities for L2 speakers (e.g., Brouwer 2003; Svennevig 2018). The present study, incorporating L1 and L2 dialogues from the same speakers, thus offers a novel perspective to examining WSs across the participants' L1 and L2 dialogues, providing insights into potential individual communicative styles across languages (see also Gullberg 2011).

## 4 Data and method

The present study uses data collected for a larger project *DF2*, as mentioned in the Introduction. Of this larger data set, the dialogic problem-solving tasks were included in this study. The participants (N=50, 25 pairs) in the project were university students of English in Finland (84% major students) who completed comparable problem-solving tasks in their L1 (Finnish) and L2 (English). The mean age of the participants was 21.9 years, and 58% of them were female (34% male, 2% other, 6% did not want to report their gender). The participants had studied English for approximately 10 years at school before their university studies and represented the CEFR level C1/C2 on average

based on their LexTale scores (mean 86.4%, scores over 80% representing the C1/C2 level; Lemhöfer & Broersma 2012). The participants can, therefore, be characterized as advanced speakers of English.

During data collection, the participants completed two problem-solving tasks, one in their L1 (n=25 interactions) and another in the L2 (n=25 interactions), with the order of the tasks and the languages counterbalanced. The task was completed with the same pair in both languages to control for potential interlocutor effects. Before each task, the participants were given two minutes of individual preparation time, followed by six minutes of time for task completion. Research assistants were present to give instructions, to audio- and video-record the tasks and to inform the participants when five minutes had passed but did not otherwise intervene. The two problem-solving tasks were designed to be maximally similar to enable comparisons across the two performances: in both tasks, the participants were given sixteen items to discuss (black-and-white images printed on A4 paper) and rank according to their usefulness for either survival on a desert island (see also Peltonen 2020) or reaching a mothership after a crash landing of a spaceship on the lighted side of the moon. The data set, thus, consists of elicited but freely produced speech: while the interactions were structured around the prompt materials and task instructions, the discussions themselves were freely produced by the participants. Since the pictures in the task prompt contained some items that were potentially more difficult for the participants to name than others, especially in the L2, the task design can be viewed suitable for eliciting WSs.

For the present study, all instances of solitary and collaborative WSs were identified from the data. The data were analyzed based on the audio files and accompanying transcriptions (for transcription conventions, see Appendix 1), but the video recordings of interactions were also consulted especially to distinguish solitary WSs from collaborative ones with the help of gaze direction (see Goodwin & Goodwin 1986). Overall, WSs were identified based on participants' displays that they were engaged in a WS (cf., making a WS "public", Rydell 2019: 63). These displays could involve various resources and often combinations of them, including SPs and FPs, sound lengthenings, repetitions, and wh-questions in conjunction with a vocabulary item (e.g., Rydell 2019; see also Section 3). As many of these features are considered as indicators of (dis)fluency, a clear orientation towards a specific vocabulary item (e.g., with the use of wh-questions or all-purpose words such as *thing* in English or *juttu* in Finnish) was required in addition to hesitations for the sequence to be counted as a WS (see also Rydell 2019).

Solitary WSs were started and answered (or left unanswered altogether) by the same participant, while collaborative WSs were interlocutor-oriented and, in many cases, ended with the interlocutor completing the search (see also Section 3). Collaborative WSs could include an implicit or explicit question for the interlocutor about a vocabulary item, often one of the objects included in the task (e.g.,



P[articipant]-62: *then I suppose the ah I don't remember the name but the like äh what is this called now* [pair 15, L2 English dialogue]), but could also involve the interlocutor's completion of a search without an explicit (verbal) request to participate from the speaker (P-29: *I'm also thinking uh we can maybe: put the tent and the um what-whatever it's called um* P-38: *sleeping bag?* [pair 5, L2 English dialogue]). The WSs receiving a collaborative solution and/or involving the interlocutor in other ways were, nevertheless, assigned only to the participant initiating the WS in the frequency calculations.

To answer the quantitative RQ1, descriptive statistics were calculated and subjected to statistical analyses. Both unstandardized (raw) and standardized frequencies of WSs are reported in Section 5. The frequencies were standardized per minute of an individual participant's speaking time (ST; excluding SPs) following a common practice in fluency research (De Jong 2016). To analyze potential differences between L1 Finnish and L2 English dialogues, non-parametric Wilcoxon signed ranks tests were calculated for the standardized measures. The non-parametric tests were preferred over paired samples t-tests due to non-normality in the data based on Shapiro-Wilk's tests of normality and a visual analysis of boxplots. False discovery rate was applied to the p-values to control for type I error, i.e., potential false positives (see Larson-Hall 2010: 251–252) resulting from multiple comparisons. To answer the quantitative part of the mixed-methods RQ2, Spearman's rank-order correlations were computed. The effect sizes were interpreted based on guidelines in Plonsky and Oswald (2014):  $r_s$  0.25 = small,  $r_s$  0.40 = medium, and  $r_s$  0.60 = large. Non-parametric correlations were chosen over Pearson correlations due to the abovementioned non-normality in the data. To complement this quantitative analysis, connections in WS use were also analyzed qualitatively based on those participants' productions that were chosen for a more detailed analysis (see RQ3).

