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RESEARCH TIMELINE

Eye-tracking research in instructed second language acquisition

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1. Introduction

Eye movement registration, or eye tracking, is the recording of an individual's eye movements during a task. Because eye movement registration happens online (in real time), it can reveal the nuances of learner attention and cognitive processing during task performance. The online nature of the eye gaze data collected has proven to be a valuable asset in the field of instructed second language acquisition (ISLA), and represents a recent development within eye tracking in the broader field of second language acquisition (SLA). It was not until around 2010 that ISLA researchers recognized the opportunities that eye-tracking technology affords. In this timeline, we present a brief history of eye tracking in SLA, with the goal of situating the development of eye tracking in ISLA within its wider historical context. We review three major time periods, which we refer to as follows: (1) early eye-tracking research with bilinguals (1997 – present); (2) eye tracking as a tool to study language learning processes (2010 – present); and (3) the shift to ecologically valid, remote, and wearable eye tracking (2018 – present). Whereas the first time period lays the historical foundations for this work, the second time period marks the emergence of eye tracking as a tool to study ISLA, and along with the third, is the focus of this timeline. Recently, in the third time period, the accessibility and options available for eye-gaze tracking have expanded significantly, driving further innovation in ISLA research. We highlight major and emerging lines of research in eye tracking in ISLA and review various applications of the technology in terms of research design, settings, and focus. We conclude the narrative portion of this research timeline with our coding scheme of ISLA eye-tracking studies.

2. Early eye-tracking research with bilinguals (1997 – present)

In the late 1990s and early 2000s, eye-tracking research on bilingualism was still a niche area compared to the extensive research with so-called monolinguals already being conducted in cognitive psychology and psycholinguistics (for landmark reviews, see Rayner, 1998, 2009; Tanenhaus & Trueswell, 2006). Two major paradigms were influential at the time and remain so to this date, namely, eye tracking with reading and the visual world eye-tracking paradigm.[1] Some of the pioneering eye-tracking research in these two paradigms that we would now consider to mark the beginning of eye tracking in SLA and bilingualism originated in the realms of psychology (Marian & Spivey, 2003a, 2003b; Spivey & Marian, 1999) and linguistics (Frenck-Mestre & Pynte, 1997), highlighting its interdisciplinary beginnings.

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Researchers at the time used eye-movement registration to examine questions about linguistic representation or knowledge, often as it relates to morphology and syntax (e.g., Keating, 2009), and sometimes, the lexicon (Marian & Spivey, 2003a, 2003b; Spivey & Marian, 1999). Another focus was crosslinguistic influence and L2-specific factors in parsing, which is the mental process of building and revising syntactic structures to enable language comprehension (Dussias & Sagarra, 2007; Frenck-Mestre & Pynte, 1997; Roberts et al., 2008). Although eye movements by definition are recorded while participants are performing a task, that is, in real time during processing, the theoretical focus was on the cognitive architecture supporting language acquisition that the eye movements were believed to reflect; that is, eye tracking was primarily a knowledge measure. The materials (sentences) that participants read or listened to were not intended to teach them new information about the language. They were not meant as an instructional intervention (and hence, we will not consider them further in our ISLA timeline), but rather, they were specifically designed to examine linguistic representations (existing knowledge) and parsing procedures that were already established in the bilingual mind as a result of exposure or prior instruction. This idea is sometimes referred to as the "processing outcomes of acquisition" (e.g., Godfroid, 2019; VanPatten & Rothman, 2015). It would be another decade before eye-tracking researchers in SLA, (psycho)linguistics, and applied linguistics discovered that eye tracking could also be used to study how processing can lead to acquisition and started exploring this powerful idea – termed "acquisition-as-processing" (e.g., Godfroid, 2019; VanPatten & Rothman, 2015) – in ISLA research.

3. Eye tracking as a tool to study acquisition-as-processing (2010 – present)

The second wave of eye-tracking research in SLA began around 2010, when eye-movement registration was newly introduced as a processing measure[2] (Godfroid et al., 2013*; Smith, 2013*). This innovative use of eye tracking empowered researchers to capture learning processes in real time and measure the effects of an instructional intervention designed to promote language learning (see Lai et al., 2013, for a similar review in education on learning-related eye-tracking research). As such, the second wave of eye tracking marked the beginning of eye tracking in ISLA (also see Godfroid, 2019, for a review).

Two foundational assumptions informed eye-tracking research in ISLA, namely the eye-mind link (Just & Carpenter, 1980; Reichle et al., 2006) and Schmidt's noticing hypothesis (e.g., Schmidt, 1990). The eye-mind link in applied eye-tracking research is the notion that the eye gaze, as a marker of overt attention, is linked with ongoing cognitive processing; in other words, overt and covert attention are connected, even if the strength of the connection can vary. Attention, of course, is a central component of Schmidt's noticing hypothesis, which highlights a crucial role for focal attention and a low level of awareness, called noticing, in second language learning. Combined, these two assumptions make eye-movement registration an exquisite tool to examine attentional allocation in language learning.

One line of related language-learning research has examined the role of attention in vocabulary learning, using both unimodal (reading-only) and multimodal (reading-while-listening, captioned/subtitled videos) input. Results generally support the beneficial role of attention, especially for the acquisition of meaning, and especially in reading-only contexts. The more attention a reader pays to an unfamiliar word during reading (i.e., the longer they look at it, as measured with an eye-tracking camera), the more likely they are to recognize or recall that word on a surprise test after the reading (e.g., Elgort et al., 2018*; Godfroid et al., 2013*, 2018*; Pellicer-Sánchez, 2016*). In multimodal studies with captioned/subtitled videos, the attention-learning relationship appears to be more complicated (e.g., Montero Perez et al., 2015*), potentially due to the need for learners to integrate both auditory and visual information in real time. Understanding how L1 and L2 users are able to accomplish this complex task successfully is another focus of contemporary eye-movement research (e.g., for reading-while-listening: Conklin et al., 2020*; for captioned/subtitled videos: Liao et al., 2022*).

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The basic question of an attention-learning relationship is now being examined across a range of learning conditions, from implicit (unsupported, meaning-focused, input-only) input conditions to highly explicit (directed, form-focused) interventions (e.g., Indrarathne & Kormos, 2017*). Researchers have designed different forms of modified input with the goal of increasing the salience of the target structures in the input. They do this because salience may impact attention, and attention may increase the likelihood that language learners will notice and potentially learn the new target structures. Examples of input modifications are aural and visual enhancement, glossing, and different manipulations of task instructions designed to direct learners' attention towards the form and/or meaning of the target structures (as described in the classic work by Doughty & Williams, 1998, and Sharwood Smith, 1993). Across all of these, the novel addition of eye-movement registration, again, can tell how effective these interventions are in directing a learner's attention to specific structures in the input. Eye tracking, therefore, provides the missing link between instructional design and student reception.

4. The shift to ecologically valid, remote, and wearable eye tracking (2018 – present)

In the past five to ten years, eye tracking has emerged as a readily accessible technology for researchers investigating second language learning in different settings, including those that do not require a computer in a lab. The current utilization of eye tracking therefore covers a full spectrum of possibilities, spanning a continuum between experimental control and ecological validity. On the one end of this continuum, we continue to see studies conducted in controlled laboratory settings that allow researchers to systematically manipulate variables, isolate specific factor(s), and strengthen causal inferences through experimental designs. In many of these cases, researchers employ highly accurate and precise, high-speed eye trackers, thus optimizing data quality, at least in principle (see Godfroid et al., 2025). In contrast, the adoption of eye tracking in more naturalistic settings permits the investigation of learners engaging in authentic language learning tasks and activities. A parallel trend, driven in part by the COVID-19 global health crisis, is the shift from lab-based to remote data collection, which provides access to larger and more diverse participant pools. By leveraging webcam-based eye-tracking functionality on platforms like Gorilla, researchers are no longer confined to physical labs. These technological advances – including virtual data collection platforms and a full range of eye-tracking devices with varying technical capabilities – have eliminated the need for participants to remain tethered to a computer setup with a chinrest in an eye-tracking lab. As a result, researchers are free to explore eye-tracking applications in diverse real-world situations, thereby enhancing the external validity of the study.

These applications of eye tracking outside the lab include but are not limited to classrooms (Morell, 2018*), interactional contexts (McDonough et al., 2015*), computer-assisted language learning environments (Fievez et al., 2023; Michel & O'Rourke, 2019*; Michel & Smith, 2018), and online instruction (Satar & Wigham, 2017*). In some studies, eye movements remain a primary source of data; in other studies, researchers engage in intense triangulation of different research methodologies, whereby eye-gaze tracking provides an additional source of information amidst many others. In the latter case, the various data sources provide researchers with a more complete picture of the sociocognitive and affective processes that take place in L2 instructional settings (e.g., Lindberg et al., 2021*; Morell, 2018*). Given the growing interest in using eye tracking for classroom-based research on second language learning and instruction, wearable eye trackers seem to hold special promise because of their portability. To our knowledge, such research has not been attempted yet in ISLA. However, in education, researchers are actively using wearable eye trackers in classrooms, investigating areas such as the professional vision of the teacher (e.g., selective attention to a classroom situation, leading to classroom management decisions), sometimes with a focus on teacher training (Witt et al., 2024). A specific research question in this line of work is the role of teaching expertise in understanding a classroom situation (Miller et al., 2024).

