Mem Cogn (2013) 41:137–151
DOI 10.3758/s13421-012-0248-7

The psychologist said quickly, "Dialogue descriptions modulate reading speed!"

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Published online: 28 August 2012

Abstract In the present study, we investigated whether the semantic content of a dialogue description can affect reading times on an embedded quote, to determine whether the speed at which a character is described as saying a quote influences how quickly it is read. Yao and Scheepers (Cognition, 121:447–453, 2011) previously found that readers were faster to read direct quotes when the preceding context implied that the talker generally spoke quickly, an effect attributed to perceptual simulation of talker speed. For the present study, we manipulated the speed of a physical action performed by the speaker independently from character talking rate to determine whether these sources have separable effects on perceptual simulation of a direct quote. The results showed that readers spent less time reading direct quotes described as being said quickly, as compared to those described as being said slowly (e.g., *John walked/bolted into the room and said energetically/nonchalantly, "I finally found my car keys."*), an effect that was not present when a nearly identical phrase was presented as an indirect quote (e.g., *John . . . said energetically that he finally found his car keys.*). The speed of the character's movement did not affect direct-quote reading times. Furthermore, fast adverbs were themselves read significantly faster than slow adverbs, an effect that we attribute to implicit effects on the eye movement program stemming from automatically activated semantic features of the adverbs. Our findings add to the literature on perceptual simulation by showing that these effects can be instantiated with only a single adverb and are strong enough to override the effects of global sentence speed.

Keywords Eye movements · Embodied cognition · Sentence processing · Reading

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When reading a story, readers often have the phenomenological experience of hearing the voices of the characters in their heads. Dating back to Huey (1908), psychology researchers have considered this inner speech to play an important role in reading comprehension (Rayner & Pollatsek, 1989). However, studying the form of the inner voice experimentally has proven difficult. In the present study, we sought to address one aspect of inner speech—specifically, whether the "speed" of inner speech can be affected by the content of a narrative currently being read and whether the effect is reflected in the speed of eye movements during silent reading.

The amount of perceptual detail represented during silent reading has recently been the focus of considerable research. It has been shown that at the word level, some phonetic aspects of the speech signal are represented during reading. For example, words with more stressed syllables, which take longer to say aloud than words with fewer stressed syllables, receive longer gaze durations (Ashby & Clifton, 2005). In terms of sentence-level prosody, Fodor (2002) proposed the implicit-prosody hypothesis, which states that readers generate a default form of prosody that plays a key role in parsing sentence structure, especially for resolving syntactic ambiguities. However, this hypothesis does not address how detailed the default prosody that readers automatically generate is, with respect to portions of a text that are not critical choice points in the ongoing parse.

Work in the domain of *embodied cognition*, also known as *perceptual simulation* (Barsalou, 1999), has provided

reasons to speculate that readers may simulate much more detailed representations than those specifically required for parsing, on the basis of findings that readers mentally simulate the physical actions described in a text. For example, when reading verbs describing simple physical actions, readers show increased brain activity in the areas of the motor cortex responsible for controlling those movements (Hauk, Johnsrude, & Pulvermüller, 2004). In addition to brain activity, reading about actions can facilitate one's future performance of those actions, in terms of broad movement either toward or away from the body (Glenberg & Kaschak, 2002) or of quite specific movements involving manual rotation in a particular direction (Zwaan & Taylor, 2006; Taylor & Zwaan, 2008).

Psycholinguistic researchers have extended the perceptual-simulation literature in order to ask which aspects of a story character's linguistic experience are simulated during silent reading. Two recent studies by Klin and Drumm (2010; Drumm & Klin, 2011) showed that readers mentally represent the modality in which information is presented to a story character. These researchers found that when an identical utterance is presented to a character within a modality (i.e., in the form of a written note and an e-mail), participants' reading times on the repeated line are facilitated. However, when the same utterance is presented to the character across modalities (i.e., in a written note and a voicemail), the repetition effect is eliminated, even though both lines were presented to participants visually.