Finally, to answer the mainly qualitative RQ3, selected participants' L1 and L2 dialogues were analyzed in detail with a focus on how WSs were connected with maintaining fluency from individual and interactional perspectives. The pairs with the highest raw frequencies of WSs in the L1 Finnish (pair 11, P-53 and P-55) and L2 English (pair 16, P-61 and P-63) dialogues were chosen as the focus participants for the qualitative analyses. The approach was based on "extreme case analysis" (Dörnyei 2007: 272) used in some mixed-methods designs in applied linguistic studies: by illustrating unusual cases, the most extreme forms of a particular phenomenon can be explored and extended to the average population as well, albeit perhaps in less extreme ways (Dörnyei 2007: 128; see also Peltonen 2020). A similar "critical case sampling" (Dörnyei 2007: 128) has previously been used in conjunction with L1 and L2 monologue fluency analysis regarding stalling mechanisms (Peltonen 2018), L2 monologue fluency analysis of anxious and non-anxious individuals (Szyszka & Lintunen 2023), and L2 interactional fluency analysis focusing on other-repetitions and collaborative completions (Peltonen 2017a). To contextualize the qualitative



analysis, three fluency measures were calculated for the two pairs: articulation rate (AR; syllables per minute of ST), the mean length of within-turn SPs, and the mean length of between-turn SPs. The first two measures give an impression of each participant's individual fluency from the perspectives of speed (AR) and pausing (mean length of within-turn SPs), and the final measure (mean length of between-turn SPs) characterizes their interactional fluency from the perspective of "shared" silences. In the qualitative analysis itself, along with paying particular attention to features traditionally associated with disfluency (e.g., SPs), the use of stalling mechanisms (e.g., FPs, sound lengthenings, and filler words) during WSs was also examined to characterize their role in maintaining fluency.

## 5 Findings

In total, 48 instances of WSs were identified from the L1 Finnish dialogues: of these WSs, 66.7% (32) were solitary WSs, while 16 were collaborative. In comparison, from the L2 English dialogues, a total of 39 WSs were identified. Of these WSs, 43.6% were solitary (17), while 22 were collaborative. Of the 25 pairs, three pairs did not produce WSs at all during their L1 Finnish or L2 English dialogues.

The descriptive statistics (means and SDs) for solitary and collaborative WSs (raw frequencies and frequencies standardized per minute of ST) are compiled in Table 1.

TABLE 1. Means (*M*) and standard deviations (*SD*) for WSs in the Finnish and English dialogues (N=50).

Measure	Finnish (L1)		English (L2)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Number of solitary WSs	0.64	0.92	0.34	0.52
Number of solitary WSs / minute of ST	0.28	0.42	0.14	0.23
Number of collaborative WSs	0.32	0.62	0.44	0.97
Number of collaborative WSs / minute of ST	0.14	0.27	0.19	0.43
Total number of WSs	0.96	1.28	0.78	1.22
Total number of WSs / minute of ST	0.42	0.60	0.33	0.54

As can be seen from Table 1, the tendencies for raw and standardized frequencies are similar: L1 Finnish dialogues, on average, contained more WSs than the L2 English

dialogues. Within the specific WS types, solitary WSs were more common than collaborative ones in the Finnish L1 dialogues, while the opposite tendency was observed for the English L2 dialogues. Based on Wilcoxon signed ranks tests for the standardized frequencies, only the difference between the number of solitary WSs per minute of ST in Finnish and English dialogues was statistically significant ( $Z = -2.451, p = 0.014$ ), while the differences for total WSs per minute of ST ( $Z = -1.131, p = 0.258$ ) and collaborative WSs per minute of ST ( $Z = -0.120, p = 0.904$ ) were nonsignificant.