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Another potential application of wearable devices lies in the ability to integrate augmented and virtual realities. This advance has considerable commercial potential, prompting tech giants like Google and Apple to acquire companies specializing in eye-tracking technology. New headsets have interactive eye-tracking applications built into them, which allow the viewer, for example, to make selections in a user interface simply by looking at the relevant objects.

As commercial applications of eye tracking become ubiquitous, we are also beginning to witness the integration of these ideas into the realm of L2 research. For instance, Révész and colleagues (2023*) used a first potential application of interactive eye tracking in vocabulary studies that demonstrated the usefulness of interactive, gaze-contingent support in instructed language learning. In their study, lexical glosses that readers would otherwise overlook (as revealed in skips of the glosses in the eye-movement records) were made visually more salient through yellow highlighting, whereas glosses that readers looked at (as revealed by fixations on the glosses in the eye-movement records) remained unenhanced. The interactive addition of enhancement – that is, only in cases where learners needed it – highlights how eye-movement registration could be integrated as a part of an instructional treatment or language assessment to tailor the input to an individual learner's behavior. Considering the rapid, continuous pace of technological advancements, we foresee that an increasing number of pioneering studies will begin to incorporate eye tracking in these innovative, interactive applications (e.g., Smith & González-Lloret, 2021).

While these developments are exciting, researchers are reminded of the importance of the balance between ecological validity and methodological rigor. For example, by opting for commonly available technology like video cameras or webcams for recording eye movements, researchers often compromise the accuracy and precision of their recordings. This means that certain topics and questions (e.g., those requiring small interest areas, like words or units below the word level in reading) cannot be investigated in a valid manner with off-the-shelf eye-tracking devices like webcams, even though such work does get attempted sometimes. Despite the many technological advances, we believe that substantive questions should continue to drive the research process more than the technology. Eye-movement registration is simply a tool, and nothing more than that. Researchers enjoy the freedom to use that tool in ways that best suit their research purposes. They are, at the same time, presented with the challenge to judiciously select their eye-tracking equipment and match their research designs with the eye-tracker's technical capabilities (Godfroid & Hui, 2020).

In summary, eye tracking has continued to gain momentum as a valuable research method in ISLA research. Its versatility allows researchers to strike a balance between experimental control and ecological validity, catering to a wide range of research purposes.

5. Preview of research timeline

In what follows, we present a timeline of eye tracking in ISLA research. We review the historical significance of each study and situate it within the broader context of earlier and later works. Our timeline highlights the emergence and evolution of eye tracking as a tool for studying acquisition-as-processing – using eye movements to examine how attention and processing varies across individuals and learning conditions, and how these variations influence or mediate eventual learning outcomes (which are often measured independently through offline tests).

Major themes emerging from this research include investigations into incidental and intentional vocabulary learning during reading. Here, researchers have manipulated variables such as exposure frequency, input enhancement, glosses, and explicit instruction to examine their influence on attention, processing, and learning. Eye-movement registration has also been employed to evaluate and compare the effectiveness of instructional approaches, including processing instruction. Additionally, the affordances of multimodal input for language learning – including captions, reading-while-listening, and picture books – have been a focal point since the early days of eye-tracking in ISLA.

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Table 1. Codes for study characteristics

Category	Code
Time period	• **2**: Eye tracking as a tool to study acquisition-as-processing (from 2010 onwards) • **3**: Mobile eye tracking and methodological triangulation (from 2018 onwards)
Paradigm	• **Read**: Reading • **VWP**: Visual world paradigm • **MM**: Multimodal • **Write**: Writing
Design	• **Obs**: Observational-descriptive • **Ex post facto**: refers to the retrospective grouping of participants or items based on data collected during the experimental task. Examples include comparing the eye-movement patterns for high- and low-performing participants in the experiment or comparing eye-movement data for items that received a correct versus incorrect response on the posttest • **Exp**: Experimental
Device	• **VideoCam**: Video camera • **WebCam**: Webcam • **Wear**: Wearable eye tracker (e.g., head-mounted eye trackers, eye-tracking glasses, headsets) • **Station**: Stationary eye tracker (e.g., standalone, screen-mounted, desk-mounted, tower-mounted eye trackers)
Setting	• **Classroom**: Classroom • **Remote**: Remote (data collection over the internet, with participants located in front of a computer in a different location than the researcher) • **Room**: Quiet room (no computer) • **Lab**: Research lab (data collection in a research laboratory where the researcher is physically present and the participant is seated in front of a computer)
Focus (multiple foci are possible within a single study)	• **Ling**: Linguistic (e.g., vocabulary, grammar, reading/listening/speaking/writing) • **Interact**: Teacher-student or peer-to-peer interaction patterns • **Instruction**: Instructional design • **Viewing behavior:** Viewing behavior of typically multimodal input, often with a primary goal of describing patterns in processing behavior rather than a linguistic focus

Increasingly, eye movements are being triangulated with other data sources, including stimulated recall, interviews, screen capture, keystroke logging, and skin conductance. These multi-method approaches provide rich accounts of complex activities, adding important insights to research on writing, face-to-face or computer-mediated interaction, and online or in-person teaching. We are also witnessing the emergence of eye tracking in social approaches to ISLA, such as analyzing eye gaze as a multimodal or semiotic resource in classroom or peer-to-peer interactions, or using eye tracking as a tool to promote learner development in L2 writing.

The timeline below includes 73 studies, each coded for the key characteristics outlined in Table 1.

Competing interests. The authors have no competing interests to declare.

Notes

1. Visual world eye tracking is an audiovisual paradigm used to examine auditory linguistic processing in the presence of real-world objects or images on the screen that are related to the sentences that participants are listening to.
2. Two book chapters appeared in 2010 that possibly mark the earliest use of eye tracking in this time period (Godfroid et al., 2010; Smith, 2010). We cite the later references by the same authors because they represent more complete reports of the work in full-length research articles.

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3. Author names in small capitals indicate the work is mentioned elsewhere in this timeline.
* Indicates that the full reference for this work can be found in the subsequent timeline.

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Year	References	Annotations	Study characteristics
2011	Bolger, P., & Zapata, G. (2011). Semantic categories and context in L2 vocabulary learning. *Language Learning, 61*(2), 614–646. https://doi.org/10.1111/j.1467-9922.2010.00624.x	This is the first study to use eye tracking as a measure of vocabulary knowledge resulting from an intervention. Results showed that those who had learned the lexical items in semantic sets took longer to reject semantically related distractors than those who had learned the same words in semantically unrelated conditions.	2, VWP, Exp, Station, Lab, Ling
2013	Godfroid, A., Boers, F., & Housen, A. (2013). An eye for words: Gauging the role of attention in incidental L2 vocabulary acquisition by means of eye-tracking. *Studies in Second Language Acquisition, 35*(3), 483–517. https://doi.org/10.1017/S0272263113000119	This is the first study in SLA to connect learning processes measured by eye tracking to learning gains in vocabulary. In a reading study, **Godfroid et al.** found that learners tended to attend more to unfamiliar lexical items than familiar control words. Also, reading times predicted learning gains as measured by a vocabulary test. The authors proposed that eye tracking can be used to measure noticing at the level of attention.	2, Read, Exp, Ex post facto, Station, Lab, Ling
2013	Godfroid, A., & Schmidtke, J. (2013). What do eye movements tell us about awareness? A triangulation of eye-movement data, verbal reports, and vocabulary learning scores. In J. M. Bergsleithner, S. N. Frota, & J. K. Yoshioka (Eds.), *Noticing and second language acquisition: Studies in honor of Richard Schmidt* (pp. 183–205). University of Hawai'i, National Foreign Language Resource Center.	The authors analyzed verbal report data from the participants in Godfroid et al.[3] (2013) and triangulated these data with the eye-movement data to explain vocabulary learning outcomes. Reading times were longer in cases where the learner reported awareness of having read an unfamiliar word. Awareness, in turn, predicted performance on a vocabulary assessment.	2, Read, Exp, Ex post facto, Station, Lab, Ling
2013	Godfroid, A., & Uggen, M. (2013). Attention to irregular verbs by beginning learners of German: An eye-movement study. *Studies in Second Language Acquisition, 35*(2), 291–322. https://doi.org/10.1017/S0272263112000897	Recordings of eye movements showed that learners of German paid more attention to irregular verbs than to matched, regular verbs. Longer reading times were also associated with accurate production of the targeted vowel change in the irregular verbs, providing more evidence for a possible link between the processes of learning and the resulting acquisition.	2, Read, Exp, Station, Lab, Ling

