

Audiobooks Decomposed: Toward a Psycholinguistic Account of the Benefits of Reading-while-Listening for Comprehension

Abstract

We propose a study to investigate potential effects of audiobooks on verbal comprehension and the role of orthographic decoding and segmentation skills as individual differences factors. Eighty-four intermediate to advanced Chinese learners of English will read (Reading-Only [RO]), read and listen (Reading-While-Listening [RWL]), and listen (Listening-Only [LO]) to excerpts of a novel. They are exposed to the experimental text only once, but experience different parts of the text under each of the three conditions. Participants' orthographic decoding and segmentation skills will be measured by reading times obtained through eye tracking and a shadowing task, respectively. We hypothesize that the advantages of RWL for comprehension, in relation to RO and LO, will be clearest for readers with weaker orthographic decoding skills and listeners with weaker segmentation skills, and may find their origin in the capacity of RWL to enhance language users' orthographic decoding and segmentation skills.

Introduction

Audiobooks simultaneously present spoken and written input to second language (L2) learners. Language teachers have been encouraged to allow students to read and listen to a text simultaneously as a “principle” to guide a successful reading and listening program (Renandya & Jacobs, 2016, p. 106). The belief behind this is that reading-while-listening (RWL) can “help

lower proficiency L2 learners achieve greater comprehension” (Renandya & Jacobs, 2016, p. 106). A number of pedagogically-oriented researchers have compared the effects of RWL to mostly reading-only (RO) conditions. For example, relative to RO, RWL has been found to promote vocabulary learning (e.g., Brown, Waring, & Donkaewbua, 2008; Malone, 2018; Tragant-Mestres, Llanes-Baró, & Pinyana-Garriga, 2019; Webb & Chang, 2015), reading rates (e.g., Chang & Millett, 2015; Taguchi, Takayasu-Maass, & Gorsuch, 2004), reading development (Beglar, Hunt, & Kite, 2012; Chang & Millett, 2015), and positive attitudes towards reading (Lightbown, 1992; Renandya & Jacobs, 2016; Tragant & Vallbona, 2018). However, support for RWL’s efficacy in promoting comprehension has been less consistent (as discussed in detail below). These mixed results suggest that RWL may not be helpful in all circumstances, but rather may interact with learner factors, such as learners’ basic reading and listening skills, to shape comprehension.

Of note, most previous studies were not designed to examine the psycholinguistic mechanisms underlying the potential advantage of RWL. Although extant findings are informative for practitioners, the results remain largely silent on *why* exactly audiobooks could have generally favorable effects and *for whom* they might be more beneficial. Consequently, drawing on work from another strand of bimodal input, namely captions research (Charles & Trenkic, 2015; Mitterer & McQueen, 2009), we hypothesize that reading-while-listening can assist reading and/or listening by supporting lower-level component processes (e.g., orthographic decoding and segmentation of the sound stream). Hence, RWL’s advantage for comprehension could depend on the learner’s specific decoding profile in reading (i.e., their orthographic decoding) and listening (i.e., segmentation). Our overall aim is to investigate the nature of RWL’s beneficial effects at these lower-level processes and at the level of propositional

comprehension in light of learners' individual profiles. The results, in turn, will strengthen our theoretical understanding of RWL's presumed pedagogical benefits and may help to ensure RWL is used with those learners who are most likely to benefit from it.

Background Literature

Audiobooks allow learners to simultaneously read and listen to the same text, receiving concurrent written and auditory input. In developmental research, RWL has been found to promote native language (L1) literacy and assist struggling readers in reading development (e.g., Koskinen et al., 2000; Montali & Lewandowski, 1996; Rasinski & Hoffman, 2003; Reitsma, 1988). For children learning to read in their L1, RWL (or the provision of an additional audio model) assists the development of a mapping system that allows the child to establish correspondence between graphemes and phonemes, the latter being more established in the child's mind than the former (e.g., Ehri, 1992; Goswami & Bryant, 1990; Snowling, 2000). A well-developed grapheme-to-phoneme conversion system, which tends to be more manifest in learners with high phonemic awareness, can then support generalization of reading from familiar to unfamiliar words (e.g., Harm & Seidenberg, 1999; Nation & Snowling, 2004) and, more generally, facilitate reading development. However, one question to ask is the extent to which RWL as a form of reading assistance is relevant to L2 learners as well, especially when phonemic representations are not necessarily as well established in L2 readers as when learning to read in one's L1, and sometimes lag behind graphemic knowledge. Although L1 and L2 development may not always follow the same trajectory in this way, L2 researchers have found some fairly consistent benefits of RWL in promoting vocabulary learning (e.g., Malone, 2018), reading rates (e.g., Chang & Millett, 2015), and positive attitudes towards reading (e.g., Tragant & Vallbona, 2018). At the same time, research focusing on comprehension as a result of RWL

has yielded less consistent patterns, with authors reporting beneficial effects (Amer, 1997; Dhaif, 1990; Taguchi, Gorsuch, Takayasu-Maass, & Snipp, 2012; Woodall, 2010), null effects (Tragant-Mestres et al., 2019), and detrimental effects (Diao & Sweller, 2007) of RWL on comprehension.

Unveiling the Roots of Benefits of Reading-While-Listening

We consider two potential sources of any benefit observed of RWL: support provided to orthographic decoding (compared to reading-only) and support provided to segmentation (compared to listening-only).

Comparing Reading-While-Listening With Reading-Only.

One possible cause of the inconsistency in the research base is that researchers to date have not yet built a sufficiently robust theoretical account of *why* RWL should have a beneficial effect on comprehension. Since work in this area has been pedagogically oriented, the psycholinguistic basis of RWL's advantage is not well understood. For example, in examining the effect of RWL on university-level L2 English learners in Puerto Rico, Woodall (2010) divided his participants into an experimental ($n = 69$) and a control group ($n = 68$). Over the course of eight weeks, the experimental group simultaneously listened to and read the audiobook version of an English novel (*Charlotte's Web*). In contrast, the control group was only able to silently read the same print text without access to the audio model. Eight end-of-class quizzes targeting comprehension of general and specific ideas from the book as well as vocabulary showed superior performance by the experimental group. To account for his results, Woodall (2010) argued that "these basic-level readers of L2 English can devote more of their processing capacity to comprehension if they are freed from using those mental resources for orthographic decoding [as a result of the

provision of the audio model]” (p. 196). In other words, the author suggested that RWL assisted reading by the audio input compensating for weaker orthographic decoding.

If Woodall’s argument holds, the psycholinguistic basis for RWL’s benefits on reading would be that the audio model assists reading by supporting the lexical (as opposed to the sub-lexical) route of segmentation (e.g., Coltheart, 2005). Those with weaker orthographic decoding skills (e.g., as a result of difficulties with grapheme-phoneme correspondences) may be helped in comprehension because the audio allows them to access words holistically via the lexical route. Retrieving words via the sub-lexical route, on the other hand, is a cognitively demanding process that entails relating orthographic segments to phonological ones (Coltheart, 2005). The sub-lexical route is in fact the default in beginning readers (Coltheart, 2005). Therefore, if the provision of an audio model during reading could enable L2 learners to bypass sub-lexical processing in favor of lexical access, this support would indeed be a substantial help.

In line with this account, RWL has been said to provide an audio model with prosody that facilitates phonological encoding and alleviates the burden on the reader’s own decoding of the orthographic information (Rayner, Pollatsek, Ashby, & Clifton, 2012; Taguchi, Gorsuch, Lems, & Rosszell, 2016). This suggests that the learner’s orthographic decoding skills are a key consideration in investigating the effects of RWL on comprehension. Specifically, the cognitive mechanisms underlying RWL, as described by these authors, appear to be most relevant to poorer readers whose orthographic decoding skills are comparatively less developed. Good readers, who can decode orthographic information (i.e., from print to sound to meaning) efficiently, may not need help with lexical access. In other words, adding audio to the text may be beneficial only for readers who struggle to decode orthographic information themselves. Consistent with this account, Kořak-Babuder, Kormos, Ratajczak, and Piřorn (2019) recently

demonstrated how RWL can assist with language comprehension specifically in young L2 learners with dyslexia who struggle with orthographic decoding; in contrast, adding the audio made less of a difference for typically developing learners in their study.

Examining potential differential effects of RWL on comprehension (relative to RO) based on readers' orthographic decoding skills is thus one way to unveil the psycholinguistic mechanisms that may underlie RWL's benefits. If relatively weaker orthographic decoders comprehend a text disproportionately better in RWL (than RO) than relatively stronger decoders do, this would suggest that RWL assists with comprehension because it supports orthographic decoding in those who need it (i.e., the weaker decoders). In statistical terms, researchers should expect an interaction between condition (i.e., RWL vs. RO) and orthographic decoding capacity. Such interactions between condition and participant characteristics are a common point of interest in individual difference research, where researchers draw on Aptitude \times Treatment interactions, for instance, to make inferences about the nature of the treatment (e.g., Yilmaz & Granena, 2019). As DeKeyser (2012) noted, "the interaction not only tells us about the importance of the internal (individual difference) variable, the external (treatment) variable, and their joint impact on the outcome variable, but also about the process that links them" (p. 190). Hence, in this study, a Condition \times Orthographic Decoding interaction would underscore the importance of a reader's orthographic decoding skills in understanding the benefits of RWL for comprehension.