To answer RQ2, correlations between the two types of WSs and the total (standardized) frequencies in the two languages were calculated. Based on the results ( $N=50$ ), none of the correlations reached statistical significance. Solitary WSs per minute of ST were weakly positively correlated across L1 and L2 dialogues ( $r_s = 0.271, p = 0.057$ ), while no association was found between the total number of WSs per minute of ST across the dialogues in different languages ( $r_s = 0.058, p = 0.690$ ). Interestingly, while the correlation between collaborative WSs in L1 and L2 was also weak and not statistically significant, it was negative: thus, participants producing many collaborative WSs in L2 English produced few of them in Finnish and vice versa ( $r_s = -0.241, p = 0.092$ ).

A closer look at individual participants' performances for the selected pairs (pairs 11 and 16) suggested that, for pair 11, P-53 used two solitary and one collaborative WS, while P-55 used two solitary and three collaborative WSs in their L1 Finnish dialogue. In contrast, in their L2 English dialogue, P-53 used two solitary and one collaborative WS (exactly the same profile as in the Finnish dialogue), while P-55 did not use any WSs in the English dialogue. For pair 16, the pattern was somewhat different, as they engaged in WSs relatively rarely in their Finnish dialogue: P-61 used only one solitary WS, while P-63 used one solitary and one collaborative WS. In contrast, P-61 engaged frequently especially in collaborative WS in the English dialogue: six collaborative WSs and one solitary WS were identified from their dialogue. However, P-63 did not produce any WSs during their English dialogue. These patterns provide additional support for the lack of statistically significant correlations across L1 and L2 dialogues: as the use of WSs was, overall, relatively rare in the data, it is perhaps not surprising that clear patterns were not detected in the quantitative analysis. Furthermore, even the comparison of the two pairs showed that the patterns regarding L1–L2 connections could be relatively different, not only across individual participants, but also across pairs. While certain participants can have a particular communicative style regarding WSs across the two languages (e.g., P-53), others exhibit differing patterns in the two languages: for instance, P-61 seemed to rely on their partner more during WSs in the English dialogue than in the Finnish one (see also RQ3 below).

To answer RQ3, the two pairs' WSs were analyzed in detail, with particular attention paid to the connections between WSs and fluency. Before discussing the

qualitative analyses, information about the selected pairs' samples and quantitative fluency profiles based on selected measures is provided in Table 2.

TABLE 2. Descriptive information about the selected pairs' samples (duration, syllables) and quantitative fluency measures.

	Pair 11				Pair 16			
	P-53		P-55		P-61		P-63	
Measure	Fin	Eng	Fin	Eng	Fin	Eng	Fin	Eng
Dialogue duration	366.25	392.70	366.25	392.70	221.79	328.78	221.79	328.78
Number of syllables (individual)	295	432	1093	879	638	531	363	345
Articulation rate	275.61	227.76	311.31	246.35	342.53	225.52	336.30	256.25
Mean length of within-turn SPs	0.95	0.67	0.71	0.61	0.76	0.72	0.66	0.57
Mean length of between-turn SPs	0.81	0.66	0.81	0.66	0.85	0.99	0.85	0.99
Note: Articulation rate = syllables per minute of ST (excluding all SPs). The dialogue durations and mean lengths of SPs are given in seconds.								

As can be seen from Table 2, the durations of the dialogues in the L1 and L2 were relatively similar for pair 11, while pair 16 produced a shorter dialogue in L1 Finnish than in L2 English. P-55 was the more dominant participant in pair 11's dialogues, producing 79% of the syllables in the L1 Finnish dialogue and 67% of the syllables in the L2 English dialogue. Pair 16's dialogue was more symmetrical, with P-61 only slightly dominating the interactions (producing 64% of the syllables in the L1 Finnish and 60% in the L2 English dialogues). Regarding individual fluency (articulation rate), all participants were somewhat more fluent, i.e., faster speakers, in their L1 Finnish dialogues. Interestingly, however, regarding the other individual fluency measure (mean length of within-turn SPs), there was an opposite tendency: the SPs within turns were, on average, somewhat longer for all participants in their L1 Finnish compared to L2 English dialogues. Finally, regarding the interactional fluency measure (mean length of between-turn SPs), a difference between the two pairs was observed. Pair

11's dialogue in L1 Finnish included somewhat longer "shared" silences, on average, compared to the L2 English dialogue, whereas for pair 16, the between-turn SPs were somewhat longer in the L2 English than in the L1 Finnish dialogue. In the following, we will discuss both pairs' WS use, starting with pair 11, followed by pair 16.

As stated before, pair 11 (P-53 and P-55) produced the most WSs in the Finnish dialogues (P-53 three instances, P-55 five instances). Both of them used two solitary WSs in Finnish. P-55's WSs related to the word *hätäsoihtu* ('flare' in English, see Example 1; full English translations of the Finnish examples, translated by the first author, can be found in Appendix 2).