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Year	References	Annotations	Study characteristics
2013	Smith, B. (2013). Eye tracking as a measure of noticing: A study of explicit recasts in SCMC. *Language Learning & Technology, 16*(3), 53–81. https://doi.org/10125/44300	In this computer-assisted language learning study, **Smith** attempted to identify noticing episodes of corrective feedback independently in language learners' eye movement records and in their stimulated recall protocols. The two measures of noticing overlapped and were predictive of posttest success.	2, Read, Obs, Ex post facto, Station, Lab, Ling
2013	Winke, P. M. (2013). The effects of input enhancement on grammar learning and comprehension: A modified replication of Lee (2007) with eye-movement data. *Studies in Second Language Acquisition, 35*(2), 323–352. https://doi.org/10.1017/S0272263112000903	**Winke** introduced eye tracking as an additional component in her replication of previous research focusing on input enhancement. The added value of the technology became increasingly evident as the eye-tracking data reinforced our understanding of input enhancement; that is, its ability to promote noticing as evidenced by longer reading times on enhanced (vs. unenhanced) text.	2, Read, Exp, Station, Lab, Ling
2013	Winke, P., Gass, S., & Sydorenko, T. (2013). Factors influencing the use of captions by foreign language learners: An eye-tracking study. *Modern Language Journal*, *97*(1), 254–275. https://doi.org/10.1111/j.1540-4781.2013.01432.x	**Winke et al.** utilized eye tracking to describe how language learners use L2 captions when viewing videos. Results suggested that learners of Arabic spent more time reading captions than learners of Spanish or Russian. Also, learners of Chinese spent significantly more time reading captions when they were unfamiliar with the contents of the video, suggesting content familiarity is an important factor to consider.	2, Read, MM, Obs, Station, Lab, Viewing behavior
2014	Bisson, M., Van Heuven, W., Conklin, K., & Tunney, R. (2014). Processing of native and foreign language subtitles in films: An eye tracking study. *Applied Psycholinguistics, 35*(2), 399–418. https://doi:10.1017/S0142716412000434	Another early eye-tracking study on caption use like WINKE ET AL. (2013), this study represents an important effort to compare viewing behavior for first language subtitles vs. foreign language captions in film. Results suggested that English speakers who did not know Dutch relied more on written support (of either kind, subtitles or captions) when the film soundtrack was in English rather than the unknown foreign language (Dutch).	2, Read, MM, Exp, Station, Lab, Ling
2014	Ellis, N. C., Hafeez, K., Martin, K. I., Chen, L., Boland, J., & Sagarra, N. (2014). An eye-tracking study of learned attention in second language acquisition. *Applied Psycholinguistics, 35*(3), 547–579. https://doi.org/10.1017/S0142716412000501	This is the first study by **Ellis et al.** to explore the phenomenon of learned attention with eye-tracking methodology. Building on their previous work without eye tracking, the authors partially replicated the finding of learned attention to competing cues of temporal marking during instruction. Specifically, the eye-tracking data supported the notion that early experience of adverb (but not verb) cues can alter attention in later production, explaining why morphology can be difficult to acquire for adult L2 learners.	2, Read, Exp, Station, Lab, Ling, Instruction

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(*Continued.*)

Year	References	Annotations	Study characteristics
2014	Révész, A., Sachs, R., & Hama, M. (2014). The effects of task complexity and input frequency on the acquisition of the past counterfactual construction through recasts. *Language Learning, 64*(3), 615–650. https://doi.org/10.1111/lang.12061	In this study, eye tracking was used for the first time to inform instructional design in the context of task-based language teaching (TBLT). The researchers took advantage of eye movement data to provide validity evidence for their manipulation of task complexity (simple vs. complex task) as a critical independent variable in their subsequent experiment. More specifically, the participating learners spent more time on the visual materials (pictures and labels) as measured by both fixation counts and durations for the complex task than for the simple task, supporting the researchers' task-complexity manipulation.	3, MM, Obs, Station, Lab, Instruction
2015	Andringa, S., & Curcic, M. (2015). How explicit knowledge affects online L2 processing: Evidence from differential object marking acquisition. *Studies in Second Language Acquisition, 37*(2), 237–268. https://doi.org/10.1017/S0272263115000017	In an original application of the eye-tracking methodology, **Andringa and Curcic** used the visual-world eye-tracking paradigm to assess the processing outcomes of acquisition following explicit instruction (also see Cintrón-Valentín & Ellis, 2015). The authors reported that, for a grammatical structure that is absent in their L1, Dutch learners of English were unable to use L2 metalinguistic information during online processing of auditory input in a visual world experiment.	2, VWP, Exp, Station, Lab, Ling
2015	Cintrón-Valentín, M., & Ellis, N. (2015). Exploring the interface: Explicit focus-on-form instruction and learned attentional biases in L2 Latin. *Studies in Second Language Acquisition, 37*(2), 197–235. https://doi.org/10.1017/S0272263115000029	Building on Ellis et al.'s (2014) work on learned attention, this study is one of the first eye-tracking studies focusing on the processing outcomes of explicit instruction in the domain of grammar (also see Andringa & Curcic, 2015). The authors reported that focus on form instruction can direct learners' attention away from temporal adverbs to verb morphology, promoting greater processing of morphological cues in both comprehension and production.	2, Read, Exp, Station, Lab, Ling, Instruction

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Year	References	Annotations	Study characteristics
2015	McDonough, K., Crowther, D., Kielstra, P., & Trofimovich, P. (2015). Exploring the potential relationship between eye gaze and English L2 speakers' responses to recasts. *Second Language Research, 31*(4), 563–575. https://doi.org/10.1177/0267658315589656	This study featured an innovative use of eye-tracking methodology to capture attention during spoken communicative tasks (vs. reading and viewing studies). A research assistant–L2 speaker pair performed various communicative tasks while seated at a table with their eye movements recorded. The authors reported that L2 speaker gaze and mutual eye gaze predicted target-like linguistic responses following a recast in an interaction, highlighting the potential of eye gaze as an indication of uptake of oral corrective feedback.	2, MM, Obs, Station, Room, Ling
2015	Montero Perez, M., Peters, E., & Desmet, P. (2015). Enhancing vocabulary learning through captioned video: An eye-tracking study. *Modern Language Journal, 99*(2), 308–328. https://doi.org/10.1111/modl.12215	Set in the domain of audiovisual language learning, **Montero Perez et al.** bring together work on learners' use of captioning (Bisson et al., 2014; Winke et al., 2013) and attentional processes in vocabulary learning (Godfroid et al., 2013). They compared different types of captions for video clips and the announcement of a vocabulary test after the videos in an attempt to study the links between learning conditions, attentional processes, and the products of learning. The authors reported, among other findings, positive correlations between word learning and second pass and total reading times on target words in a full captioning condition.	2, Read, MM, Exp, Station, Lab, Ling
2016	Hopp, H. (2016). Learning (not) to predict: Grammatical gender processing in second language acquisition. *Second Language Research, 32*(2), 277–307. https://doi.org/10.1177/0267658315624960	This was the first study to use the visual world eye-tracking paradigm as a pretest and posttest measure to gauge the effects of an instructional intervention. In two experiments, the researcher showed that intermediate L2 German learners can be trained to engage in gender-based predictions (through lexical training on gender assignment), whereas L1 German learners can be trained not to make predictions based on gender if the gender cue in the input is made unreliable. Together, the results show that robust knowledge of lexical gender assignment is a prerequisite for predictive processing of gender agreement.	2, VWP, Exp, Station, Lab, Ling

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Year	References	Annotations	Study characteristics
2016	Pellicer-Sánchez, A. (2016) Incidental L2 vocabulary acquisition from and while reading: An eye-tracking study. *Studies in Second Language Acquisition, 38*(1), 97–130. http://doi.org/10.1017/S0272263115000224	Extending the research theme of incidental vocabulary learning during reading (GODFROID ET AL., 2013), **Pellicer-Sánchez** investigated vocabulary processing and acquisition over six encounters with novel words embedded in a short story, which was the first attempt to examine word learning over repeated encounters. Reading times for known and novel words captured by eye tracking were used to unveil both the process of vocabulary acquisition (shorter reading times after multiple encounters of target words) as well as the outcome of the acquisition process (attention paid to target words correlated positively with eventual learning measured by independent vocabulary assessments).	2, Read, Exp, Station, Lab, Ling
2017	Indrarathne, B., & Kormos, J. (2017). Attentional processing of input in explicit and implicit conditions: An eye-tracking study. *Studies in Second Language Acquisition, 39*(3), 401–430. https://doi.org/10.1017/S027226311600019X	**Indrarathne and Kormos** extended research on the role of attentional processing (see GODFROID ET AL., 2013; WINKE, 2013) to understand the effects of different kinds of grammar instruction, ranging from implicit to explicit. Results highlighted the value of (explicit) instruction to pay attention to the grammatical structure and some added benefits of metalinguistic explanation. Implicit Focus on Form conditions were comparatively less effective in drawing attention to and promoting development of the target grammatical construction (causative *had*).	2, Read, Exp, Station, Lab, Ling
2017	McDonough, K., Trofimovich, P., Dao, P., & Dion, A. (2017). Eye gaze and production accuracy predict English L2 speakers' morphosyntactic learning. *Studies in Second Language Acquisition, 39*(4), 851–868. https://doi.org/10.1017/S0272263116000395	This study builds on the research agenda established by MCDONOUGH ET AL. (2015), with a specific focus on investigating the relationship between eye gaze and the learning of a morphosyntactic pattern through one-on-one interactions. Learner-initiated eye gaze behavior, specifically, looks at images on a poster board depicting the target structure (vs. distractor images), predicted acquisition as measured by an independent grammar test.	2, MM, Exp, Station, Room, Ling