An interaction with an individual difference variable may not provide the full picture, however. For one thing, the moderation analysis to test this interaction considers only participants' baseline orthographic decoding skills in the RO condition. The results remain silent on if and how orthographic decoding would change with the addition of an audio model in the

RWL condition. The individual differences design is also correlational in nature and as such, the results are vulnerable to the undue influence of confounding variables. For instance, it could be the case that general L2 proficiency is the true factor that underlies the benefits of RWL for text comprehension, and that general L2 proficiency correlates with readers' orthographic decoding skills. To bolster the evidence for a causal link between RWL, orthographic decoding, and text comprehension, further support that is not correlational in nature would certainly be helpful. To this end, we also propose to compare readers' orthographic decoding in the RWL *vs.* RO conditions directly. This additional analysis will take advantage of the experimental manipulation in the study (i.e., RO *vs.* RWL) and the fact that the same participants take part in both the RO and RWL parts of the study (for details of the experimental design, see Figure 1 below). Hence, any confounding variables such as the participants' L2 proficiency level will be controlled, and the evidence will no longer be correlational in nature. If RWL exerts its benefits on comprehension through serving orthographic decoding, as we hypothesized based on earlier claims (e.g., Woodall, 2010), then we predict that orthographic decoding will be more efficient (i.e., faster) in the RWL than the RO condition. The results can verify or falsify earlier claims (e.g., Woodall, 2010), reviewed above, that RWL frees up cognitive resources for orthographic decoding, which can then be diverted to higher-level language processing, including the comprehension of the propositional meaning of a text.

Comparing Reading-While-Listening with Listening-Only.

Listening is likely to be an integral part of RWL: to benefit from an audio model during reading, L2 users may need to have attained a certain level of listening ability. In literacy acquisition, L1 readers often have strong oral language skills (listening and speaking) but need instruction to

establish sound-letter correspondences for reading and writing (literacy). However, when working with adult L2 learners, as in this study, the component lower-level processes in listening (i.e., segmentation of the sound stream into words, phrase, and sentences) may need to be considered, along with orthographic decoding, in order to fully understand for what learner profile(s) RWL will be most beneficial, as instructed L2 learners rarely have highly established oral language skills prior to learning to read and write in the L2.

Few studies have examined the importance of listening in audiobook comprehension to date. This is why we turn to the captions literature as a potentially useful starting point for understanding the role of listening in the comprehension of bimodal input, despite some fundamental differences between captions and audiobooks. We first note these differences, in order to convey why it is worth asking whether (and not to be taken for granted that) audiobooks will have similar beneficial effects as captions.

First, captions are often used to assist listening (e.g., when watching videos), whereas reading-while-listening has generally been used in language pedagogy more as a means to aid silent reading (although language teachers also sometimes present transcripts of auditory input as a type of support for listening comprehension). Another key difference, highly relevant to the current study, concerns the synchronization of the two modalities. In captioned videos, chunks of written words are presented on the screen so they are broadly in sync with the audio. Readers of audiobooks, however, need to constantly use their cognitive resources to maintain synchronization themselves, and they may differ in how successfully they are able to do this as a result of their general L2 proficiency (Conklin et al., 2020). Nevertheless, both captioned videos and RWL present visual cues that can potentially influence lower-level processes in listening

such as speech perception and segmentation. Hence, whether RWL has the same benefits for comprehension as captions is truly an open question.

A fairly small number of studies have traced the benefits of captions to component skills of listening such as segmentation, defined as the ability to identify word boundaries in a speech stream (Birulés-Muntané & Soto-Faraco, 2016; Charles & Trenkic, 2015; Mitterer & McQueen, 2009). For example, Mitterer and McQueen (2009) reported evidence that listeners used the captions when watching video clips to accommodate to different accents (i.e., tuning in to the spoken language) as observed through better segmentation performance. Participants were university-level Dutch learners of English. They watched video clips with an unfamiliar Australian or Scottish accent with either L2 captions (i.e., broadly synced with the speech), L1 subtitles (i.e., not synced with the speech), or no subtitles/captions at all. The participants then performed a shadowing task (a test of segmentation) where they listened to excerpts from the video clips and needed to repeat the words they thought they had heard. Experimental items included both phrases that had occurred in the videos (old items) and those that had not (new items, spoken in the same accent). In line with the authors' expectations, the captions group demonstrated improvements in segmentation after exposure to L2 captions. Mitterer and McQueen concluded that the captions helped learners "to retune their perceptual categories to characteristics of the exposure speakers" (p. 4) and adjust their phonetic categories accordingly.

Of particular relevance here is that the role of captioning in listening was demonstrated by measuring its direct effects on a lower-level listening process, namely word segmentation. As previously argued, it is an open question whether written input similarly supports segmentation processes in the context of audiobooks, when audiobooks do not sync the audio with the appearance of the text as do captions. That is, it seems worthwhile to investigate whether

audiobooks can similarly enhance lower-level listening processes (i.e., segmentation) compared to listening-only input as captioned videos do. If it can, researchers should expect not only a direct effect of RWL on segmentation (compared to LO), but also that RWL be particularly helpful for, or perhaps only helpful for, listeners with comparatively weaker segmentation skills than others.

In sum, there is a need for reading-while-listening research to consider the component processes involved in unimodal reading or listening as the direct beneficiaries of reading-while-listening. To our knowledge, this study will be the first to examine the benefits of audiobooks taking into account the component reading and listening processes. To this end, we propose to conduct a three-way comparison: RO *vs.* RWL *vs.* LO. In doing so, we will consider both sides of the bimodal coin (also see Brown et al., 2008; Charles & Trenkic, 2015), which will set the present study aside from most previous captions and audiobook studies, which have focused on either the LO/L+captions comparison (i.e., captions research) or the RO/RWL comparison (i.e., audiobook research). By adding the RWL *vs.* LO comparison, we will be able to shed light on both the direct effects of RWL on lower-level listening processes (i.e., segmentation) and the extent to which potential benefits of RWL for comprehension depend on the learner's detailed skill profile, following a similar logic as in the comparison of RWL *vs.* RO performance.

Focusing on propositional comprehension

Propositional comprehension refers to the understanding of propositions in a text, which are the “literal interpretation[s] of what is on the page [or in the aural text]” (Khalifa & Weir, 2009, p. 50, our addition). In the process of reading and listening, comprehenders build a mental model of meaning about the text which also encompasses processes such as inferencing and integration of new information into one's existing knowledge. Examining propositional comprehension

specifically is appropriate for the present study, because it enables us to bridge psychologically-oriented research and second language acquisition (SLA) and language assessment research. Psycholinguistic models of reading and listening (e.g., Cutler, 2012; Field, 2013; Grabe & Stoller, 2019; Khalifa & Weir, 2009) posit that propositional information is the product of lower-level processes that are often of interest to psychologists and psycholinguists (e.g., Birulés-Muntané & Soto-Faraco, 2016; Charles & Trenkic, 2015; Mitterer & McQueen, 2009). At the same time, propositional comprehension is itself the basis for further higher-level comprehension (e.g., understanding of gist and inferencing) which is of interest to many SLA, language assessment and education researchers (e.g., Andringa et al., 2012; Hui & Godfoid, in press; Vandergrift & Baker, 2015; Yamashita & Shiotsu, 2017). Importantly, psycholinguistic models of reading and listening predict that any potential benefits for lower-level processes should cascade up to the level of propositional comprehension (e.g., Cutler, 2012; Field, 2013; Grabe & Stoller, 2019; Khalifa & Weir, 2009). In sum, propositional comprehension may represent a key aspect of reading and listening comprehension on which psycholinguists, SLA researchers, education researchers, and language testers can converge, and as such is the level of comprehension that we examine here.

The Current Study

The main goal of the present study is to reveal the psycholinguistic mechanisms underlying the potential advantage of RWL for propositional comprehension. To this end, we consider comparative strengths and weaknesses in L2 users' profiles, relative to others in the study, by using the participants' baseline orthographic decoding and segmentation skills in the unimodal (RO and LO) conditions as individual difference variables. Additionally, we assess the potential, direct impact of bimodal (RWL) input on L2 users' lower-level reading and listening

processes, by examining whether participants' orthographic decoding differs in RWL *vs.* RO and whether their segmentation differs in RWL *vs.* LO. These comparisons can strengthen the claim that RWL benefits comprehension because it supports lower-level reading and listening processes, thus providing unique evidence on top of the individual differences analyses, which are designed to reveal primarily which participants are most likely to benefit from RWL. We formulated the following research questions (RQs) and predictions to guide the present study:

RQ1: To what extent do RWL's benefits for propositional comprehension compared to RO depend on the language user's orthographic decoding skills, when his or her speech segmentation skills are controlled for statistically?

Prediction 1: RWL will be more helpful for comprehension than RO, and more so for learners with weaker orthographic decoding skills than learners with more efficient orthographic decoding skills.

RQ2: To what extent does RWL influence learners' orthographic decoding speed compared to RO?

Prediction 2: Participants will decode words more efficiently in the RWL than the RO condition.

RQ3: To what extent do RWL's benefits for propositional comprehension compared to LO depend on the language user's speech segmentation skills, when his or her orthographic decoding skills are controlled for statistically?