(1a) Flare, part 1 (pair 11, P-55)

- 1 P-55: joo (.) ku mä mietin ku (.) täs on meijä tää niinku varotus tää (0.25)
- 2 P-55: \* GAZE DIRECTED TO PAPER ON THE DESK THROUGHOUT THE SEQUENCE
- 3 P-55: tai tää niinku hälytys (0.28) valo (0.67) syty[tys] juttu (0.50)
- 4 P-53: [nii]
- 5 P-55: nii mä mietin et (.) oisko kuitenkin et kiikarit?

(1b) Flare, part 2 (pair 11, P-55)

- 1 P-55: et (.) ehkä sitten kiikarit ja sit se (0.76) varoitus:: (0.80)
- 2 P-55: \* GAZE DIRECTED TO PAPER THROUGHOUT THE SEQUENCE
- 3 P-55: sytyke (0.38)
- 4 P-55: °en tiedä (.) [mikä se on°]
- 5 P-53: [entä sit ] toi lamppu tai mikä toi (0.55)

In Example 1a, P-55 engages in a WS searching for the word *hätäsoihtu* ('flare'). The participant produced approximations related to the target word (*varotus* and *hälytys*; English 'warning' and 'alarm' combined with the word *valo*; 'light'), followed by a further combination of an approximation (*sytytys*) and an all-purpose word (*juttu*, roughly translating to 'detonation thing'). These approximations indicate the participant's engagement in a WS, coupled with the two filler words *niinku* ('like') and SPs, with gaze directed at the paper throughout the sequence suggesting a solitary search. P-53 does not engage in the WS, providing only a minimal acknowledgment token *nii* ('yes') in line 4. While P-55's search is relatively lengthy, it only minimally interrupts the speaker's individual fluency: the sequence does not contain very long SPs and includes filler words to keep the flow of talk going. Furthermore, the multiple alternative attempts to convey the meaning of *flare* help in maintaining the flow of the interaction. Later in the dialogue (Example 1b), P-55 refers to the flares again by using a new approximation (*varoitussytyke*; 'warning kindling'), accompanied with a sound lengthening at the end of the word *varoitus*, a typical indicator for initiating a WS (e.g., Dressel 2020). This time, P-55 also explicitly marks their lack of vocabulary knowledge related to this particular item, spoken more softly than the surrounding talk (*en tiedä*

*mikä se on*; 'I don't know what it is' in line 4; see also Kurhila 2006). Again, P-55's gaze is directed at the paper indicating a solitary search, and P-53 does not engage in this WS but continues the discussion by shifting the focus to another item, using a solitary WS themselves (*lamppu tai mikä toi*; 'lamp or what that' in line 5). Despite the lack of P-53's engagement in P-55's WS, the dialogue is minimally interrupted. From the perspective of P-55's individual fluency, despite the WSs, their articulation rate still, overall, remained relatively high (311 syllables per minute) and the SPs were not exceptionally lengthy on average (0.71 seconds within turns).

Regarding the collaborative WSs used by the pair in their Finnish dialogue (one instance for P-53, three instances for P-55), two of them related to the same item (*onki*; 'fishing rod' in English; see Example 2).

(2a) Fishing rod, part 1 (pair 11, P-55)

- 1 P-55: ni mä mietin et tuisko sit sen (1.09)
- 2 P-55: \* GAZE DIRECTED TO PAPER
- 3 P-55: tää (0.57) °kalastus::° (0.43)
- 4 P-55: \* SHIFTS GAZE TOWARDS P-53
- 5 P-55: °mikä tää onkaa°
- 6 P-55: \* GAZE BACK TO PAPER
- 7 (0.36)
- 8 P-53: on-
- 9 (0.26)
- 10 P-55: [nii onki nii]
- 11 P-53: [onki onki ]
- 12 P-55: tulisko onki ennen kattilaa (1.30)

(2b) Fishing rod, part 2 (pair 11, P-55)

- 1 P-55: amm (0.37) >mikä tää on< (0.39)
- 2 P-55: \* GAZE DIRECTED TO PAPER THROUGHOUT SEQUENCE
- 3 P-53: on[ki]
- 4 P-55: [on]ki (0.64) kattila

In Example 2a, P-55 starts their WS by shifting their gaze from the paper towards P-53, engaging their interlocutor in the search (lines 3–4). Preceded by *tää* ('this') and a SP, P-55 produces a softly spoken *kalastus* ('fishing'), with a sound lengthening at the end of the word, using these markers to distinguish the WS from the surrounding talk. Following a SP, the sequence also contains an interrogative *mikä tää onkaa* ('whatever this is'; line 5), with gaze shifting back towards the desk. This WS thus contains similar elements as Example 1: quieter speech, sound lengthening, approximations, SPs, and an interrogative expressing the participant's lack of knowledge regarding the target word. However, in contrast to Example 1, the gaze direction is different, engaging P-53 in the WS: they provide the first syllable of the target word *onki* ('fishing rod') in line