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Year	References	Annotations	Study characteristics
2017	Muñoz, C. (2017). The role of age and proficiency in subtitle reading: An eye-tracking study. *System, 67*, 77–86. https://doi.org/10.1016/j.system.2017.04.015	Captioned media (see WINKE ET AL., 2013 and BISSON ET AL., 2014) have continued to be a popular topic of investigation in the eye-tracking literature. This study is the first to account for factors of individual differences (i.e., age and proficiency) in the examination of viewing behavior. **Muñoz** reported that children and beginner learners looked more at the L2 captions (vs. L1 subtitles) than older and more advanced participants, demonstrating difficulties in processing captions/subtitles might vary based on age and proficiency, and shedding light on the question of who might benefit most from them.	2, Read, MM, Obs, Station, Lab, Viewing behavior
2017	Satar, H. M., & Wigham, C. R. (2017). Multimodal instruction-giving practices in webconferencing-supported language teaching. *System, 70*, 63–80. https://doi.org/10.1016/j.system.2017.09.002	This is an early example of a study from time period 3 when researchers began recording eye movements in ecologically valid settings. A webcam was used to collect eye gaze data from trainee teachers instructing French language learners online as a part of a telecollaboration project. The eye gaze data were integrated into a multimodal interaction analysis, documenting how preservice teachers use eye gaze when giving instructions in an online teaching-learning environment.	3, MM, Obs, WebCam, Interact
2018	Beltrán-Planques, V., & Querol-Julián, M. (2018). English language learners' spoken interaction: What a multimodal perspective reveals about pragmatic competence. *System, 77*, 80–90. https://doi.org/10.1016/j.system.2018.01.008	In another multimodal study like SATAR AND WIGHAM (2017), the researchers examined the use of different semiotic modes (e.g., facial expression and eye gaze) by two pairs of male language learners in a complaint situation. The microanalysis of the interactions suggested that spoken language is only one of the resources learners resort to in performing a language task and underscored the value of embracing a multimodal (vs. linguistic) perspective in the study of interlanguage pragmatic development.	3, MM, Obs, VideoCam, Room, Ling, Interact

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Year	References	Annotations	Study characteristics
2018	Elgort, I., Brysbaert, M., Stevens, M., & Van Assche, E. (2018). Contextual word learning in a second language: An eye-movement study. *Studies in Second Language Acquisition, 40*(2), 341–366. https://doi.org/10.1017/S0272263117000109	Furthering the investigation into word learning during reading (see also Godfroid et al., 2013; Pellicer-Sánchez, 2016), **Elgort et al.** examined how changes in reading times, which serve as an index of the development of word familiarity, occur over multiple encounters with low-frequency target words. The researchers were also the first (in SLA) to use eye tracking to assess lexical knowledge that can be deployed online post-exposure (vs. the more common use of vocabulary posttests). In addition, the authors were one of the first to practice open science by sharing their data publicly, making secondary analysis of eye-tracking data possible (see also Hui, 2020).	2, Read, Exp, Station, Lab, Ling
2018	Gánem-Gutiérrez, G. A., & Gilmore, A. (2018b). Tracking the real-time evolution of a writing event: Second language writers at different proficiency levels. *Language Learning, 68*(2), 469–506. https://doi.org/10.1111/lang.12280	This is an early example of a writing study with eye tracking. **Gánem-Gutiérrez and Gilmore** triangulated the recording of L2 writers' eye movements with screen recordings, keystroke logging, and stimulated recall to identify different cognitive processes during a writing task. The results highlighted the recursive and chronological development of L2 writing together with the influences of L2 proficiency and essay length on the frequency and duration of specific cognitive processes during writing.	3, Write, Obs, Station, Lab, Ling
2018	Gánem-Gutiérrez, G. A., & Gilmore, A. (2018a). Expert-novice interaction as the basis for L2 developmental activity: A SCT perspective. *Language and Sociocultural Theory, 5*(1), 21–45. https://doi.org/10.1558/lst.33621	This is a companion paper to Gánnem-Gutiérrez and Gilmore (2018b) in which the authors examined, for the first time (to our knowledge), language development from the perspective of sociocultural theory with eye tracking. The data came from an interaction between a student and her instructor during a stimulated recall session, where they watched the replay of the student's writing event (including eye gaze data). The student then recalled and reflected on the writing process with the guidance of her instructor. Through a microgenetic multimodal interaction analysis, the authors described how language development took place through an expert–novice interaction.	3, Write, Obs, Station, Lab, Ling

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Year	References	Annotations	Study characteristics
2018	Godfroid, A., Ahn, J., Choi, I., Ballard, L., Cui, Y., Johnston, S., Lee, S., Sarkar, A., & Yoon, H. J. (2018). Incidental vocabulary learning in a natural reading context: An eye-tracking study. *Bilingualism: Language and Cognition, 21*(3), 563–584. https://doi.org/10.1017/S1366728917000219	This study represents a continuation of the literature examining incidental vocabulary learning through reading (see also ELGORT ET AL., 2018; GODFROID ET AL., 2013; PELLICER-SÁNCHEZ, 2016). Participants read part of an English novel with 29 Farsi target words occurring multiple times in the novel to convey the foreign setting of the story. Eye-tracking data showed that reading times for Farsi words decreased in a nonlinear fashion, more rapidly during initial encounters, suggesting increased familiarity with the target word forms. The number of target-word exposures, as well as cumulative reading times, were predictive of word learning (form and meaning), suggesting that both quantity and quality of exposure are important.	2, Read, Exp, Station, Lab, Ling
2018	Jung, J., & Révész, A. (2018). The effects of reading activity characteristics on L2 reading processes and noticing of glossed constructions. *Studies in Second Language Acquisition, 40*(4), 755–780. https://doi.org/10.1017/S0272263118000165	**Jung and Révész** broadened the scope of ISLA research with eye tracking by introducing a focus on task characteristics (see also RÉVÉSZ ET AL., 2014). The researchers investigated how the design of a reading activity may influence learners' processing of the text as well as the glossed vocabulary and grammar in the text. Learners read two texts under two conditions that required either more or less careful reading. The authors reported that when the text was divided into multiple (vs. just two) subparts, learners read it more closely and attended more to the glossed, English unaccusative verbs, but not the novel lexical items.	3, Read, Exp, Station, Room, Ling
2018	Kohlstedt, T., & Mani, N. (2018). The influence of increasing discourse context on L1 and L2 spoken language processing. *Bilingualism: Language and Cognition, 21*(1), 121–136. https://doi.org/10.1017/S1366728916001139	Together with BOLGER AND ZAPATA (2011), this is one of few eye-tracking studies examining topics in vocabulary learning and teaching using picture displays. The authors investigated the role of discourse context in the inference of unknown words in a spoken story context. Semantically biased (vs. neutral) story contexts helped L1 and L2 speakers infer the meaning of target words embedded in the story (and depicted on the screen), which was revealed in the participants' anticipatory looks to the target images in the latter half of the story.	2, VWP, Obs, Station, Lab, Ling

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Year	References	Annotations	Study characteristics
2018	Lee, M., & Révész, A. (2018). Promoting grammatical development through textually enhanced captions: An eye-tracking study. *The Modern Language Journal, 102*(3), 557–577. https://doi.org/10.1111/modl.12503	Extending the use of eye tracking to examine the effects of input enhancement on grammatical development (see also INDRARATHNE & KORMOS, 2017; WINKE, 2013), **Lee and Révész** attempted to link increased visual salience (through enhancement), attention, and learning. Participants completed multimodal input-based activities where the target structure (*he*/*she*/*they* pronouns and their antecedents) was either enhanced in the image captions or not. Enhancement promoted attention to the target structure and promoted learning gains, yet a positive connection between attention and learning gains was established in the unenhanced group only.	2, Read, MM, Exp, Station, Lab, Ling
2018	Mohamed, A. A. (2018). Exposure frequency in L2 reading: An eye-movement perspective of incidental vocabulary learning. *Studies in Second Language Acquisition, 40*(2), 269–293. http://doi.org/10.1017/S0272263117000092	This is one of three eye-tracking studies published in 2018 on incidental vocabulary learning through reading (see ELGORT ET AL., 2018; GODFROID ET AL., 2018). Together they continued the research trajectory on this topic (see GODFROID ET AL., 2013; PELLICER-SÁNCHEZ, 2016). In this study, 42 advanced learners of English read a graded reader containing 20 pseudowords (target words) and 20 known words (controls) with varying frequencies of occurrence (1 to 30 repetitions) before completing surprise tests of vocabulary recognition and recall. Total times spent on the pseudowords during reading contributed uniquely to the prediction of all vocabulary learning outcomes, above and beyond repeated encounters with the words. The author emphasized the role of active engagement, measured through online reading metrics, in fostering vocabulary learning from reading, alongside the influence of text features.	2, Read, Exp, Station, Lab, Ling