Several recent studies have suggested that readers go beyond modality to also represent the speaking rates of particular story characters, and that these representations can in turn affect reading speed. Alexander and Nygaard (2008) showed that after listening to a fast talker, readers were faster to read a passage that they were told was "written" by that talker than one they were told was "written" by a slow talker. These effects held in both oral and silent reading, although the effects in silent reading depended heavily on the passage difficulty and on individual differences in imaging abilities. Additionally, this study could not determine whether readers can generate the talker's speed from text alone or whether an explicit spoken cue is necessary for the effect.

This work led to the question of whether quotations from a character may also hold special importance for readers and may encourage additional perceptual simulation of a character's voice. Yao, Belin, and Scheepers (2011) tested the claim, originally made by Clark and Gerrig (1990), that direct speech (e.g., *Mary said, "I'm hungry"*) is more perceptually vivid to readers, because it is a demonstration of what a character actually said, as compared to indirect speech (e.g., *Mary said that she was hungry*), which functions simply as a description of the gist of what was said. In an fMRI study, Yao et al. found that brain activation in voice-selective areas of the auditory cortex was greater while participants read direct rather than indirect speech. These findings suggest greater perceptual simulation of the direct speech acts during silent reading. To follow up, Yao and Scheepers (2011) investigated how an implicit description of a story character's speaking rate modulates the online reading speeds of direct as compared to indirect quotations. The protagonists' speech rates were implied by a three-to-four-sentence passage preceding the speech act that set up a context in which the speaker would plausibly be expected to speak quickly or slowly (see Table 1 for an example). The quoted line was held constant across the four contexts (fast or slow speaker and direct or indirect speech act). Interestingly, Yao and Scheepers found that readers spent less time reading direct quotes said by fast-talking story characters than quotes by slow-talking ones, but the researchers found no differences between the reading times for these same characters' indirect speech. These findings suggest that

Table 1 Examples of the materials used in Yao and Scheepers (2011)

Region Label	Fast-Speaking Story	Slow-Speaking Story
Setup of implicit speed	It was 11 am in the morning when the fire alarm went off. Hearing people running down the corridors, Mary grabbed her jacket and burst into Peter's office next door.	It was 11 am in the morning when the fire alarm went off. Knowing that this was just a test, Mary put on her jacket and walked into Peter's office next door.
Direct speech	She shouted: "Peter, quick, we have **to leave immediately because the building is on fire**!"	Tongue-in-cheek, she said: "Peter, quick, we have **to leave immediately because the building is on fire!"**
Indirect speech	She urged Peter **to leave immediately because the building was on fire.**	Tongue-in-cheek, she told Peter **to leave immediately because the building was on fire.**
Conclusion	Confused, Peter replied: "Wasn't there an e-mail about a fire alarm test this morning?"	Peter just replied: "Very funny—I've seen the e-mail about the fire alarm test as well!"

The critical regions are marked in boldface. Each item contained either the direct-speech sentence or the indirect-speech sentence.

readers were using contextual information to perceptually simulate a character's voice while reading, and that this representation of the fast-talkers' speaking rates modulated the speed of the readers' eye movements.

The present study was designed to extend the intriguing findings of Yao and Scheepers (2011) in the following ways. First, we sought to understand the nature of the context that is necessary to produce perceptual simulation effects. In the materials used by Yao and Scheepers, their readers received multiple implicit cues, spread over several sentences, indicating that a particular character would more plausibly speak faster or slower. Given this stimulus configuration, it is possible that readers would need multiple exposures to speaking rate cues, and/or sufficient time, to build an internal representation of a character that included his or her likely speech rate. The spacing of the implicit cues over several sentences allowed the expectation of speech rate to build up over the passage preceding the direct quotation, so that readers could activate their previously constructed character representation when they encountered a direct quote, and no explicit speed adverb was necessary to induce perceptual simulation of talker speed. With the present study, we probed whether readers require this gradual buildup of context information about a character in order to produce perceptual simulations for direct quotations, or whether only one explicit speed-related adverb immediately preceding a direct quote can produce similar perceptual-simulation effects. We addressed this question by embedding direct (Exp. 1) and indirect (Exp. 2) quotations in sentences that were immediately preceded by an adverb describing the speed at which they were uttered (see Tables 2 and 3 for example stimuli). We sought to understand whether the semantic content of a speed-related adverb can integrated during online reading to generate perceptual simulation of a direct quote immediately following the adverb itself, even as quickly as the very next fixation following the adverb. This marks an interesting distinction from Yao and Scheepers, who showed that readers can apply previously constructed expectations about character talking rates so as to perceptually simulate direct quotes, but did not investigate whether readers can initiate perceptual simulation mere milliseconds after receiving a speed-specific adverb.