8, which is followed (after a SP) by P-55 confirming and providing the target word in line 10 (*nii onki nii*; 'yes fishing rod yes'). This is produced in overlap with P-53, who also produces and repeats the target word (*onki onki*, line 11), providing a collaborative resolution to the WS. With P-53 orienting to P-55's WSs and helping them finding the target word, the participants are able to move the discussion forward collaboratively after some minor halts in P-55's individual fluency.

Later on in the discussion they return to the same item while listing the items in the order of importance (Example 2b). P-55 engages in a brief WS in line 1, marked by an interrogative (*mikä tää on*; 'what is this') preceded by a FP (*amm*) and a SP. P-55's gaze is directed at the paper, not inviting the interlocutor to participate. Yet P-53 collaborates and provides the word *onki* (line 3), preceded only by a very brief SP of 0.39 seconds and the last syllable being produced in partial overlap with P-55's production of the target word in line 4. Compared to Example 2a, this sequence is solved more quickly and without a request for P-53 to collaborate; yet both participants provide the solution to the WS together almost simultaneously and are thus able to move the discussion forward quickly, maintaining interactional fluency and avoiding lengthy silences.

The final example from pair 11, now from their L2 English dialogue, involves a collaborative WS initiated by P-53 (Example 3).

(3a) Intercom, part 1 (pair 11, P-53)

- 1 P-53: so {\*pt\*\_0.54} is this an intercom? (0.77)
- 2 P-55: yeah or like a: (.) [radio]phone or
- 3 P-53: [inter-]
- 4 P-53: yeah [that's]
- 5 P-55: [it- ]
- 6 P-55: I think yeah that
- 7 (1.14)
- 8 P-53: I don't know the exact term but (0.83)
- 9 P-53: so they can: (0.77) I don't know who they can communicate

(3b) Intercom, part 2 (pair 11, P-53)

- 1 P-55: do you think flashlight or rope after (.) or maybe the: (.) intercom (0.69) °there°
- 2 P-53: um (.) they do need to communicate with each other

In contrast to the more indirect invitations to participate in the WS by P-55 in Example 2, in Example 3a, P-53 initiates their WS by asking directly from their interlocutor whether an item in the task is an intercom (line 1), preceded by WS markers *so* and a SP including a lip smack.<sup>2</sup> P-55 initially confirms this in line 2 (*yeah*) but continues

2 P-53's gaze direction is difficult to estimate reliably here due to their hair being in front of their eyes.

by providing a more appropriate word (*like a radiophone*), albeit with some hedging (the word *like* and sound lengthening in the indefinite article *a*). After some overlapping talk in line 6, P-55 returns to the word they previously suggested, confirming that it is likely to be the correct word (*I think yeah that*). Followed by a SP, P-53 takes the turn and, despite indicating not knowing the target word (line 8), shifts the focus from terminological negotiation towards task completion (*I don't know who they can communicate*, line 9) without adopting P-55's more target-like *radiophone*.

Interestingly, later in the discussion, the opposite happens: in Example 3b, P-55 adopts P-53's candidate word *intercom* (line 1), followed by P-53 reiterating their earlier point about the need of being able to communicate with one another (line 2). Thus, rather than using the more target-like *radiophone*, the participants both refer to the item as *intercom*. While the word *radiophone* would have depicted the item more accurately, the participants opted for a less target-like item for the purposes of maintaining interactional fluency and focusing on the completion of the task without further negotiation related to this particular vocabulary item.<sup>3</sup>

The other pair chosen for the qualitative analysis, pair 16, produced few WSs in their Finnish dialogue (P-61 one solitary WS; P-63 one solitary and one collaborative WS). Note, however, that for the two pairs, the quantitative interactional fluency (based on the mean length of between-turn SPs) was very similar in their L1 Finnish dialogues, indicating that the frequency of WSs is not reflected in (the lack of) interactional fluency in a straightforward way. Example 4 illustrates P-61's solitary WS.