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Year	References	Annotations	Study characteristics
2018	Morell, T. (2018). Multimodal competence and effective interactive lecturing. *System, 77*, 70–79. https://doi.org/10.1016/j.system.2017.12.006	This is one of few classroom-based studies where the author recorded eye gaze data using a video camera (compare Beltrán-Planques & Querol-Julián, 2018; Satar & Wigham, 2018) and used the data as one data source in a small-scale, multimodal discourse analysis. The aim of the study was to understand how an instructor instantiated pair work. Results revealed coordinated use of different modes (e.g., gaze, gesture, and spoken and written language), highlighting the importance of multimodal competence of teachers in English-medium instruction contexts.	3, MM, Obs, VideoCam, Classroom, Instruction
2018	Warren, P., Boers, F., Grimshaw, G., & Siyanova-Chanturia, A. (2018). The effect of gloss type on learners' intake of new words during reading: Evidence from eye-tracking. *Studies in Second Language Acquisition, 40*(4), 883–906. https://doi.org/10.1017/S0272263118000177	Moving beyond establishing an association between attention and vocabulary learning (see Elgort et al., 2018; Godfroid et al., 2013), **Warren et al.** manipulated gloss type as an independent variable to investigate its effect on vocabulary learning. Participants read passages containing target lexical items glossed with (1) L2 definitions, (2) pictures, or (3) L2 definitions and pictures. While participants in the picture-gloss-only condition directed least attention to the targets and the glosses, they were best at learning the word meanings, suggesting a role for other processes that might not be captured by eye tracking in their entirety.	2, Read, Exp, Station, Lab, Ling
2018	Wong, W., & Ito, K. (2018). The effects of processing instruction and traditional instruction on L2 online processing of the causative construction in French: An eye-tracking study. *Studies in Second Language Acquisition, 40*(2), 241–268. https://doi.org/10.1017/S0272263117000274	This is an extension of research on processing instruction (see also Issa & Morgen-Short, 2018; Lee & Doherty, 2019) into the auditory modality. In two experiments with a pretest–posttest design, **Wong and Ito** compared processing instruction and traditional instruction without explicit explanation of rules (experiment 1) and with explicit explanation (experiment 2). They found that processing instruction (but not traditional instruction) and explicit explanation were both beneficial in terms of accuracy and processing and that explicit explanation did not have any added benefits over processing instruction. Eye-movement data were useful in revealing if/when L2 listeners revised their initial thematic role assignments towards the target-like solution during a paired picture selection task.	2, VWP, Exp, Station, Lab, Ling, Instruction

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Year	References	Annotations	Study characteristics
2019	Chukharev-Hudilainen, E., Saricaoglu, A., Torrance, M., & Feng, H.-H. (2019). Combined deployable keystroke logging and eyetracking for investigating L2 writing fluency. *Studies in Second Language Acquisition, 41*,(3) 583–604. https://doi.org/10.1017/S027226311900007X	This study exemplifies the use of methodological triangulation to examine cognitive processes during writing disfluencies in L1 and L2 writing (see also GÁNEM-GUTIÉRREZ & GILMORE, 2018b). The researchers used time-aligned eye-movement and keystroke data to obtain a more comprehensive picture of writing behaviors. These data suggested differences and some similarities in writing in L1 and L2.	3, Write, Exp, Station, Lab, Ling
2019	Issa, B., & Morgan-Short, K. (2019). Effects of external and internal attentional manipulations on second language grammar development: An eye-tracking study. *Studies in Second Language Acquisition, 41*(2), 389–417. https://doi.org/10.1017/S0272263118000013X	**Issa and Morgan-Short** compared the effectiveness of different instructional conditions in manipulating learner attention and promoting L2 grammar development. In two experiments, they manipulated learner attention: through input enhancement (external manipulation) and structured input practice (internal manipulation), respectively. Results suggested that the internal manipulation, in particular, led to reliable L2 development, yet the most robust association between attention and L2 development was found in the external manipulation group (compare INDRARATHNE & KORMOS, 2017; LEE & RÉVÉSZ, 2018; WINKE, 2013).	2, Read, Exp, Station, Lab, Ling
2019	Ito, K, & Wong, W. (2019). Processing instruction and the effects of input modality and voice familiarity on the acquisition of the French causative construction. *Studies in Second Language Acquisition, 41*(2), 443–468. https://doi.org/10.1017/S0272263118000281	The authors built on their previous work on processing instruction in the auditory modality (WONG & ITO, 2018) by aligning training and test modalities; that is, they used auditory instead of written training to match the auditory modality of the pretests and posttests. The authors confirmed the benefits of processing instruction for sentence interpretation that they also reported for written training in WONG AND ITO (2018), but interestingly, the visual-world eye-tracking data did not show the anticipated shift towards the correct target picture after auditory instruction. Together, these findings point to potential differences in the effectiveness of auditory vs. written processing instruction to overcome real-time processing biases in thematic role assignment.	2, VWP, Exp, Station, Lab, Ling, Instruction

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Year	References	Annotations	Study characteristics
2019	Koval, N. (2019). Testing the deficient processing account of the spacing effect in second language vocabulary learning: Evidence from eye tracking. *Applied Psycholinguistics, 40*(5), 1103–1139. https://doi.org/10.1017/S0142716419000158	This is the first study that uses eye tracking to investigate spacing effects in vocabulary learning. In a sentence-reading experiment, **Koval** compared the effects of massed and spaced repeated exposure to Finnish target words embedded in English sentences. Overall, words presented in greater temporal distribution across the experiment benefited from more attentional processing and, in turn, were learned better than words that occurred more closely together in the experiment. A notable methodological feature was the use of mediation analysis to uncover the interplay (i.e., the direct and indirect effects) between learning condition, attention, and learning gains.	2, Read, Exp, Station, Lab, Ling, Instruction
2019	Lee, J., & Doherty, S. (2019). Native and nonnative processing of active and passive sentences: The effects of processing instruction on the allocation of visual attention. *Studies in Second Language Acquisition, 41*(4), 853–879. https://doi.org/10.1017/S027226311800027X	Examining processing instruction as a pedagogical approach (see also Issa & Morgan-Short, 2018; Wong & Ito, 2018), **Lee and Doherty** used eye tracking to track how L2 Spanish speakers processed written sentences before and after instruction on the Spanish passive. The eye-movement data showed an increase in efficiency of processing after training, such that learners' processing became more similar to that of native speakers (though not identical) following instruction. The accuracy and response time data for a paired picture matching task further suggested robust learning as evidenced by a lack of difference between the learner and the native speaker data.	2, Read, Exp, Station, Lab, Ling
2019	Michel, M., & O'Rourke, B., (2019). What drives alignment during text chat with a peer vs. a tutor? Insights from cued interviews and eye-tracking. *System, 83*, 50–63. https://doi.org/10.1016/j.system.2019.02.009	This is the first study using eye tracking to examine the phenomenon of alignment in L2 users' lexical choices. In an extension of Smith (2013), learners engaged in language activities in an online chat room with their tutor and with a peer. To gain comprehensive insights into lexical alignment, the authors collected data from three sources: chat log, eye movements, and cued interviews. Results suggested that lexical alignment was relatively infrequent overall. Learners aligned their production with their interlocutor both consciously and unconsciously and paid visual attention to a subset of lexically aligned phrases. Alignment happened more in the tutor chat, and less in cases where the learner was partnered with a less advanced peer.	3, Read, Obs, Station, Lab, Ling, Interaction

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Year	References	Annotations	Study characteristics
2020	Abashidze, D., McDonough, K., & Gao, Y. (2020). Exploring the effect of eye gaze cues on novel L2 morphosyntactic pattern learning. *Second Language Research, 38*(1), 173–186. https://doi.org/10.1177/0267658319896829	Building on McDonough et al. (2017), **Abashidze et al.** examined the role of eye gaze in morphosyntactic pattern learning, using training videos in which the actor drew attention to (by looking at) a relevant cue in the video to help with interpretation. Learners who received the eye gaze cues (vs. no cues) learned the target morphosyntactic pattern better. During the posttest, these learners also spent longer looking at the images that correctly depicted the targeted event (vs. competitor images).	2, VWP, Obs, Station, Lab, Ling
2020	Conklin, K., Alotaibi, S., Pellicer-Sánchez, A., & Vilkaitė-Lozdienė, L. (2020). What eye-tracking tells us about reading-only and reading-while-listening in a first and second language. *Second Language Research, 36*(3), 257–276. https://doi.org/10.1177/0267658320921496	This is the first study that documents eye movement patterns in reading-while-listening contexts for both L1 and L2 readers. Results showed that participants, in both groups, did not consistently fixate the word they were hearing. More proficient L2 readers tended to read slightly ahead of the audio, while others sometimes lagged behind the audio. The authors suggested that reading slightly ahead could be an important piece in understanding the benefits of reading-while-listening in language learning and comprehension.	2, Read, MM, Obs, Station, Lab, Ling, Instruction, Viewing behavior
2020	Hopp, H. (2020). Morphosyntactic adaptation in adult L2 processing: Exposure and the processing of case and tense violations. *Applied Psycholinguistics, 41*(3), 627–656. https://doi.org/10.1017/S0142716420000119	This study was one of the first to examine the role of morphosyntactic adaptation as a potential learning mechanism in L2 acquisition. Using a pretest–posttest design, **Hopp** showed that L2 learners who receive systematic and massed input to sentences that exemplify the target structure and its correct interpretation adapt their processing mechanisms accordingly. The author proposed a possible role for prediction and processing-induced prediction error in the learning process.	2, Read, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2020	Hui, B. (2020). Processing variability in intentional and incidental word learning: An extension of Solovyeva and DeKeyser (2018). *Studies in Second Language Acquisition, 42*(2), 327–357. https://doi.org/10.1017/S0272263119000603	This is the first study to extend the use of coefficient of variation (CV) (typically used with reaction time data) to reading times recorded by an eye tracker. **Hui** took advantage of the open data shared by Elgort et al. (2018) and carried out secondary analyses to examine processing stability in vocabulary learning under natural reading conditions. Results showed that learners did not gain much processing stability in the early stages of word learning.	2, Read, Exp, Station, Lab, Ling