Prediction 3: RWL will be more helpful for comprehension than LO, and more so for learners with weaker speech segmentation skills than learners with more efficient speech segmentation skills.

RQ4: To what extent does RWL influence learners' speech segmentation compared to LO?

Prediction 4: Participants will segment the speech stream more accurately in the RWL than the LO condition.

Methodology

Participants

We plan to have a final sample of 84 Mandarin-speaking Chinese undergraduate and graduate students in the US.² We will recruit additional participants to compensate for potential data loss due to participant exclusions (see Data Analysis below). The participants' age, gender, language background (i.e., first and additional languages, starting age of instruction, years of formal English education), length of residence in the US (in months), and self-rated English proficiency (on a 10-point Likert scale where 1 represents novice and 10 represents native-like), and standardized test scores for English (if available) will be reported in the Stage 2 manuscript. The participants are expected to be between B2 and C1 levels in the Common European Framework of Reference (CEFR) because they fulfil the admission requirement of the university site at which the study will be carried out; that is, an overall score of 79 or more on the Test of English as a Foreign Language–Internet-Based Test (TOEFL-iBT) or Band 6.5 or above in the International English Language Testing System (IELTS). Participants will receive either monetary compensation or extra credit for a course for their time. Ethical clearance will be obtained from the Institutional Review Board (IRB) in accordance with the University's regulations governing research involving human participants.

Materials

Experimental Text and the Audio

The participants will read, read-while-listen, and listen to three different excerpts from the novel *Crime and Punishment*. We selected *Crime and Punishment* as our experimental text from Lit2Go (<https://etc.usf.edu/lit2go/>), a website providing a free online collection of stories for use in the classroom. The experimental text was adapted from Part 1: Chapters 1 – 3 of the novel and contained a total of 2,932 words (see Appendix A). A vocabulary profile analysis (www.lextutor.ca) using the British National Corpus (BNC) 1-20k word family lists revealed that the 8-9k most frequent word families in the English language afforded a 97% lexical coverage of the text. As such, given that non-native-English-speaking PhD students know approximately 9,000 word families (Nation, 2012), we expect the current sample of participants will find the text slightly difficult, making it an adequate material for reading with audio support. In particular, the variance in comprehension of the text may provide sufficient opportunities for observing potential effects of bimodal input and/or lower-level processes. The experimental text was divided into three parts of similar length, which will be used to counterbalance the three input conditions in a within-subjects design: Reading-Only (RO), Listening-Only (LO), and Reading-While-Listening (RWL). Participants will be exposed to each part only once, but overall, across the whole text, they will experience all three input conditions (see Procedure below). There are no repeated exposures to any of the text parts. Since we will use an authentic, long text for this study, repetition of lexical items, especially high-frequency words, is unavoidable. This repetition raised the question of whether exposure to vocabulary in one condition/text part will influence the processing and comprehension of the same vocabulary in the next condition/text part (otherwise known as carryover effects). We deal with this possibility by using a fully counterbalanced research design, in which the order of the experimental conditions is varied between the participants (see Figure 1, for a visual representation, and

further details below). Counterbalancing will spread out carryover effects evenly across the different lists, such that across the whole participant sample any order effects of the experimental conditions will cancel each other out (Rose, McKinley, Baffoe-Djan, 2020). What we are left with, then, is the effect of different input conditions (RO, LO, RWL) on text processing and comprehension, in alignment with the stated goals of this study.

The audio narration of the text will be provided by a female American English native-speaking volunteer who has experience in teaching English as a second language in universities in the US. The speaker will be instructed to read aloud the text at a pace of approximately 140 words per minute, which corresponds to the average reading rate of university L2 learners of English as reported by Suk (2017). The recording will take place in a sound-proof studio using a professional microphone with a 44.1 kHz sampling rate. All sound files will be normalized in volume, and the pace of audio may be manipulated after the recording using Audacity, a sound editing software program, to ensure a similar and even pace across the three text parts.

Measures of Orthographic Decoding and Segmentation

In this study, we examine both orthographic decoding skills and segmentation skills through eye tracking and a shadowing task, respectively.

Eye-tracking Measures and Set-up. Participants will read, and read and listen to parts of the experimental text (see Procedure below) on an eye tracker which will record their eye movements during exposure. We will analyze the eye-movement data at the lexical level. To this end, we will use the content words that are not repeated across text parts ($k = 109$: 41 in Part 1, 33 in Parts 2, and 35 in Part 3) in the phrases that are selected for the shadowing task (see details below) as our targets for word-level analysis. Each of the 109 content words will represent one interest area (IA). In terms of specific eye-movement measures, we will use gaze durations (i.e.,

the sum of all fixations in the IA during first-pass reading) and total reading times (i.e., the sum of all fixations in the IA) to address the research questions. We use gaze durations to index early, automatic, and non-strategic reading processes such as lexical access and word recognition (Godfroid, 2020; Godfroid & Winke, 2015). We also use the hybrid measure of total reading times to reflect general reading skill. As an aggregate measure of both early and late measures, total reading time provides an overall index of how efficiently readers processed the text (Godfroid, 2020). These eye-movement measures will provide more fine-grained information about the participants' reading skills, including speed of lexical access and word recognition, compared with overall silent-reading speed timed by a stopwatch, for example. For both measures, we expect good orthographic decoders to show shorter durations than those with poorer decoding skills, hence we use these measures as measures of individual differences in L2 reading.

Apparatus set up largely follows previous eye-tracking research investigating reading in naturalistic contexts (Godfroid et al., 2018). We will use an EyeLink 1000 desk-mounted eye-tracking camera to record participants' eye movements (see accuracy and precision information in the manufacturer's manual). A chin and forehead rest, at a 66 cm distance from the screen, will be used to minimize head movements of the participant. To improve data quality, we will present the texts to the participant on a computer monitor with a resolution of 1920 x 1080 pixels, using Courier, a monospaced font, in size 18, with 2.0 line spacing against a white background. We will divide the text so that it appears across multiple screens. We estimate the entire reading experiment will encompass 32 text screens, with an average of 98 words per screen and between five and twelve lines of text per screen. These estimates are provided based on the display settings used in Godfroid et al., 2018, which we will adopt in the present study.

We will report the exact number of words and lines per screen in our Stage 2 manuscript, when we have regained access to the eye-tracking lab post COVID-19 lockdown. The number of words and lines per screen will be the same in the RO and the RWL conditions. To the extent that is possible, we will arrange the text such that the target words (and hence the IAs) are relatively centered on the screen (i.e., not in the first or last line and not at the beginning or end of a line).

In the silent RO condition, participants will control their own pace of reading, and they will proceed to the next screen by pressing a button on a Cedrus response pad. They will not be able to go back to previous screens, which we will explain to them prior to the experiment. In the RWL condition, the screen will automatically proceed to the next section together with the audio. Although this arrangement could potentially introduce a confounding effect of time on task, it will provide a clear assessment of how (or whether) bimodal input impacts on orthographic decoding and will mirror the way audiobooks are used in natural classroom contexts where learners seldom have control over the playing of the audio (e.g., Webb & Chang, 2015), and are allowed to read at their normal pace during silent reading activities. The first author, who will collect the data, will calibrate the eye tracker before the start of the RO and the RWL conditions (see Procedure below), totaling two calibrations. We will also recalibrate the eye tracker if needed during the recording. Data quality will be monitored continuously and with the help of a drift check point that will appear in between each text screen.

Shadowing Task.

We have modeled the shadowing task after the shadowing tasks used by Charles and Trenkic (2015) and Mitterer and McQueen (2009). To create the materials for the shadowing task, we selected 20 phrases from each of the three parts of the experimental text, totaling 60 phrases.

Each phrase consisted of three to eight words, of which one to three were content words. These content words serve as our scoring units (see scoring details below). The intact phrases are highlighted in Appendix A and separately presented in Appendix B. In choosing these phrases, we minimized the number of content words included in the phrases that were repeated across more than one text part. The (few) repeated content words that did have to be included in the phrases in the shadowing task will not be used as scoring units.

The shadowing task will be undertaken after the participants have experienced the RWL and LO conditions and will follow the comprehension test. The task requires participants to repeat all words in the phrases that have just been presented auditorily to them, word by word with brief pauses in between (see Appendix C for the scripted instructions). We will inform participants of the upcoming shadowing task before they begin reading and/or listening to the texts. The task will be programmed in Superlab. A warning tone is played to the participant 1000 ms before the stimulus onset. The stimulus (a spoken multi-word phrase) will then be played twice with a 1000 ms interval and the participant is visually prompted (with “repeat now” on the screen) to repeat the phrase out loud after the second presentation. The experiment will proceed to the next trial 4000 ms after the onset of the second presentation. All participant responses will be audio recorded.