#### (4) Star chart (pair 16, P-61)

- 1 P-61: sit mä mietin et jos on joku tämmöne (.) tähti (.) kartta-asia?
- 2 P-61: \* GAZE DIRECTED TO PAPER
- 3 P-61: ni sithän jos me tietään et misä kaikki tähtikuviot on
- 4 P-61: ni sit me voidaa suunnistaa siel \$paremmi\$ \*hihi\*
- 5 P-61: \* GAZE SHIFTED TOWARDS INTERLOCUTOR

In Example 4, P-61 is searching for the word *tähtikartta* ('star chart') in Finnish. While the example does not include as many hesitations as Example 1, only some micro-pauses, it contains markers of vagueness (*joku tämmöne*; 'something like this' in English), suggesting the participant's engagement in a solitary WS, coupled with their gaze towards the desk. The compound word *tähtikartta* itself is interrupted with a

3 Pair 18 arrived at a somewhat similar solution when discussing a magnifying glass. Neither participant used the target-like expression; instead, P-67 explicitly offered an alternative item *widening glass* (P-67: *for the purpose of this let's call it the widening glass*) and the interlocutor P-65 adopted this item. Both participants also used the expression later on in the interaction to refer to the magnifying glass. While a non-target-like expression, using this coined term helped with task accomplishment and maintaining interactional fluency, much like *intercom* in Example 3 (for a similar example involving word coinage, see Rydell 2019).



micropause and ends with an all-purpose word *asia* ('thing') attached to the end of the compound, forming a unit that contains the target word with an added element of hedging. This, coupled with the rising intonation, marks the word as potentially non-target-like, but as something close to it. P-63 does not participate in this search; instead, P-61 continues by providing a justification for why this item could be useful (lines 3–4), following the task instructions and moving the discussion forward despite the potential insecurity related to the specific vocabulary item. Furthermore, P-61's individual fluency does not seem to be disrupted during this sequence, as it does not contain any SPs.

The final example (Example 5) illustrates one of the six collaborative WSs produced by P-61 during the English dialogue.

(5) Rockets (pair 16, P-61)

- 1 P-61: um (0.37) but what if this- (0.39) these are (1.45) are those (0.69)
- 2 P-61: \* GAZE DIRECTED TO THE PAPER
- 3 P-61: \* POINTS AT PAPER
- 4 P-61: [rockets or the-? ]
- 5 P-61: \* GAZE SHIFTED TOWARDS THE INTERLOCUTOR
- 6 P-61: \* WAVING GESTURE WITH RIGHT HAND
- 7 P-63: I [don't know the exact] name but like (1.37)
- 8 P-63: to let others know you're here
- 9 (0.52)
- 10 P-61: yeah okay tha[t would be] (0.33) kind of cool [\*hahaha\*] so
- 11 P-63: [sticks ] [\$yeah\$ ]

In line 1, P-61 initiates the WS with a combination of a FP and SP, followed by a hesitantly delivered *wh*-question. At this point, P-61's gaze is directed to the paper (line 2). They also point at the item on the paper (line 3) to specify the referent *this* (later repaired to *these*). While producing an approximation *rockets* in line 4 (followed by an embodied completion involving a representational gesture consisting of waving of the imaginary flares in their hand, line 6), P-61 shifts their gaze towards the interlocutor, inviting them to collaborate in the search. P-63's response in line 7, stating that they do not know the target-like word, partially overlaps with P-63's previous turn, minimizing the gap between turns and enhancing interactional fluency. This is followed by a circumlocution describing the function of the object in line 8 (*to let others know you're here*). In line 10, P-61 responds after a brief between-turn SP of 0.52 seconds by stating that it would be *kind of cool*, followed by laughter. Involving P-63 in the WS ensures that there is minimal disruption to interactional fluency.

Using *wh*-questions to engage the interlocutor was a typical strategy for P-61 in the L2: in their other collaborative WSs as well, direct *wh*-questions were common (e.g., *what are these things*, *what is this called*), occasionally spoken softly, marking the activity as distinct from the surrounding talk. Compared to the examples from pair

11, P-61 thus tended to use a somewhat different strategy, more directly engaging the interlocutor in WSs. This is interesting considering that P-61 was, nevertheless, the participant producing somewhat more talk during their L1 and L2 interactions. While engaging P-63 in the WSs can be viewed as a good approach for maintaining interactional flow, from an individual fluency perspective, P-61 did not utilize many individual communication strategies to attempt to solve the WSs to maintain their individual fluency, as reflected, in particular, in their within-turn SPs in Example 5. While the local disfluencies did not seem to have a major impact on the overall mean length of within-turn SPs for this participant, the slower speech production during WSs could have been reflected in P-61's articulation rate, which was considerably slower in their L2 English dialogue (226 syllables per minute) than in the L1 Finnish dialogue (343 syllables per minute). As the interlocutor P-63 represented C1/C2 level and P-61 represented level B2 in the CEFR, P-61 potentially relied on the more proficient participant's vocabulary knowledge in their L2 English dialogue. This strategy could be useful from a language learning perspective, with the more advanced participant providing input above the interlocutor's level (scaffolding; Wood et al. 1976; see also Brouwer 2003; Peltonen 2017a).