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Year	References	Annotations	Study characteristics
2020	Lee, M., & Révész, A. (2020). Promoting grammatical development through captions and textual enhancement in multimodal input-based tasks. *Studies in Second Language Acquisition, 42*(3), 625–651. https://doi.org/10.1017/S0272263120000108	Building on their previous work with multimodal input-based tasks (LEE & RÉVÉSZ, 2018), the authors newly adopted a task-based language teaching (TBLT) framework to study the role of captioning and input enhancement paired with video-based listening activities. Participants watched short video clips with textually enhanced captions, unenhanced captions, or no captions. Eye-movement data suggested that enhancing the target structure (present perfect vs. past tense) in the captions was effective in drawing learners' attention to the target structure (as compared to captioning-only). Enhanced captions also showed the strongest relationships between attention and pre-to-posttest and pre-to-delayed-posttest learning gains.	2, Read, MM, Exp, Station, Lab, Ling, Instruction
2020	McDonough, K., Trofimovich, P., Lu, L., & Abashidze, D. (2020). Visual cues during interaction: Are recasts different from non-corrective repetition? *Second Language Research, 36*(3), 359–370. https://doi.org/10.1177/026765832091496	Going back to the influential study by MCDONOUGH ET AL. (2015), **McDonough et al**. examined whether there is a visual signature to the delivery of corrective feedback during spoken interaction. Participants watched videos capturing interactions between a language learner and an interlocutor and rated the nature of the interlocutor's repetitions: as either a simple (non-corrective) repetition or a (corrective) recast of what the language learner said. While the raters were able to reliably distinguish corrective feedback from repetitions, their eye gaze behaviors while watching the videos did not account for their rating accuracy, suggesting limited use of visual cues in this context.	2, MM, Obs, Station, Lab, Interact
2020	Michel, M., Révész, A., Lu, X., Kourtali, N.-E., Lee, M., & Borges, L. (2020). Investigating L2 writing processes across independent and integrated tasks: A mixed-methods study. *Second Language Research, 36*(3), 307–334. https://doi.org/10.1177/0267658320915501	In this ambitious mixed-methods project, the authors examined the cognitive processes that underlie different writing behaviors using a combination of keystroke logging, stimulated recall, and eye-movement data (also see CHUKHAREV-HUDILAINEN ET AL., 2019; and GÁNEMGUTIÉRREZ & GILMORE, 2018b). L2 learners performed a total of four writing tasks (two independent and two integrated). They engaged in similar cognitive processes overall in both task types; differences related primarily to use of the source text in the integrated writing task.	3, Write, Obs, Station, Lab, Ling

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Year	References	Annotations	Study characteristics
2020	Pellicer-Sánchez, A., Tragant, E., Conklin, K., Rodgers, M., Serrano, R., & Llanes, À. (2020). Young learners' processing of multimodal input and its impact on reading comprehension: An eye-tracking study. *Studies in Second Language Acquisition, 42*(3), 577–598. https://doi.org/10.1017/S0272263120000091	This is one of the first studies to use eye tracking to understand children's processing of text and images during storybook reading with or without audio. In a repeated-measures design, young EFL learners read, or read and listened to, an English storybook with pictures. **Pellicer-Sánchez et al.** found that the audio allowed child learners to look more at the pictures (as compared to when they were reading without audio), suggesting that the audio helped them to integrate the verbal and nonverbal information in the materials. Time spent looking at the images (but not the text) was positively associated with comprehension scores.	2, Read, MM, Exp, Station, Lab, Viewing behavior
2020	Zhou, W., Ye, W., & Yan, M. (2020). Alternating-color words facilitate reading and eye movements among second-language learners of Chinese. *Applied Psycholinguistics, 41*(3), 685–699. https://doi.org/10.1017/S0142716420000211	This study addresses the question of how L2 Chinese speakers can be supported in their reading fluency, focusing on the issue of word segmentation during reading (Mandarin is an unspaced language). Undergraduate students with Chinese as a L2 read colored texts with alternating colored words that provided consistent, inconsistent, or no information about word boundaries. When color signaled the correct word boundary, learners' reading patterns were more efficient than when the color was uninformative or used inconsistently with word segmentation. The authors concluded that L2 readers are able to use word-boundary knowledge to facilitate their reading efficiency.	2, Read, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2021	Conklin, K., & Carrol, G. (2021). Words go together like "bread and butter": The rapid, automatic acquisition of lexical patterns. *Applied Linguistics, 42*(3), 492–513. https://doi.org/10.1093/applin/amaa034	**Conklin and Carrol** offered a new lens on the acquisition of formulaic language. The authors examined the processing advantage for novel (rather than existing or made-up) multi-word units during natural reading. Native English speakers read short stories containing conventional (e.g., time and money) and novel (e.g., wires and pipes) patterns. Results suggested that readers developed sensitivity to the co-occurence and order of different constituents in a lexical bundle fairly quickly after four to five exposures, which aligns with usage-based theory of language processing.	2, Read, Exp, Station, Lab, Ling, Viewing behavior

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Year	References	Annotations	Study characteristics
2021	Esteve-Gibert, N., & Muñoz, C. (2021). Preschoolers benefit from a clear sound-referent mapping to acquire nonnative phonology. *Applied Psycholinguistics, 42*(1), 77–100. https://doi.org/10.1017/S0142716420000600	This study examines the learning of foreign phonological contrasts in preschool children. Four- and five-year-olds were trained on a computer to discriminate L3 English speech sounds, either: (1) with speech containing visual information (e.g., lip configuration), (2) with speech and an explicit sound-referent mapping, or (3) with speech delivered in a socially engaging manner. Provision of an explicit sound-referent mapping led to the best sound discrimination at the delayed posttest, especially in four-year-olds, and results from eye tracking suggested that the children looked at the object of reference when exposed to novel phonological input.	2, MM, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2021	Gangopadhyay, I., & Kaushanskaya, M. (2021). Word learning in monolingual and bilingual children: The influence of speaker eye-gaze. *Bilingualism: Language and Cognition, 24*(2), 333–343. https://doi.org/10.1017/S1366728920000565	**Gangopadhyay and Kaushanskaya** tested the hypothesis that bilingualism might make speakers more attuned to social-pragmatic cues such as speaker eye gaze in language learning contexts. Four- and five-year-old, monolingual and bilingual children were taught six novel labels and their objects: three novel words where the speaker looked at the referent object both times during the two presentations and another three words where the speaker looked only during the initial presentation. Contrary to the research hypotheses, monolingual children learned the novel vocabulary better than bilingual children. Differences in attention to speaker gaze during training were subtle.	2, VWP, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2021	Lindberg, R., McDonough, K., & Trofimovich, P. (2021). Investigating verbal and nonverbal indicators of physiological response during second language interaction. *Applied Psycholinguistics, 42*(6), 1403–1425. https://doi.org/10.1017/S014271642100028X	**Lindberg et al.** analyzed data from the Corpus of English as a Lingua Franca Interaction (CELFI) to identify verbal and nonverbal features of anxiety during L2 interaction. Interlocutors' eye gaze was recorded while they performed a face-to-face, paired communicative task and coded for instances of gaze aversion, blinking, glancing away, and mutual eye gaze (see McDonough et al., 2015). The authors found that learners experiencing anxiety during a communicative task tended to glance away and blink more frequently (vs. learners who did not).	3, MM, Ex post facto, Station, Lab, Interact

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Year	References	Annotations	Study characteristics
2021	Pellicer-Sánchez, A., Conklin, K., & Vilkaitė-Lozdienė, L. (2021). The effect of pre-reading instruction on vocabulary learning: An investigation of L1 and L2 readers' eye movements. *Language Learning, 71*(1), 162–203. https://doi.org/10.1111/lang.12430	**Pellicer-Sánchez et al.** broadened the scope of vocabulary learning research by examining what happens to the real-time processing of target words embedded in texts when their meanings are pretaught. Results on vocabulary posttests suggested that explicit pre-reading activities on word meaning followed by text reading led to greater vocabulary learning gains than text reading only. Eye-movement data on in-text encounters showed no differences between the two groups, but PELLICER-SÁNCHEZ ET AL. (2022) came to a different conclusion in a reanalysis of the same data set.	2, Read, Exp, Station, Lab, Ling, Instruction
2021	Prichard, C., & Atkins, A. (2021). Evaluating the vocabulary coping strategies of L2 readers: An eye tracking study. *TESOL Quarterly, 55*(2), 593–620. https://doi.org/10.1002/tesq.3005	This is one of the first studies using eye tracking to investigate language use strategies for dealing with unknown vocabulary in a text. Participants read texts embedded with unfamiliar words for which there was a dictionary link providing definitions (although the words were not marked as hyperlinked in the text). Participants clicked on the words to access the definitions often, and non-selective use of the dictionary was found to be detrimental to text comprehension. In contrast, time spent reading the definitions and reviewing the corresponding sentences in the text did predict text comprehension. These results highlight the need for developing learners' strategic competence in dealing with unknown vocabulary during reading.	3, Read, Obs, Station, Lab, Ling, Instruction, Viewing behavior
2021	Ranalli, J. (2021). L2 student engagement with automated feedback on writing: Potential for learning and issues of trust. *Journal of Second Language Writing, 52*, 100816. https://doi.org/10.1016/j.jslw.2021.100816	**Ranalli** investigated how L2 writers use the feedback provided by grammar check functionalities that are available as a plug-in in commercial word-processing software. In addition to interview data, the author recorded the participants' eye movements as they worked through the automated feedback on their writing, which provided the basis for subsequent stimulated recall. Results suggested that the learners tended to use the feedback as a tool to facilitate proofreading, rather than engage with the feedback for their own learning.	3, Write, Obs, Station, Lab, Ling, Instruction, Viewing behavior