Two native-speaking volunteers who are naïve as to the purpose of the study will score the participant responses for accuracy, using the content words in the phrase (e.g., nouns and verbs, as opposed to function words, e.g., prepositions) that are not repeated across text parts as scoring units ($k = 109$: 41 in Part 1, 33 in Parts 2, and 35 in Part 3; see scoring units bolded in Appendix B). Because the current task is designed to measure listeners’ ability to segment a continuous input stream into discrete lexical units, we will consider primarily the location of

pauses between the words when the participant repeats the phrases. Phonemic deviations and morphosyntactic errors may be accepted. Omission of phonemes is acceptable as long as the sound (consonant or vowel) immediately after the word in question (i.e., the onset of the next word) is rendered correctly and appropriately preceded by a pause. For example, *afterward disposed* instead of *afterwards disposed* is acceptable. If the error results in resegmentation, no score is awarded. For example, repeating *taking the pledge* as *take - in - the - pledge* or *slipped in* as *slip tin* will not receive credit for *taking* and *slipped*, because the participant did not establish the correct word boundary for the first word. Finally, if a content word is substituted by another content word (e.g., *house* instead of *door*), no point is awarded. These general rules will be explained in the training of raters and illustrated with actual examples from the participants' responses. After training, any cases of disagreement between the two raters will be resolved through discussion. The total accuracy on the task represents a participant's speech segmentation skills. All items will be pseudorandomized by Superlab in order to offset any ordering effects. Reliability information will be reported in our Stage 2 manuscript as follows: test reliability, in terms of Cronbach's alpha and McDonald's omega; interrater reliability in terms of % agreement and Cohen's Kappa.

Comprehension Measure

We will use a set of written, untimed multiple-choice (MC) comprehension questions to test participants' understanding of the text at the propositional level. In writing these questions, we considered Khalifa and Weir's (2009) model of reading and Field's (2013) model of meaning construction in listening. In particular, we focus solely on testing participants' ability to establish propositional (literal) meanings due to the reasons discussed in the Background Literature section above. There will be a total of 60 questions (20 for each part of the text). Each question

will have four options: one key and three distractors. A given answer option (e.g., answer option A) will be the key an equal number of times across all 60 questions, so the correct (intended) response will occur with equal likelihood in first, second, third, and fourth position. In order to further reduce guesses, an “I am not sure” option is provided as an additional, fifth option. We will inform participants of the upcoming comprehension tests before they begin reading and/or listening to the texts (see Appendix C for specific, scripted instructions for participants).

To establish the validity of our instrument, we conducted numerous rounds of revision and item validation, involving both authors and four native speakers. The first author initially drafted a set of questions. Two native speakers who were naïve to the purpose of the study independently attempted all questions without reference to the text. Both of these two native speakers chose “I am not sure” for all 60 questions, indicating that the questions tap into the content of the text (as opposed to general world knowledge). Then, we provided the text and asked them to attempt the questions again. Additionally, we asked them to underline, for each item, the exact, specific wordings in the text that motivated their choice of answers. We consider this to be a validation process confirming that the questions serve as a test of propositional comprehension. After the first round, the first author obtained feedback from the native speakers and revised two problematic items accordingly. The second author participated in the second round of review following the same procedure. No problematic items were identified, but minor revisions, such as a change in wordings for some items and/or distractors for improved clarity, were undertaken. After that, we asked two more native speakers to repeat the procedure, and they found no problematic items either (except for a minor editing suggestion for one item). In Appendix A, we also provide the exact location of the answers for readers’ ease of reference.

In terms of scoring, one point will be awarded for each correct answer. Each participant will have three sets of comprehension accuracy data (one for each condition), each of which contains 20 items. All items are presented in Appendix E. We will report the test's internal consistency using Cronbach's alpha and McDonald's omega in our Stage 2 manuscript.

Procedure

The experiment will take place one to one in the Second Language Studies eye-tracking lab at Michigan State University. The first author will explain the overall procedure and seek the participants' consent to take part in the study. Participants will first complete the linguistic background questionnaire. We will confirm that they are not familiar with the contents of the novel *Crime and Punishment* (i.e., have read it or seen a movie based on it before). At this point only the name of the novel will be mentioned. Neither the storyline nor any other information will be divulged. For the text exposure, the first author will assign participants to one of six counterbalanced groups that alternate sequentially between the three conditions (see Figure 1), using the participants' order of participation as a basis for group assignment. They will be instructed not to close their eyes during listening, especially under RWL conditions. Participants will read and/or listen to each part only once and will then switch to another condition for the next part of the novel according to their group assignment. Overall, at the end of the study, participants' comprehension will have been tested after all three exposure conditions, but they will not have been exposed to any part of the text more than once. Participants will be on the eye tracker in the RO and RWL conditions. After each exposure, participants will complete the relevant MC comprehension questions. After exposure and comprehension tests in the LO and RWL conditions, participants will also take part in the shadowing task. Finally, we will confirm once more that this experiment was the first time participants engaged with the novel *Crime and*

Punishment. We will also ask them to confirm that they did not close their eyes while listening to the text. Figure 1 graphically summarizes the entire procedure.

<Insert Figure 1 here>

Data Analysis

For all instruments, we will rely on Cronbach's alpha reliability for internal consistency. If reliability were not satisfactory (i.e., Cronbach's alpha below .80; see Plonsky & Derrick [2016] for the levels of reliability in L2 listening research [$k = 38$, median .77, interquartile range = .17] and reading research [$k = 70$, median .86, interquartile range = .15]), we would remove items that had the highest negative item-total correlation coefficients until the test meets the .80 criterion or the overall reliability of the test can no longer be improved. Any such cases will be reported in our Stage 2 manuscript. Additionally, we will report McDonald's omega as an alternative that makes fewer assumptions to measure internal consistency (see McNeish, 2018).

In the current design, each participant will have five sets of accuracy measures: three sets from the comprehension measures (one for each experimental condition) and two sets from the shadowing task (one for LO and one for RWL). In addition, each participant will also have four sets of reading time measures (two sets [gaze duration and total reading time] for both the RO and RWL conditions). Any participants who reported closing their eyes during LO or RWL will be excluded from further analysis.

For the accuracy data, we will first screen the comprehension measure for participants who may not have engaged in the task. Specifically, we will exclude participants whose overall accuracy score on the test was below 25% (chance level given four answer options in the MC

test that lent themselves to guessing). We reason that their test performance will not have reflected the construct under investigation (i.e., text comprehension). For all accuracy data, we will then inspect the descriptive statistics and identify any non-normal distributions through visual inspection of histograms and the significance of the Shapiro-Wilk and Kolmogorov-Smirnov normality tests (alpha set at .01). Skewed data will be log-transformed; outliers will be dealt with at the stage of model criticism (Baayen & Milin, 2010), if necessary.

Descriptive statistics of all measures will be provided as follows: means, 95% confidence intervals (CI) around the means, and standard deviations. We will also provide Cohen's *d* family effect size and 95% CIs around those effect sizes. To this end, we will aggregate the data by condition. Given that we plan to perform linear mixed-effects modeling on the item-level data (see details below), this means-based information will be provided for informational purposes only. We will also visualize distributional features of the comprehension data by means of a beeswarm plot (also known as a jittered box plot). We will further present three scatter plots to visualize the relationship between the two individual differences variables (i.e., baseline segmentation from LO, and baseline orthographic decoding from RO [gaze durations and total reading times]) and comprehension as the outcome variable.

To analyze the reading times measures, we will first visually inspect 10% of the data for each participant to verify the proper working of the eye data parsing algorithm from SR Research as recommended by Godfroid and Hui (2020). Specifically, we will ensure there is a high degree of correspondence between the raw and parsed eye data. Next in the data cleaning process, we will deal with overly short and long fixations, following the recommendations by Godfroid (2020). The default algorithm from SR Research (2010) automatically merges and/or deletes overly short fixations (e.g., <100 ms). Additionally, we will consider fixations overly long and

delete them if they are longer than 800 ms. These pre-processed fixations will serve as the basis for the computation of gaze durations and total reading times. We will compute a mean gaze duration and a mean total reading time for each participant in each of the two conditions (RO and RWL). We will proceed with inspecting the descriptive statistics and log-transform these measures as they will likely follow a non-normal (right-skewed) distribution as confirmed through visual inspection of histograms and skewness values above 2 (Larson-Hall, 2016).

To ensure our individual differences variables are on a common metric, we will standardize and center the segmentation data and the reading time data by condition to allow for a direct comparison of the two variables. To this end, each set of measures will be converted to z -scores with a mean of 0 and standard deviation of 1. To model participants' comprehension, we will use linear mixed-effects modeling (LMM), simultaneously accounting for fixed effects and for crossed random effects pertaining to participants and text parts (1, 2, 3). We plan to build two sets of models: one for the RO vs. RWL comparison and one for the LO vs RWL comparison. Since gaze duration and total reading times are not independent measures, but may represent different constructs, we will build separate models for each in order to examine the potential effects of orthographic decoding skills. We will also report the correlation between the two eye-tracking metrics, as recommended by Godfroid and Hui (2020). If the correlation exceeds .60, suggestive of a strong relationship (Plonsky & Oswald, 2014), we will run an additional set of models on rereading time, which is the difference between total reading time and gaze duration (for further discussion, see Godfroid, 2020). These analyses will provide us with an assessment of the unique contribution of total reading time to the overall results. We will report only one of the two analyses (either total reading time or rereading time) in the main text and include the other analysis in the appendix. Table 1 lists the fixed effects for each model.