## 6 Discussion and conclusion

The present study set out to examine WSs in L1 Finnish and L2 English dialogues from the same speakers using a mixed-methods approach, aiming to bridge the gap between research on WSs and fluency research. While efficient problem-solving during WSs has the potential to contribute to individual and interactional fluency (e.g., Peltonen 2020), WSs had rarely been in the focus of fluency research before the present study. Examining L1 and L2 dialogue data from the same speakers was an additional novel aspect of the present study. The findings showed differences especially in the use of solitary WSs across L1 and L2 samples (RQ1), WSs being used more often in the L2 English dialogues despite the participants' high proficiency level. Regarding RQ2, correlations between WS use in L1 Finnish and L2 English did not reach statistical significance, but based on qualitative observations, some participants demonstrated potential cross-linguistic communication styles regarding WSs (see also Gullberg 2011). However, since the qualitative analysis was based on only four participants, further research is needed to confirm this tendency discovered in the present study. Finally, based on detailed analyses of the four participants' WSs across L1 and L2 samples (RQ3), with focus on examining these sequences from the perspective of fluency-related features and linking them to the participants' quantitative fluency measures, especially collaborative WSs were found to be linked with a potential to enhance fluency from an interactional perspective (cf. Peltonen 2017a on collaborative completions).

Furthermore, while WSs contained some disfluencies, such as SPs, these were not reflected in particularly low individual fluency measures for the participants. Some differences in the participants' orientations to problem-solving were also observed: while some participants preferred solitary WSs, others relied more on their interlocutors to overcome lexis-related problems. Furthermore, the profiles were not always linked across L1 and L2 dialogues, suggesting that some participants' strategies were, at least to some extent, language-specific.

Overall, while some quantitative tendencies could be detected based on the frequencies of WSs in the L1 and L2 dialogues, the qualitative analyses suggested that individual participants and pairs display complex and somewhat different patterns regarding L1 and L2 WSs and fluency. While the present study can be viewed as exploratory in nature, being among the first to approach WSs from the perspective of fluency in an interactional setting, the study provides the basis for further research in this area. Despite WSs being marked with indicators that have traditionally been approached as disfluencies in fluency research, the present study, along with previous CA-oriented WS studies (e.g., Dressel 2020; Skogmyr Marian & Pekarek Doehler 2022), has highlighted the importance of these disfluencies in marking the WS as a separate activity from the surrounding talk and providing important interactional cues for the interlocutor. This poses implications for speech fluency research using interactional data: while on the surface level, certain features may suggest disfluency, they may also provide the speaker more time to complete their search (cf., Dörnyei & Kormos 1998 on stalling mechanisms providing planning time during problem-solving) and, as mentioned above, signal their engagement in WSs to the interlocutor. Furthermore, from a more collaborative perspective, the disfluencies may provide cues for the interlocutor to participate in the search, and as a result of the participation, contribute to maintaining the flow of the discussion, i.e., interactional fluency.

While the data set used in the present study, involving task-based dialogues, differed somewhat from previous studies on WSs in institutional (e.g., classrooms) or informal (e.g., conversation) settings, the patterns found regarding the structure of WSs were, in many respects, similar to those found in previous L1 (e.g., Dressel 2020) and L2 studies (e.g., Rydell 2019). Thus, the present study has added to the body of CA-oriented research on WSs by confirming many observations demonstrated previously in other settings and/or with other languages. Most importantly, the data set used in the present study enabled the analysis of L1 and L2 patterns from the same speakers, which has been rare in previous research. Furthermore, while WSs in L1 and L2 English interaction have been extensively studied, the present study provided insights into WS use from the perspective of a less widely studied language, Finnish (but see Kurhila 2006).

While the present study has some limitations, especially related to the preliminary nature of the qualitative findings due to the small sample size, it has provided

the starting point for examining the links between fluency and WSs with a mixed-methods approach. Importantly, WSs were employed both in the L1 Finnish and L2 English dialogues, with a statistically significant difference only being found in the use of solitary WSs. Furthermore, based on the qualitative analysis, structurally, the L1 and L2 WSs did not differ considerably from each other (see also, e.g., Kurhila 2006). This suggests that WSs are employed both in the L1 and L2 to solve especially lexis-related problems, the frequency of collaborative WSs not differing statistically significantly across L1 and L2 dialogues. Thus, from a fluency perspective, disfluencies in conjunction with WSs should not be straightforwardly categorized as impacting the individual or interactional fluency negatively; in contrast, the efficient problem-solving during these sequences may, in fact, help to maintain the overall flow of the interaction despite local disfluencies (see also Peltonen 2017b).