Table 2 Examples of the stimulus materials used in Experiment 1

Direct Speech	Fast Adverb	Slow Adverb
Fast verb	John bolted into the room and said energetically, **"I finally found my car keys."**	John bolted into the room and said nonchalantly, **"I finally found my car keys."**
Slow verb	John walked into the room and said energetically, **"I finally found my car keys."**	John walked into the room and said nonchalantly, **"I finally found my car keys."**

The quotation regions are marked in boldface.

Table 3 Examples of the stimulus materials used in Experiment 2

Indirect Speech	Fast Adverb	Slow Adverb
Fast Verb	John bolted into the room and said energetically **that he finally found his car keys.**	John bolted into the room and said nonchalantly **that he finally found his car keys.**
Slow Verb	John walked into the room and said energetically **that he finally found his car keys.**	John walked into the room and said nonchalantly **that he finally found his car keys.**

The quotation regions are marked in boldface.

Second, we asked whether readers perceptually simulate the speed at which physical actions are performed by a character and whether a conflict between the speed of the physical action being performed and the rate at which a quote is uttered might produce different effects from when these two speeds coincide. Given the evidence that readers activate motor programs involved in actions that they read about (Glenberg & Kaschak, 2002; Zwaan & Taylor, 2006; Taylor & Zwaan, 2008), it remains an open question whether readers' eye movements are sensitive to any type of fast or slow action being performed by the characters in a sentence, or whether the perceptual-simulation effects observed by Yao and Scheepers (2011) might be limited to only linguistic actions. For example, in the sentence *John walked into the room*, would readers read the phrase *into the room* faster if it were instead preceded by the verb *bolted* rather than *walked*? Furthermore, we asked whether the speed at which a character performs an action has an effect on reading times for a quote later in the sentence, particularly if the speed of the action conflicts with their speaking rate. For example, in the sentence *John bolted into the room and said energetically, "I finally found my car keys,"* the speeds of the action verb (*bolted*) and the talking-rate adverb (*energetically*) are congruent. Compare this to the sentence *John bolted into the room and said nonchalantly, "I finally found my car keys,"* in which the speed of the action verb (*bolted*) conflicts with that of the talking-rate adverb (*nonchalantly).* In the present stimulus set, we fully crossed the speed of the action verb (fast or slow) with the speed of the talking-rate adverb (fast or slow). If the perceptual-simulation effects seen on quote reading times simply reflect the summation of the effects from speed-related words seen in the preceding context, we would expect to see larger effects of perceptual simulation when the character was moving and speaking at the same rate, and weaker effects when these two cues were

incongruent. On the other hand, if perceptual simulation reflects simulation of the speech act alone, then only those words in the preceding context pertaining to the character's speaking rate (i.e., the adverbs) should affect reading times on the direct-quote region. This physical action manipulation marks another major departure from the stimuli used by Yao and Scheepers, in which the implicit cues were consistent with each other in terms of speed. Thus, our stimulus set could begin to tease apart whether eye movements can serve as indicators for perceptual simulation of physical actions, whether the perceptual-simulation effects observed by Yao and Scheepers are limited to direct speech acts, and whether these two possible forms of simulation interact.