<Insert Table 1 here>

Table 1 Summary of model parameters

Model	Conditions included in the data set	Outcome	Fixed effects	RQ addressed
Model 1.1	RO & RWL	comprehension	condition [#] + gaze duration.z (RO) + segmentation.z (LO) + condition:gaze duration.z (RO)	RQ 1
Model 1.2	RO & RWL	comprehension	condition + total reading times.z (RO) + segmentation.z (LO) + condition:total reading times.z (RO)	RQ 1
Model 2.1	RO & RWL	gaze duration.z	condition	RQ 2
Model 2.2	RO & RWL	total reading times.z	condition	RQ 2
Model 3.1	LO & RWL	comprehension	condition + gaze duration.z (RO) + segmentation.z (LO) + condition:segmentation.z (LO)	RQ 3

Model 3.2	LO & RWL	comprehension	condition + total reading times.z (RO) + segmentation.z (LO) + condition:segmentation.z (LO)	RQ 3
Model 4.1	LO & RWL	segmentation.z	condition	RQ4

Notes: # In all models, we will use effects coding for condition (e.g., RWL: -1, RO:1).
 Segmentation.z = standardized segmentation scores; gaze duration.z = standardized gaze duration; total reading times.z = standardized total reading times
 Predictor variables will be standardized by condition (i.e., Models 1.1, 1.2, 3.1, and 3.2). Outcome variables will be standardized across the whole data set after having merged the data across the different experimental conditions (i.e., Models 2.1, 2.2, and 4.1).

To determine the random effects, we will engage in backward model selection to identify the optimal random effects structure justified by the data (Matuschek, Kliegl, Vasishth, Baayen, & Bates, 2017). Backward model selection can avoid issues associated with model overfitting that may arise when researchers opt for a maximal random effects structure (i.e., including all possible random effects) by default (Barr, Levy, Scheepers, & Tily, 2013; Linck & Cunnings, 2015). Backward model selection also preserves more statistical power and therefore reduces the incidence of Type II errors (false negatives). We will use the `lmer()` function in R's `lme4` package (version 1.1-23) for model building purposes. To assess the significance of the regression coefficient estimates of the fixed effects (alpha set at .05), we will rely on the `lmerTest` package (version 3.1.2) to obtain p values via Satterthwaite's degrees of freedom method. We will provide 95% CI for the regression coefficients. Since the whole model selection process involves both fixed and random effects, we will use maximum likelihood as the method of estimation. However, for interpretation purposes, models will be refitted with restricted maximum likelihood (REML) because this method of estimation produces better estimates (Hox, Moerbeek, & Van de Schoot, 2018).

We will first build a null model containing only the random intercepts for participants and text parts (no fixed effects), from which we can compute the intra-class correlation (ICC). The ICC represents the proportion of variance explained by the nested data structure. We expect a certain proportion of variance to be accounted for, which will justify the use of mixed-effects modeling. Next, we will enter all fixed effects and all relevant random components (random slopes and intercept-slope correlations for text part by participant) associated with the fixed effects. At each step, we will remove one random component, with the goal of testing if the removal of the random component in question will result in a worse model fit. If this is the case,

model selection is complete and the more complex model will be retained. To compare model fit, we will use the Akaike information criterion (AIC), a model fit index derived from deviance that accounts for model complexity (i.e., the number of parameters in the model). In general, smaller AIC values indicate a better model fit. If AIC values are negative, the model that has the more negative AIC value is the better-fitting model. After selecting the best-fitting model, we will engage in model criticism (Baayen & Milin, 2010) to identify potential outliers (observations with a standardized residual larger than an absolute value of 2.5) in the data set. These outliers will be removed, and the model refitted to arrive at the most robust and generalizable solution. Model summaries will be reported in the Stage 2 manuscript.

To address RQs 1 and 3, we will examine the main effects of condition and the two-way interactions between condition and orthographic decoding (for RQ1) and between condition and segmentation (for RQ3). The two-way interaction terms between condition and reading times (i.e., gaze durations_z and total reading times_z) will shed light on the extent to which the effects of RWL (relative to RO in Models 1.1 and 1.2) are based on one's orthographic decoding skills. Similarly, the interactions between condition and segmentation_z will allow us to examine the potential moderating role of speech segmentation in the effects of RWL (relative to LO in Models 3.1 and 3.2). If the two-way interactions are not statistically significant, we will then consider the main effect of condition in Models 1.1, 1.2, 3.1, and 3.2. Finally, in terms of the effects of RWL on lower-level processes (RQs 2 and 4), the estimates for condition and their 95% CIs will shed light on the extent to which RWL can influence orthographic decoding (Models 2.1 and 2.2) and segmentation (Model 4.1).

Notes:

¹ We will thus compare the same readers' orthographic decoding skills in two experimental

conditions (i.e., RWL vs. RO), which we manipulate experimentally as a within-participants variable in this study. This evidence, obtained through statistical tests on an experimentally manipulated independent variable, will corroborate the correlational evidence from the individual differences analyses, which only take readers' baseline orthographic decoding skills in the RO condition into account.

² For comparison, we report the participant numbers per group in related research: Birulés-Muntané and Soto-Faraco (2016), $n = 60$ (with 20 participants per group); Charles and Trenkic (2015, Experiment 2), $n = 12$ (with 4 participants per group); Mitterer and McQueen (2009), $n = 120$ (with 30 participants per group). Because the previous studies differed in statistical approach or did not provide full statistical information, we could not run an a priori power analysis. Therefore, we aimed for a large sample given available resources instead.

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Appendix A

Experiment text

Propositions tested are underlined
Numbers in superscripts indicate the question number
Phrases chosen for the shadowing task are **highlighted**

Part 1

On an exceptionally hot evening¹ early in July, a young man, Rodion Raskolnikoff, came out of the garret, which was **under the roof** of a high, five-storied house in one of the poorest areas in St Petersburg. He had successfully avoided meeting his landlady on the staircase, **passing her door** which always stood open. Each time Raskolnikoff passed as he was obliged to, the young man had a frightened feeling because of his crippling debt to the landlady².

His suffering was not because he was cowardly. Quite the contrary, for some time past, Raskolnikoff had been in an overstrained, irritable condition³. He had become so **completely absorbed in himself** and isolated from his fellows that he dreaded meeting, not only his landlady, but anyone at all⁴. He had also given up his university studies, his work, and society in general. “I want to attempt an extraordinary thing and am frightened by these trifles such as the rent and the landlady,” Raskolnikoff thought, with a strange smile. “All is in a man’s hands, and he lets it all **slip from cowardice**. That’s an axiom.” He turned in the direction of the Haymarket, a neighborhood at the heart of St Petersburg occupied by **the struggling classes**.

When Raskolnikoff walked past drunk men outside the cheap bars, prostitutes waiting on street corners, and young children running wild⁵, an expression of the profoundest disgust⁶ gleamed for a moment in the face of the young man, who was, by the way, exceptionally handsome, above the average in height, slim, well-built, with beautiful dark eyes and dark brown hair. At these moments he would become aware that, for two days, he had not tasted any food.

Suddenly a drunken man shouted and pointed at him, “Hey there, German hatter!”

Raskolnikoff **clutched at his hat**. It was a tall round hat, but completely worn out, all torn and bespattered, and bent on one side **in a most unseemly fashion**. “I knew it,” he muttered in confusion, “That’s the worst of all! Why? A stupid thing like this, **the most unimportant detail**, might spoil the whole plan. Yes, my hat is too noticeable⁷.”

Raskolnikoff knew indeed it was exactly 730 steps from the gate of his lodging house which he had counted once when he had been lost in dreams⁸, but now, a month later, he was positively

going for a “rehearsal” of his project, and, at every step, his excitement grew more and more violent.

With a sinking heart and a nervous tremor, Raskolnikoff went up to an enormous building which was let out in tiny sets of rooms and was inhabited by working people of all kinds, such as carpenters⁹, cooks, office clerks, and so on. He slipped in without attracting attention through the door, and up the dark and narrow staircase. “If I am so scared now, what would it be if it somehow came to pass that I were really going to do the terrible thing¹⁰?” He could not help asking himself as he reached the fourth story.

There his progress was barred by some porters engaged in moving furniture out of a flat¹¹, from which he knew that the flat had been occupied by a German clerk in the civil service and his family. This German was moving out then, and so, the fourth floor on this staircase would be untenanted except by the old woman¹² until a new occupant was found. Raskolnikoff rang the bell of the old woman’s flat.

In a little while, the door was opened a tiny crack through which the old moneylender in the shadowy entrance eyed her visitor with evident distrust¹³, and, from Raskolnikoff’s perspective, nothing could be seen but her little eyes glittering in the darkness. The young man stepped into the dark entry where the old woman stood facing in silence and looking inquiringly at him. She was a small, old woman of sixty, with sharp eyes and a sharp nose. Her colorless hair was thickly smeared with oil. In spite of the heat, she had a fur cape on her shoulders.

“Raskolnikoff, a student, I came here a month ago,” the young man muttered, with a half bow, remembering that he ought to be more polite if he expected her to willingly receive his next visit¹⁴. “Do you remember me, Alena Ivanovna? I pawned a ring for two roubles.”

“I remember, my good sir, I remember quite well your coming here,” the old woman said, still keeping her inquiring eyes on his face. “The time is up for your last pledge¹⁵. The month was up the day before yesterday.”