The findings of the present study also have implications for L2 teaching (see also Lintunen et al. 2020; Peltonen 2023). In L2 classrooms, students' attention could be drawn to the fact that WSs are common in both L1 and L2 interaction. Efficient ways of solving WS could also be practiced with various activities, such as the Alias game, in which you explain a concept without mentioning the word. In addition, different kinds of problem-solving tasks, such as the ones used for data elicitation in the present study, could be used in classrooms to practice collaborative problem-solving: since the task instructions specify a common goal and encourage collaboration and negotiation among the participants, they are likely to be useful for pedagogical purposes as well, especially combined with awareness-raising about problem-solving strategies and WSs (see also Peltonen 2020). Importantly, students should be encouraged to use their whole multimodal repertoire in these activities: by realizing that they have plenty of resources at their disposal when encountering communicative problems, the students can be supported to become efficient communicators also outside the classroom.

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## Appendix 1. Transcription conventions

:	Extended or stretched sound, syllable, or word
(.)	Micropause (duration less than 0.25 seconds)
(0.65)	Timed pause (duration at least 0.25 seconds)
*pt*	Lip smack. Included in SP time measured and marked with curly brackets {*pt*_0.54}
um, uh	Non-lexicalized FP
*heh*	Laugh syllable
\$ \$	Laughing/chuckling talk between markers
° °	Passage of talk noticeably softer than surrounding talk
> <	Portions of talk delivered at a pace noticeably quicker than surrounding talk
?	Rising vocal pitch
-	Halting, abrupt cut off of a sound or word
=	Latching of contiguous utterances, with no interval or overlap
[ ]	Overlapping speech
* CAPS	Multimodal conduct (gestures, gaze)

## Appendix 2. English translations of Examples 1–2

The translations are provided in italics below each line.

### (1a) Flare, part 1 (pair 11, P-55)

- 1 P-55: joo (.) ku mä mietin ku (.) täs on meijä tää niinku varotus tää (0.25)  
*yeah (.) since I was thinking since (.) here is our this like warning this (0.25)*
- 2 P-55: \* GAZE DIRECTED TO PAPER ON THE DESK THROUGHOUT THE SEQUENCE
- 3 P-55: tai tää niinku hälytys (0.28) valo (0.67) syty[tys] juttu (0.50)  
*or this like alarm (0.28) light (0.67) detona[tion] thing (0.50)*
- 4 P-53: [nii ]  
[yes]
- 5 P-55: nii mä mietin et (.) oisko kuitenkin et kiikarit?  
*so I was thinking that (.) should we rather take binoculars?*

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A MIXED-METHODS STUDY OF L1 FINNISH AND L2 ENGLISH INTERACTION

(1b) Flare, part 2 (pair 11, P-55)

- 1 P-55: et (.) ehkä sitten kiikarit ja sit se (0.76) varoitus:: (0.80)  
*so (.) maybe then binoculars and then the (0.76) warning:: (0.80)*
- 2 P-55: \* GAZE DIRECTED TO PAPER THROUGHOUT THE SEQUENCE
- 3 P-55: sytyke (0.38)  
*kindling (0.38)*
- 4 P-55: °en tiedä (.) [mikä se on°]  
*°I don't know (.) [what it is° ]*
- 5 P-53: [entä sit ] toi lamppu tai mikä toi (0.55)  
*[what about then] that lamp or what that (0.55)*

(2a) Fishing rod, part 1 (pair 11, P-55)

- 1 P-55: ni mä mietin et tuisko sit sen (1.09)  
*so I was thinking that would it come after that (1.09)*
- 2 P-55: \* GAZE DIRECTED TO PAPER
- 3 P-55: tää (0.57) °kalastus::° (0.43)  
*this (0.57) °fishing::° (0.43)*
- 4 P-55: \* SHIFTS GAZE TOWARDS P-53
- 5 P-55: °mikä tää onkaa°  
*°whatever this is°*
- 6 P-55: \* GAZE BACK TO PAPER
- 7 (0.36)
- 8 P-53: on-  
*ro-*
- 9 (0.26)
- 10 P-55: [nii onki nii]  
*[yes rod yes]*
- 11 P-53: [onki onki ]  
*[rod rod]*
- 12 P-55: tulisko onki ennen kattilaa (1.30)  
*would the rod come before the pot (1.30)*