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Year	References	Annotations	Study characteristics
2021	Wiener, S., Ito, K., & Speer, S. (2021). Effects of multitalker input and instructional method on the dimension-based statistical learning of syllable-tone combinations: An eye-tracking study. *Studies in Second Language Acquisition, 43*(1), 155–180. https://doi.org/10.1017/S0272263120000418	In this four-day training study, **Wiener et al.** examined the role of speaker variability and explicit instruction in statistical learning of syllable-tone co-occurrence in an artificial language mimicking Mandarin. Participants were trained with auditory stimuli from one speaker or four speakers, and in either the no-instruction or explicit instruction group. On day four, participants, even without explicit instruction, were found to look at a competitor image (which did not match the acoustic input, but was more probable), suggesting they had become sensitive to (i.e., learned) the syllable-tone probabilities in the training input. Learners who received variable input developed greater sensitivity than those trained by a single speaker.	2, VWP, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2022	Benati, A. (2022). The effects of structured input and traditional instruction on the acquisition of the English causative passive forms: An eye-tracking study measuring accuracy in responses and processing patterns. *Language Teaching Research, 26*(6), 1231–1251. https://doi.org/10.1177/1362168820928577	**Benati**, like Wong and Ito (2018) in their first experiment, investigated the use of structured input, the practice component of processing instruction, to help learners make the correct form-meaning mappings when processing causative sentences. Learners received either structured input or drill-based instruction before completing an auditory picture selection task with eye tracking. Learners receiving structured input (but not those in the traditional instruction group) were more accurate in selecting the correct picture after training. The online processing data for both groups continued to show a bias towards the picture incorrectly depicting the first noun as the agent of the sentence, with a possible small shift in the processing instruction group after training. The author took this finding as evidence for the effectiveness of structured input.	2, VWP, Exp, Station, Lab, Ling, Instruction

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Year	References	Annotations	Study characteristics
2022	Cappellini, M., Holt, B., & Hsu, Y. Y. (2022). Multimodal alignment in telecollaboration: A methodological exploration. *System, 110*, 102931. https://doi.org/10.1016/j.system.2022.102931	This is the first study to investigate multimodal alignment, or alignment across different levels of communication, with eye tracking. Language learners engaged in peer-to-peer or tutor-learner telecollaborations in a videoconferencing environment. An eye tracker filmed their eye movements and an external camera captured contextual information such as hand gestures. In addition to analysis of lexical alignment (see also MICHEL & O'ROURKE, 2019) and structural alignment, the authors also used a semi-automated algorithm to classify facial expressions into emotion types. The authors found that it was rare for the interlocutors to align in two or three modalities (i.e., lexical, structural, and facial) simultaneously, but when multimodal alignment occurred, facial expressions were nearly always involved.	2, MM, Obs, Station, Lab, VideoCam, WebCam, Ling, Interact
2022	Ito, K., & Wong, L. (2022). Sometimes less is more: The effects of phonetically variable input on auditory processing instruction for L2 French. *Studies in Second Language Acquisition, 44*(4), 1045–1070. https://doi.org/10.1017/S027226312100084X	In a new iteration of their research paradigm on processing instruction (see ITO & WONG, 2019; WONG & ITO, 2018), the authors examined the effects of amount of structured input (24, 48, or 96 trials) and acoustic variability on the acquisition of the French causative construction. They replicated their earlier results that auditory structured input improved offline sentence interpretation (ITO & WONG, 2019) and presented evidence that structured input changed learners' online processing after short and medium-length (but not long) training. Acoustic variability interacted in complex ways with length of training, but overall it did not hinder instructional effectiveness.	2, VWP, Exp, Station, Lab, Ling, Instruction

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Year	References	Annotations	Study characteristics
2022	Kang, H., Kweon, S.-O., & Choi, S. (2022). Using eye-tracking to examine the role of first and second language glosses. *Language Teaching Research, 26*(6), 1252–1273. https://doi.org/10.1177/1362168820928567	**Kang et al.** investigated vocabulary learning from reading with L1 or L2 glosses on the bottom margins of the texts (also see WARREN ET AL., 2018). Both types of glosses promoted better recall of the target words' meanings (vs. a no-gloss condition). An interesting finding was that the underlying attentional mechanisms for establishing new form-meaning mappings may differ for glossed and unglossed texts. Correlation analyses suggested a strong relationship between reading times on the in-text target words and vocabulary learning only for learners who read the unglossed texts, indicating that when L1 or L2 definitions are provided as textual glosses, learning outcomes depend less on the amount of attention paid to the in-text target words and other factors may need to be considered as well.	2, Read, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2022	Liao, S., Yu, L., Kruger, J., & Reichle, E. (2022). The impact of audio on the reading of intralingual versus interlingual subtitles: Evidence from eye movements. *Applied Psycholinguistics, 43*(1), 237–269. https://doi.org/10.1017/S0142716421000527	These authors examined the reading of subtitles/captions in the L1 or the L2 (also see BISSON ET AL., 2014) under conditions that made the subtitles/captions more or less indispensable to achieve comprehension. When both the audio and subtitles were in the viewers' native language, viewers spent less time on post-lexical processing (i.e., less time integrating subtitled word meanings into sentences to create a situation model, presumably because they did not need the subtitles as much). Audio in the target language, on the other hand, enhanced such post-lexical processing. The authors expanded on their multimodal integrated language-processing framework. They highlighted the importance of metacognitive strategies, such as monitoring comprehension and making flexible use of different information sources in multimodal language-processing tasks to achieve comprehension.	2, Read, MM, Exp, Station, Lab, Ling, Viewing behavior, Instruction

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Year	References	Annotations	Study characteristics
2022	Nassif, L., Huntley, E., & Mohamed, A. (2022). Attention to verbal morphology in L2 Arabic reading: An eye-movement study. *Foreign Language Annals, 55(3)*, 769–792. https://doi.org/10.1111/flan.12644	**Nassif et al**. extended the research by GODFROID AND UGGEN (2013) on incidental learning of novel verb morphology to the relatively understudied context of L2 Arabic. Participants read pairs of sentences embedded with different verb types that exemplified either stem-stable (sound) or stem-changing (geminate) verb conjugations. Results suggested that reading times for the two verb types were largely similar. Participants also did not report noticing geminate verbs. These findings, which differed from the results for L2 German in GODFROID AND UGGEN (2013), may help to explain the difficulties that L2 Arabic learners encounter in learning not only a new conjugation system but also a new alphabet.	2, Read, Exp, Station, Lab, Ling, Viewing behavior, Instruction
2022	Pellicer-Sánchez, A., Conklin, K., & Vilkaitė-Lozdienė, L. (2022). (Re)Examining the benefits of pre-reading instruction for vocabulary learning. *TESOL Quarterly, 56*(1), 363–375. https://doi.org/10.1002/tesq.3058	This study represents a re-analysis of data published in PELLICER-SÁNCHEZ ET AL. (2021). The authors further investigated the effects of pre-reading vocabulary instruction, while newly accounting for the difference in initial exposure to target words between the pre-reading group (who received two additional exposures before the reading) and the reading-only group. Results supported the use of pre-reading vocabulary instruction as an attention-drawing technique: given an equal number of exposures to the target words, readers who are pretaught the novel words' meanings pay more attention to them during reading than those who encounter the words during reading only.	2, Read, Exp, Station, Lab, Ling, Instruction
2022	Révész, A., Michel, M., Lu, X., Kourtali, N., Lee, M., & Borges, L. (2022). The relationship of proficiency to speed fluency, pausing, and eye-gaze behaviors in L2 writing. *Journal of Second Language Writing, 58*, 100927. https://doi.org/10.1016/j.jslw.2022.100927	These authors expanded on their previous mixed-methods research concerning integrated and independent writing tasks (MICHEL ET AL., 2020). In this new analysis of the dataset, they examined how L2 proficiency and writing stage affect speed fluency, pausing and pause-related cognitive processes, and eye-gaze behaviors during L2 writing. The authors confirmed evidence for a positive link between L2 proficiency and (writing) speed fluency. They also showed that more proficient L2 users engaged in more monitoring towards the end of the writing task.	3, Write, Obs, Station, Lab, Ling, Viewing behavior