Trying to memorize anything that would potentially influence his plan, Raskolnikoff walked into the little, but bright room, with yellow paper on the walls. The furniture, all very old, was very clean and brightly polished.

“Lizaveta’s work¹⁶,” thought the young man. People say the old woman treats her sister like a servant.

“What do you want?” the old woman said severely. “Have you come to reclaim your pawn?”

“I’ve brought something else to pawn here,” as he drew out of his pocket an old-fashioned flat silver watch¹⁷ which belonged to his father. “How much will you give me for the watch, Alena Ivanovna?”

“You come with such trifles, my good sir. It’s scarcely worth anything. You can have a rouble and a half for the watch, minus thirty-five kopecks that you owe me in interest, so one rouble fifteen kopecks.”

“What! Is that all you intend to give me¹⁸?”

“That’s all that’s due to you.”

“Hand it over,” Raskolnikoff complained roughly. “But it’s not a fair price!”

The old woman fished in her pocket for her keys and disappeared behind the curtain into the other room when the young man listened inquisitively¹⁹ to her unlocking the chest of drawers and then something else which could be perhaps a safe²⁰ or a metal box.

(978 words)

Part 2

“I may be bringing you something else in a day or two, Alena Ivanovna, which is a valuable thing, a silver cigarette box¹, as soon as I get it back from a friend,” he broke off in confusion after receiving the money.

“Well, we will talk about it then, sir.”

“Goodbye! Are you always at home alone? Your sister is not here with you,” he asked.

“What business is she of yours², my good sir?”

“Oh, nothing particular. I simply asked. You are too quick. Goodbye, Alena Ivanovna.”

Raskolnikoff went down the stairs in complete confusion, and when he was in the street he cried out, “Oh, can I possibly do that? No, it’s nonsense! It’s rubbish!” he added. “What disgusting things my heart is capable of.”

He walked along the pavement like a drunken man and felt very confused³. Raskolnikoff went down to a bar⁴ and sat down at a sticky little table in a dark and dirty corner before ordering some beer and eagerly drinking off the first glassful. At once, he felt easier, and his thoughts became clear.

“All that’s nonsense,” he said hopefully, “and there is nothing in it all to worry about! It’s simply physical derangement. In one moment, the brain is stronger, the mind is clearer, and the will is firm!”

Raskolnikoff was by now looking cheerful as though he was suddenly set free from a terrible burden. He looked round at the people in the room, noticing the person sitting a little distance from him. The man looked like a retired clerk⁶, who was of medium height and stoutly built. He seemed to have drunk a lot. There was a light in his eyes as though of intense feeling. Perhaps there were even thought and intelligence in them, but at the same time, there was madness in his eyes. The man was wearing an old black coat. At last, he looked straight at Raskolnikoff and said loudly and resolutely.

“May I suggest, honored sir, we have a polite conversation? I have always respected a man of education⁷. My name is Marmeladoff, a lawyer. I boldly inquire if you have been in the government service too.”

“No, I am studying⁸,” answered Raskolnikoff, and he felt immediately nervous about any stranger who approached him.

Marmeladoff got up and took up his jug. He then sat down beside the young man, facing him a little sideways.

“Honored sir,” he began almost with solemnity, “allow me to ask out of simple curiosity if you have ever spent a night on a hay barge⁹ on the Neva River.”

“No, I have not happened to,” answered Raskolnikoff. “What do you mean?”

“Well, I’ve just come from one⁹, and it’s the fifth night I’ve slept so.” Bits of hay were in fact clinging to his clothes. It seemed quite probable that he had not undressed or washed for the last five days. Now, his conversation seemed to excite a general, though languid, interest¹⁰.

“Funny fellow!” pronounced the innkeeper¹¹. “Why aren’t you at your duty if you are in the government service?”

“Why am I not at my duty? Does not my heart ache to think what a useless worm I am? My wife is a woman of a noble heart and refined by education. And yet if only she felt for me! Do you know, I have sold her clothing for drink¹²? She caught a cold this winter and has begun coughing and spitting blood¹³. She is at work from morning till night. She is cleaning everything and washing our children. I married her when she was a young widow with three mouths to feed and nowhere to go to.

“Do you understand, sir, do you understand what it means when you have absolutely nowhere to turn? For a whole year, I **performed my duties faithfully**. Then, I lost my job and started drinking again¹⁴. Sonia, my own daughter by my first marriage, was forced to become a prostitute to provide food for my starving family. What else could a teenage girl with no education do? My wife pushed her into the street, but when she returned with money, Catherine kissed her feet¹⁵ and comforted her. I felt their pain, but the more I felt, the more I drank, and then I suffered even more¹⁶.

“Now Sonia carries the yellow card, a license from the police to sell her body¹⁷. Our landlady will not let her live in our room, but she brings us any money she has been able to earn.

“Honored sir,” cried Marmeladoff, “perhaps all this seems **a laughing matter to you**, as it does to others, but it is not to me for I can feel it all. Exactly five days ago, I stole from Catherine the key of her box and took out what was left of my earnings. Now, I have nothing left. Who will have pity on a cruel man like me¹⁸?

“But He will pity us¹⁹, and He will ask, “Where is the daughter who **gave herself for her cross**, consumptive step-mother²⁰ and for the little children of another?” and He will forgive my Sonia. Then **He will summon us**. Lord, Thy kingdom come!”

He **sank down on the bench exhausted**, and his speech had created a certain impression. There was a moment of silence, but soon, laughter and oaths were heard again.

“Let us go, sir,” said Marmeladoff all at once, **raising his head** and addressing Raskolnikov, “Come along with me. I’m going to Catherine. Time I did.”

Arriving at his house, they went up the dark stairs to the fourth story. A very poor-looking room was **all in disorder** and was littered up **with rags of all sorts**. People were smoking and playing cards.

(955 words)

Part 3

Catherine Ivanovna seemed to Raskolnikov about thirty years old. Her little children, aged four, five, and ten¹, were poorly dressed. They appeared to lack food and love. One girl’s large dark eyes were watching her mother with alarm.

“Ah!” Catherine **cried out in a frenzy**, “He has come back! The criminal! And where is the money? What’s in your pocket, show me!”

She seized him by the hair and dragged him into the room. Marmeladoff seconded her efforts by crawling along on his knees³. The children in the corner began screaming. The eldest girl was shaking like a leaf in a storm.

The poor woman screamed in despair, “The children are hungry! And you, are you not ashamed?” She pounced all at once upon Raskolnikoff, “Have you been drinking with him? Go away!”

Raskolnikoff went away quickly. As he went out, the young man lay a few coppers on the window.

Afterwards on the stairs, he changed his mind and would have gone back. “What a stupid thing I’ve done,” he thought to himself, “They have Sonia⁴ and I want the money myself. I imagine they cried when they sent her into the street with her yellow card, but Man grows used to everything.”

He woke up late next day after a broken sleep. He looked at his own room. There were three old chairs and a painted table in the corner. A big clumsy sofa, which served also as his bed⁵, occupied almost the whole of one wall.

“Get up, why are you asleep?” she called to him. “It’s past nine, I have brought you some soup⁶. Will you have a cup? I should think you’re fairly starving?”

Raskolnikoff opened his eyes and saw Nastasia.

“Praskovya Pavlovna means to complain to the police about you⁷,” she said.

“I’ll go and talk to her tomorrow.”

“But why, if you are so intelligent, do you lie here and have nothing to show for it? One time you used to go out, you say, to teach children. But why is it the case that you do nothing now?”

Nastasia asked.

“I am thinking⁸,” Raskolnikoff answered seriously after a long pause.

“And have you made much money by your thinking?” she said.

“They pay so little for lessons.” he answered, reluctantly.

“And you want to get an immense fortune all at once?”

“Yes, I want an enormous fortune⁹,” he answered firmly, after a brief pause.

“You quite frighten me! Ah, I forgot! A letter came for you yesterday¹⁰.”

That was a letter from his mother whom he had not heard for more than two months¹¹. He **turned pale when he took it**, and another feeling suddenly stabbed his heart. “Nastasia, leave me alone, for goodness’ sake”

When Nastasia had gone out, he lifted the letter and kissed it. He delayed opening it because he seemed almost afraid of something. At last, he started reading it.

“My dear Rodion,” wrote his mother, “It’s two months since I last had a talk with you by letter. You know how I love you. You are all we have to look to. You are our all, our one hope, and our one stay. What a grief it was to me when I heard that you had given up the university some months ago. But now, thank God, I believe I shall be able to send you something more, and in fact, we **may congratulate ourselves** on our good luck now, of which I can’t wait to inform you. In the first place, **would you have guessed**, dear Rodion, that your sister has been living with me for the last six weeks? She was **forced to leave her position** as governess with the Svidrigailoff family. One day, Mrs. Svidrigailoff **accidentally overheard her husband** begging Dounia in the garden. She misunderstood what was happening, throwing the blame upon her and believing her to be the cause of the affairs¹². She then gave orders to Dounia that she should leave at once.

For a whole month, the town was **full of gossip about this scandal**. All our friends avoided us because they believed the story¹³, and nobody even bowed to us in the street. It made me ill, but Dounia **handled it better than I did**, and she tried to **comfort me and cheer me up!**

Thanks to God’s mercy, Mr. Svidrigailoff returned to his senses and told his wife the whole story¹⁴. The woman was completely surprised. The very next day, she came to us and asked Dounia to forgive her. The same morning, she went around in the town and told people that Dounia was innocent.

You must know, dear Rodion, that Dounia now has a boyfriend and that she has already agreed to marry him. He is already a senior officer in the government, Peter Petrovitch Looshin, and is distantly related to Mrs. Svidrigailoff¹⁵. He is a well-to-do man, to be depended upon and has already made his fortune. After Dounia agreed to marry him, he said, however, that he had made up his mind to marry a girl **who had experienced poverty**, because, for him, it is better for a wife to look upon her husband¹⁶. Dounia **was not offended at all**, though. This man would be such a benefit that we could only look upon it as a providential blessing¹⁷. It is certain that Dounia and I are to set off for St Petersburg! Dounia is all excited about seeing you. She said one day in joke that she would be ready to marry Peter for that alone¹⁸.

I shall be able to send you thirty-five roubles. I would love to send you more, but I am uneasy about our travelling expenses¹⁹, for, though, Peter has been so kind as to undertake part of the expenses of the journey, that is to say, he has taken upon himself the expenses of our luggage²⁰, we must consider some expense on our arrival in St Petersburg. But, that's enough for now.

Yours till death,

Pulcheria Raskolnikoff

(999 words)

Appendix B

Stimuli for the Shadowing Task

Scoring Units are **bolded**

Text Part	Item No.	Item	No. of Word	No. of Scoring Units
1	01	under the roof	3	1
1	02	passing her door	3	2
1	03	completely absorbed in himself	4	1
1	04	slip from cowardice	3	2
1	05	the struggling classes	3	2
1	06	clutched at his hat	4	2
1	07	in a most unseemly fashion	5	2
1	08	the most unimportant detail	4	2
1	09	a “ rehearsal ” of his project	5	2
1	10	slipped in without attracting attention	5	3
1	11	rang the bell	3	2
1	12	in the shadowy entrance	4	2
1	13	stepped into the dark entry	6	1
1	14	was thickly smeared with oil	5	3
1	15	a fur cape on her shoulders	6	3
1	16	would potentially influence his plan	5	3
1	17	come to reclaim your pawn	5	2
1	18	belonged to his father	4	2
1	19	disappeared behind the curtain	4	2
1	20	the chest of drawers	4	2

2	21	my heart is capable of	5	1
2	22	walked along the pavement	4	1
2	23	simply physical derangement	3	2
2	24	the brain is stronger	4	2
2	25	of medium height and stoutly built	6	2
2	26	madness in his eyes	4	1
2	27	said loudly and resolutely	4	2
2	28	took up his jug	4	1
2	29	out of simple curiosity	4	1
2	30	Bits of hay	4	2
2	31	clinging to his clothes	4	2
2	32	refined by education	3	2
2	33	performed my duties faithfully	4	3
2	34	a laughing matter to you	5	2
2	35	gave herself for her cross	5	1
2	36	He will summon us	4	1
2	37	sank down on the bench exhausted	6	2
2	38	raising his head	3	2
2	39	all in disorder	3	1
2	40	with rags of all sorts	5	2
3	41	cried out in a frenzy	5	1
3	42	She seized him by the hair	6	1
3	43	seconded her efforts	4	2
3	44	was shaking like a leaf in a storm	8	3
3	45	screamed in despair	3	2
3	46	are you not ashamed	4	1

3	47	lay a few coppers	4	2
3	48	an immense fortune	3	2
3	49	after a brief pause	4	2
3	50	turned pale when he took it	6	1
3	51	may congratulate ourselves	4	1
3	52	would you have guessed	4	1
3	53	forced to leave her position	5	2
3	54	accidentally overheard her husband	4	3
3	55	full of gossip about this scandal	6	3
3	56	handled it better than I did	6	2
3	57	comfort me and cheer me up	6	1
3	58	who had experienced poverty	4	2
3	59	was not offended at all	5	1
3	60	the expenses of the journey	5	2

Appendix C

Scripted, specific instructions to participants

Exposure to the text

In just a moment, you are going to read, read and listen, or listen to a part of a story. After that, we will ask you to answer some questions about the story. However, you are not expected to memorize everything. Please ask you experimenter now if you have any questions.

Multiple-choice comprehension questions

Here is a set of multiple-choice comprehension questions about the part of the story that you just read, read and listened, or listened to. Please choose the best answer for each question. If you are not sure, please do NOT guess; instead you should choose the “I am not sure” option.

Shadowing task

In just a moment, I am going to play some English phrases to you. Each time, the phrase will be played twice. Your task is to repeat the words in the phrase that you hear, one by one (with a short pause in between). For example, if you hear “not at all”, you should say “not – at – all”. A warning tone will indicate that you can repeat the phrase that you heard.

Appendix D

Comprehension Questions

(* indicates the key)

Part 1

1. What was the setting of this part of the story?
 - a. *A hot evening in St Petersburg
 - b. A cold winter night in America
 - c. A breezy fall morning in Russia
 - d. A wet spring morning in New York
 - e. I am not sure.

2. Why did Raskolnikoff want to go unnoticed on his way down the stairs?
 - a. He would be asked to clean up his place.
 - b. He would be asked to pay his utility bills.
 - c. *He would be asked to pay off his debt.
 - d. He would be asked to come in for coffee.
 - e. I am not sure.

3. What is the cause of Raskolnikoff's suffering?
 - a. He was cowardly.
 - b. He had a poor relationship with his family.
 - c. He did not work hard at school.
 - d. *He was under a lot of pressure.
 - e. I am not sure.

4. According to this part of the story, who would Raskolnikoff like to see?
 - a. his family
 - b. his students
 - c. his teachers
 - d. *nobody
 - e. I am not sure.

5. Who did Raskolnikoff see around the Haymarket?
 - a. drunk men, prostitutes, and beggars
 - b. *drunk men, prostitutes, and young children
 - c. drunk men, prostitutes, and musicians
 - d. drunk men, prostitutes, and a police officer
 - e. I am not sure.

6. How did Raskolnikoff feel about his neighborhood?
 - a. afraid
 - b. *disgusted
 - c. indifferent
 - d. disillusioned
 - e. I am not sure.

7. Why did Raskolnikoff feel strongly when the man pointed out his German hat?
 - a. *He did not want to be noticed.
 - b. He feared the man was a robber.
 - c. He had had a fight with the man the night before.
 - d. He feared the man would ridicule him. .
 - e. I am not sure.

8. How did Raskolnikoff know the number of steps it took between his place and where he was heading to?
 - a. He walked the same distance every day. .
 - b. He guessed it based on impression.
 - c. *He had counted it in a dream once before.
 - d. He asked a resident familiar with the neighborhood.
 - e. I am not sure.

9. Who would one normally see at the large building?
 - a. *carpenters, cooks, office clerks
 - b. students, artists, and intellectuals
 - c. drunk men, prostitutes, and police officers
 - d. office managers, accountants, and customers
 - e. I am not sure.

10. Why was Raskolnikoff scared when he went up the stairs?
 - a. It was a dark and narrow staircase.
 - b. He did not know what he wanted to do.
 - c. *He was contemplating doing something terrible.
 - d. He did not know which way to go.
 - e. I am not sure.

11. What did Raskolnikoff see when he reached the fourth floor?
 - a. a couple fighting
 - b. a cat meowing for food
 - c. laundry drying outside

- d. *people moving furniture out
 - e. I am not sure.
12. What did it mean to Raskolnikoff that the Germans were gone?
- a. He would have no one to seek assistance from.
 - b. *The woman would be alone on that floor from now on.
 - c. He would not be able to taste German food anymore.
 - d. He would need to come more often to look after the old lady.
 - e. I am not sure.
13. The old lady was described as...
- a. cheerful
 - b. *cautious
 - c. rich
 - d. traditional
 - e. I am not sure.
14. Why did Raskolnikoff bow to the old lady?
- a. because he respected her
 - b. because she demanded it
 - c. because she held an important position in society
 - d. *because he wanted to keep a good relationship
 - e. I am not sure.
15. Why did the old lady remember Raskolnikoff?
- a. *Raskolnikoff owed her money from his last pledge.
 - b. They had been good friends for a long time.
 - c. Raskolnikoff was a handsome young man.
 - d. Raskolnikoff had helped the old lady.
 - e. I am not sure.
16. Why did Raskolnikoff think the old lady's place was so tidy?
- a. The old lady cleaned it regularly.
 - b. *The old lady's sister was always helping.
 - c. The old lady had a servant to clean her place.
 - d. Not very many people actually visited her.
 - e. I am not sure.
17. What did Raskolnikoff bring to the old woman?
- a. a piece of gold
 - b. a couple of roubles
 - c. a metal box

- d. *a silver watch
 - e. I am not sure.
18. Why was Raskolnikoff not happy when the old woman gave him money?
- a. *He thought the old lady was not offering him enough.
 - b. He thought he deserved more respect.
 - c. She was really rude to him.
 - d. All of the above
 - e. I am not sure.
19. What was Raskolnikoff doing when the old woman went to get money?
- a. He looked at the furniture that was brightly polished.
 - b. He talked to the old woman's sister.
 - c. *He paid special attention to where she got the money.
 - d. He kept calculating if he was offered the right amount of money.
 - e. I am not sure.
20. Where did the old woman keep her money?
- a. in the living room
 - b. in the bedroom
 - c. *in a safe
 - d. in the closet
 - e. I am not sure.