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Year	References	Annotations	Study characteristics
2022	Wang, A., & Pellicer-Sánchez, A. (2022). Incidental vocabulary learning from bilingual subtitled viewing: An eye-tracking study. *Language Learning, 72*(3), 765–805. https://doi.org/10.1111/lang.12495	This study advances our understanding of L2 vocabulary learning from watching captioned media (Montero Perez et al., 2015) by exploring, for the first time, the use of bilingual subtitles, featuring two lines of subtitles (L1 captions on one line and L2 subtitles on the following line). Results showed that bilingual subtitles are more beneficial for the learning of new word meanings than other subtitling options, yet less effective than captions for learning word forms. Consistent with this view, viewers spent more time reading the L1 subtitles (that have the translations of the words' meanings) than the L2 captions (that show the L2 word forms) when both were available to them. Attention paid to the English target words, but not the translation, in the bilingual subtitles predicted learning gains.	2, Read, MM, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2022	Yi, W., & DeKeyser, R. (2022). Incidental learning of semantically transparent and opaque Chinese compounds from reading: An eye-tracking approach. *System, 107*, 102825. https://doi.org/10.1016/j.system.2022.102825	**Yi and DeKeyser** built on existing research on incidental vocabulary acquisition from reading (e.g., Godfroid et al., 2013) by examining the impact of semantic transparency – a key lexical property of compounds across languages – on vocabulary learning. Learners of Chinese read stories containing both transparent and opaque compounds, each appearing six times in the texts. The researchers found that transparent compounds were easier to learn than opaque ones. Additionally, compound reading times were associated with vocabulary gains for both transparent and opaque compounds.	2, Read, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2023	Jung, J., & Lee, M. (2023). Second language reading and recall processes under different reading purposes: An eye-tracking, keystroke-logging, and stimulated recall study. *Language Awareness, 32*(2), 278–300. https://doi.org/10.1080/09658416.2022.2069251	**Jung and Lee** continued their mixed-methods research examining the influence of reading purpose on reading behavior, following previous work by Jung and Révész (2018) and Lee and Jung (2021). Two groups of Korean EFL learners were instructed to read a text for different purposes, namely read-to-skim or read-to-learn. Reading purpose had a substantial impact on reading behavior, whereby those instructed to read the text to learn engaged in a slower, more careful reading (longer fixations, shorter eye movements) than those who skimmed the text. The reading-to-learn group also produced more detailed summaries after the reading, suggesting a link between reading and recall processes.	3, Read, Obs, Station, Lab, Ling, Instruction, Viewing behavior

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Year	References	Annotations	Study characteristics
2023	Puimège, E., Montero Perez, M., & Peters, E. (2023a). Promoting L2 acquisition of multiword units through textually enhanced audiovisual input: An eye-tracking study. *Second Language Research, 39*(2), 471–492. https://doi.org/10.1177/02676583211049741	The authors drew together eye-tracking research on input enhancement, captioned media, and vocabulary learning (see MONTERO PEREZ ET AL., 2015) and extended it to the acquisition of multi-word units (see also PUIMÈGE ET AL., 2023b). Participants watched captioned videos containing target multi-word units, with half of the units underlined and the other half not. Eye-tracking data indicated that learners paid more visual attention to the underlined items compared to the unenhanced ones. This increased attention, more so than input enhancement per se, translated to better form recall performance in the posttest.	2, Read, MM, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2023	Puimège, E., Montero Perez, M., & Peters, E. (2023b). The effects of typographic enhancement on L2 collocation processing and learning from reading: An eye-tracking study. *Applied Linguistics, 45*(1), 88–110. https://doi.org/10.1093/applin/amad003	These authors aimed to explore the potential of input enhancement for learning multi-word units during reading (see also PUIMÈGE ET AL., 2023a, for a related study on caption viewing). A notable feature of the study design was that only the first exposure to the target collocation was enhanced through bolding, while subsequent exposures were not, mirroring how input enhancement is commonly used in textbooks but not necessarily in research. Eye-movement data suggested that the effects of input enhancement (e.g., longer total reading times) were local and short-lived; they did not carry over to later, unenhanced exposures to the same target collocation in the text. Together with the results from the vocabulary posttests, the findings indicate that input enhancement did not induce the conscious attention to form believed to be necessary for explicit learning and memory.	2, Read, Exp, Station, Lab, Ling, Instruction, Viewing behavior
2023	Révész, A., Stainer, M., Jung, J., Lee, M., & Michel, M. (2023). Using eye-tracking as a tool to develop lexical knowledge. *Language Learning & Technology, 27*(1), 1–22. https://hdl.handle.net/10125/73537	These researchers demonstrated the potential of eye tracking as an interactive, educational tool in SLA thanks to the use of the gaze-contingent eye-tracking paradigm. Results suggested that learners spent more time in the interactive glossing condition, where glosses were highlighted reactively based on reading behavior (i.e., only when readers skipped them), yet interactive glossing did not lead to greater gains in word recognition.	3, Read, Exp, Station, Lab, Ling

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Year	References	Annotations	Study characteristics
2023	Schmidtke, D., Rahmanian, S., & Moro, A. (2023). Tracking reading development in an English language university-level bridging program: Evidence from eye-movements during passage reading. *Bilingualism: Language and Cognition, 26*(2), 356–370. https://doi.org/10.1017/S1366728922000542	This study is a rare example of how eye-tracking methodology can be utilized in a university-level bridging program (a pre-university intensive English program) to address real-world curricular questions about instructional effectiveness. Over 400 Chinese international students, representing three successive cohorts, read six stories at the beginning and end of their eight-month-long intensive English program. Results overall supported the effectiveness of the bridging program for reading skill growth in terms of both reading comprehension and reading fluency.	2, Read, Exp, Station, Lab, Ling, Viewing behavior
2023	Sonbul, S., El-Dakhs, D. A. S., Conklin, K., & Carrol, G. (2023). "Bread and butter" or "butter and bread"? Nonnatives' processing of novel lexical patterns in context. *Studies in Second Language Acquisition, 45*(2), 370–392. https://doi.org/10.1017/S0272263122000237	This study extends Conklin and Carrol's research (Conklin & Carrol, 2021) on the acquisition of binomials (e.g., salt and pepper, rather than pepper and salt) from native speakers to L1 Arabic–L2 English speakers. Similar to the findings with English native speakers in Conklin and Carrol (2021), L2 speakers (with L1 Arabic) became attuned to word co-occurrences in the first few encounters with novel binomials in a short reading text. However, unlike native speakers, these L2 learners treated the reverse form (e.g., pepper and salt, for salt and pepper) as another encounter of the same binomial. This suggests that different aspects of binomial knowledge may develop at different rates.	2, Read, Obs, Station, Lab, Ling
2024	Elgort, I., Wetering, R., Arrow, T., & Beyersmann, E. (2024). Previewing novel words before reading affects their processing during reading: An eye-movement study with first and second language readers. *Language Learning, 74*(1), 78–110. https://doi.org/10.1111/lang.12579	**Elgort et al.** investigated the roles of vocabulary preview (before reading) and review (after reading) as potential techniques to familiarize students with technical vocabulary in general education contexts. Compared to the vocabulary pre-teaching study by Pellicer-Sánchez et al. (2021, 2022), L1 and L2 readers in this study viewed definitions of novel vocabulary before or after a reading task but they did not memorize them. Different from pre-teaching, which enhanced attention in Pellicer-Sánchez et al. (2022), previewing reduced the amount of attention paid to the target words during reading, and it was more beneficial for L2 readers than L1 readers. Without a vocabulary preview, L2 readers spent longer on the target words during reading even after they had encountered them previously in the text.	2, Read, Exp, Station, Lab, Ling, Instruction, Viewing behavior

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Year	References	Annotations	Study characteristics
2024	Lee, M., & Jung, J. (2024). Effects of textual enhancement and task manipulation on L2 learners' attentional processes and grammatical knowledge development: A mixed methods study. *Language Teaching Research, 28*(4), 1552–1571. https://doi.org/10.1177/13621688211034640	This reading study confirmed the beneficial effects of textual input enhancement on attention during reading (e.g., WINKE, 2013) while also examining the combined effect of input enhancement and task characteristics. Extending the work by JUNG AND RÉVÉSZ (2018), Korean EFL learners read an opinion news article, either with the instruction to engage in an argumentative task (careful reading group) or quickly, to get the gist (expeditious reading group). Results suggested that careful reading and visually enhanced input resulted in greater learner attention than expeditious reading and unenhanced text, but the two variables did not interact. Comments from stimulated recall provided insight into learners' reading and noticing behaviors.	3, Read, Exp, Station, Lab, Ling, Instruction, Viewing behavior

Aline Godfroid is Professor in Second Language Studies and TESOL at Michigan State University, where she co-directs the Second Language Studies Eye-Tracking Lab. She specializes in cognitive processes in second language acquisition, L2 psycholinguistics, eye-tracking, vocabulary acquisition, and quantitative research methods. In her research, she seeks to build bridges between psychology, psycholinguistics, second language acquisition, and real-world second language learning. Aline is currently an Associate Editor of *Language Learning* and Vice President of the European Second Language Association. She is the author of *Eye tracking in second language acquisition and bilingualism* (Routledge, 2020) and the co-editor (with Holger Hopp) of *The Routledge handbook of second language acquisition and psycholinguistics* (2023).

Bronson Hui is Assistant Professor of Second Language Acquisition at the University of Maryland. His main research interests are vocabulary acquisition, applied psycholinguistics, and quantitative research methods. His publications have appeared in international, peer-reviewed journals, such as *Studies in Second Language Acquisition, Language Learning, Applied Psycholinguistics*, and *The Modern Language Journal*, among other venues. He also serves on the editorial boards of *Studies in Second Language Acquisition* and *TESOL Quarterly*. He is associate editor of *Digital Studies in Language and Literature.*

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