Part 2

1. What did Raskolnikoff say that he would bring next time?
- a. *a silver box
 - b. some cigarettes
 - c. expensive alcohol
 - d. a gold watch
 - e. I am not sure.
2. What did the old lady say when Raskolnikoff asked about her sister?
- a. She agreed that they should strike a business deal.
 - b. She said her sister was on a business trip.
 - c. She said her sister would talk to him soon.
 - d. *She did not give any information.
 - e. I am not sure.
3. What was Raskolnikoff's mood like when he went down the stairs, leaving the old lady's place?

- a. hopeful
 - b. hopeless
 - c. *confused
 - d. cheerful
 - e. I am not sure.
4. Where did Raskolnikoff go after visiting the old lady?
- a. *a bar
 - b. a friend's house
 - c. a market
 - d. a dark, dirty room
 - e. I am not sure.
5. Eventually, how did Raskolnikoff feel about executing his plan?
- a. confident
 - b. *determined
 - c. doubtful
 - d. cautious
 - e. I am not sure.
6. What did the other person in the tavern, Marmeladoff, look like?
- a. like a retired school teacher
 - b. *like a retired clerk
 - c. like a retired film actor
 - d. like a retired journalist
 - e. I am not sure.
7. Why did Marmeladoff approach Raskolnikoff?
- a. Marmeladoff was so drunk that he could not tell what he was doing.
 - b. *Marmeladoff wanted to talk with someone educated.
 - c. Raskolnikoff reminded Marmeladoff of his daughter.
 - d. Raskolnikoff made eye contact with Marmeladoff.
 - e. I am not sure.
8. What was Raskolnikoff's job?
- a. a clerical worker
 - b. a bartender
 - c. a civil servant

- d. *a student
- e. I am not sure.

9. Where had Marmeladoff spent the last couple of nights?

- a. at home with his family
- b. in the inferior tavern
- c. *on a boat
- d. in a shelter
- e. I am not sure.

10. How did the people in the tavern feel about Marmeladoff's story?

- a. eager to learn about something new
- b. sick of it already
- c. *did not mind listening
- d. inspired by it
- e. I am not sure.

11. Who joined Marmeladoff and Raskolnikoff's conversation?

- a. Marmeladoff's wife
- b. Marmeladoff's daughter
- c. * the innkeeper
- d. another guest
- e. I am not sure.

12. Where did the money that Marmeladoff bought drinks with come from?

- a. his own salary
- b. begging from people
- c. a good friend of his
- d. *selling someone's clothing
- e. I am not sure.

13. What was the health condition of Marmeladoff's wife?

- a. She had a sexually transmissible disease.
- b. She caught a common cold and the flu.
- c. She had bleeding sores.
- d. *She had tuberculosis.
- e. I am not sure.

14. What was the turning point for Marmeladoff's life?

- a. his divorce with his first wife
- b. his marriage to his second wife
- c. the birth of Sonia
- d. *his unemployment
- e. I am not sure.

15. Why would Catherine kiss Sonia's feet?

- a. Catherine wanted to praise the quality of her work.
- b. Catherine had not seen Sonia in a long time.
- c. *Sonia's earnings would provide for the family.
- d. Sonia needed comforting because there was no food.
- e. I am not sure.

16. Why did Marmeladoff say he suffered?

- a. He was coughing and had a bad cold.
- b. *He felt the pain of his family.
- c. He wasn't able to buy alcohol.
- d. He had no money for Sonia.
- e. I am not sure.

17. What was the yellow card?

- a. *a document that sex workers carry
- b. a permit from the landlady to live in the same room
- c. a license to buy alcohol
- d. an unemployment insurance card
- e. I am not sure.

18. Why did Marmeladoff think he did not deserve sympathy?

- a. He was not doing enough to send Sonia to school.
- b. *He stole money from his own struggling family.
- c. He did not take the good advice to turn his life around.
- d. He did not seek help because he felt embarrassed.

e. I am not sure.

19. For Marmeladoff, who could eventually help him and his family?

- a. Raskolnikoff
- b. *God
- c. Sonia
- d. Catherine
- e. I am not sure.

20. Who was Catherine?

- a. Raskolnikoff's second wife
- b. Marmeladoff's first wife
- c. *Sonia's step-mother
- d. Marmeladoff's child with his second wife
- e. I am not sure.

Part 3

1. How many children did Catherine have?

- a. two
- b. *three
- c. four
- d. five
- e. I am not sure.

2. Why was Catherine so angry when she saw her husband?

- a. He had spent the night on a hay barge.
- b. She suspected he had an affair with another woman.
- c. *He took all her money earlier.
- d. His breath smelled of alcohol.
- e. I am not sure.

3. What did Marmeladoff do when his wife dragged him into the room?

- a. He looked to Raskolnikoff for help.
- b. He began screaming.
- c. He explained why he had not been at home.
- d. *He was crawling along.
- e. I am not sure.

4. How did Raskolnikoff feel after he left money for Catherine's family?

- a. *He regretted it.
- b. He wished he had left more.

- c. He felt angry at Sonia.
 - d. He was pleased with himself.
 - e. I am not sure.
5. Where did Raskolnikoff sleep at home usually?
- a. in his single bed
 - b. on the floor
 - c. *on the sofa
 - d. in the parlor
 - e. I am not sure.
6. What was Raskolnikoff doing when Nastasia arrived at his place?
- a. he was eating soup
 - b. he was cleaning
 - c. *he was sleeping
 - d. he was studying
 - e. I am not sure.
7. What did Nastasia say the landlady would do?
- a. *complain about Raskolnikoff to the police
 - b. force Raskolnikoff to get a job
 - c. give Raskolnikoff a hand so he could continue his studies
 - d. ask Raskolnikoff to pay the rent
 - e. I am not sure.
8. How was Raskolnikoff spending his time?
- a. teaching
 - b. studying
 - c. making lots of money
 - d. *thinking
 - e. I am not sure
9. What made Nastasia so scared of Raskolnikoff?
- a. He looked sickly and underfed.
 - b. *He said he wanted to get really rich.
 - c. He was so rude that she thought he might hit her.
 - d. He did not look at her when talking to her.
 - e. I am not sure.
10. What triggered Raskolnikoff to ask Nastasia to leave?
- a. *She gave him a letter from his family.
 - b. She mentioned the police.

- c. She brought him a message from the landlady.
 - d. She challenged him that he was not working.
 - e. I am not sure.
11. How long had Raskolnikoff not heard from his family?
- a. so long that he could not recall
 - b. *more than two months
 - c. about half a year
 - d. a couple of weeks
 - e. I am not sure.
12. Why did Mrs. Svidrigailoff want Dounia to leave her house?
- a. She thought Dounia did not do her job well enough.
 - b. She saw her interacting too intimately with other men.
 - c. *She thought she had had an affair with her husband.
 - d. She stole some valuables from the house.
 - e. I am not sure.
13. Why did Dounia's neighbors and friends stop interacting with her?
- a. They did not like Dounia's fiancé.
 - b. She was considered in a social class that is too low.
 - c. They disapproved of her living with her mother.
 - d. *none of the above
 - e. I am not sure.
14. What was the turning point in this incident?
- a. Dounia apologized for what she had done and begged for forgiveness.
 - b. *Mr. Svidrigailoff revealed the truth to his wife.
 - c. Dounia and Mrs. Svidrigailoff had a long conversation over tea.
 - d. Dounia met a rich, upper-class man who cleared her name.
 - e. I am not sure.
15. How was Peter related to the Svidrigailoff family?
- a. They were business partners.
 - b. They were immediate family members.
 - c. *They were distant relatives.
 - d. Mr. Svidrigailoff used to work with Peter in the same office.
 - e. I am not sure.
16. Why did Peter want to marry Dounia?
- a. He thought Dounia was educated and respectable.
 - b. He thought both of them had reached a suitable age to get married.
 - c. He thought they shared the same personality and aspiration.

- d. *He thought Dounia was poor enough to be thankful to him.
 - e. I am not sure.
17. Why did Dounia want to marry Peter?
- a. *He could provide for her family's living.
 - b. She would be able to move to St Petersburg with him.
 - c. He made a lot of jokes and had done well in life.
 - d. She wanted to take care of her husband.
 - e. I am not sure.
18. What was Dounia most excited about for her trip to St Petersburg?
- a. Peter would join her and her mother on the trip.
 - b. *She could see her brother again after a long time.
 - c. She had never been to a big city.
 - d. She did not have to pay for her travel expenses.
 - e. I am not sure.
19. Why did Raskolnikoff's mother not send him more money?
- a. That was all she had.
 - b. She did not trust that he would spend it wisely.
 - c. He no longer went to school, so he needed less.
 - d. *She wanted to save some money for her own travel.
 - e. I am not sure.
20. Who would pay the luggage fees for Dounia and her mother's journey?
- a. Dounia
 - b. Raskolnikoff
 - c. Raskolnikoff's mother
 - d. *None of the above
 - e. I am not sure.