We predicted that if readers can use the semantic content of dialogue descriptions to simulate talker speed, we would see faster reading times for the entire quote region for direct quotes described as being said quickly, relative to those described as being said slowly. This result would provide evidence that readers were using the adverbs' semantic content online to guide their perceptual simulation of talker speed, and that this simulation can modulate eye movements to reflect the character's speaking rate over the duration of the quote. If, on the other hand, the semantic content of the adverb affects reading speed in a more implicit way (i.e., by temporarily accelerating or suppressing eye movements, without inducing perceptual simulation per se), then we might expect to see effects of the adverb's speed only on the next word following the adverb, without lasting effects over the duration of the direct quote. Additionally, we predicted that if readers also perceptually simulate the speed at which a character performs a physical action, we might see faster reading times on the prepositional phrase immediately following a fast action verb relative to a slow one (i.e., *John bolted into the room* . . .). If the speed of the action performed interacts with the character's talking rate on quote reading times, we would expect to see the fastest reading times for quotes that were said quickly by a fast-acting character, the slowest reading times for quotes said slowly by a slow-acting character, and intermediate reading times when these two factors were incongruent (i.e., a fast-acting character speaking slowly or a slow-acting character speaking quickly). By manipulating these two factors independently, we could answer the questions of whether the semantic content of an adverb can be used online to affect the perceptual simulation of direct versus indirect quotes, whether physical actions might also be subject to perceptual-simulation effects, and whether action speed and character talking rate have interactive effects on the perceptual simulation of direct quotations.

Experiment 1

Method

Materials The critical sentences described a character who performed an action and then said a quote (e.g., *John walked/bolted into the room and said energetically/nonchalantly, "I finally found my car keys."*); see Appendix A for a full list of the stimulus materials. Two factors were independently manipulated: the main verb, describing action verb speed (e.g., *walked*/*bolted* above), and the adverb, describing the talking rate (e.g., *energetically*/*nonchalantly*), both of which could have either a fast or a slow meaning. The verb and adverb speeds were independently manipulated in order to determine whether the effects of verb speed (describing the physical action) and adverb speed (describing speaking rate) are separable. These materials allowed us to examine three critical regions of interest: the direct quote, the adverb, and the postverbal prepositional phrase (see Fig. 1). A set of 24 sentence frames were created that could appear in four conditions (fast verb/fast adverb, fast verb/slow adverb, slow verb/fast adverb, or slow verb/slow adverb), creating a total of 96 items. Every participant saw all 24 sentence frames in only one condition and saw six of the items in each speed condition.

The average lengths of the fast (9.50) and slow (8.79) adverbs were compared in a paired-samples *t* test. Pairings were determined by comparing the two adverbs that alternated appearing across different versions of an item (i.e., *energetically* and *nonchalantly* in Item 1; see Appendix A), so that an adverb appeared in the test once for every item in which it was used (nine adverbs were used once, 18 adverbs were used twice, and one adverb was used three times). The paired-samples *t* test showed that the lengths of the fast and slow adverbs did

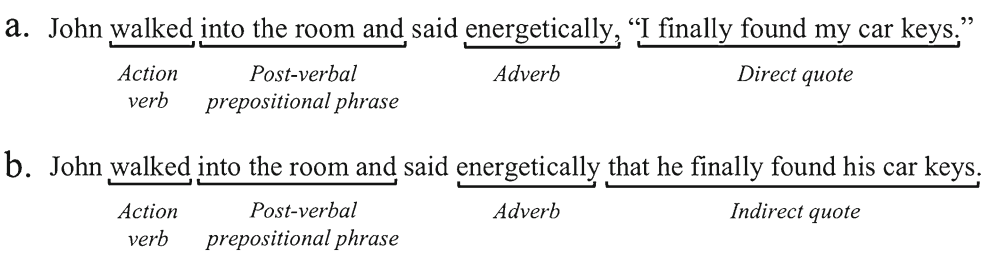

Fig. 1 Regions of interest in Experiment 1 (**a**) and Experiment 2 (**b**)

not differ significantly, $t(23) = 0.69$, $p = .50$. The frequencies of the fast (17.38 per million, taken from the CELEX database; http://celex.mpi.nl/) and slow (26.63 per million) adverbs also did not differ significantly in a similar paired-samples t test, $t(23) = –0.96$, $p = .35$. Furthermore, the adverbs did not differ in the number of syllables in the fast (3.42) and slow (3.21) groups, $t(23) = –0.62$, $p = .54$. The critical quote region varied from four to seven words (mean = 5.83). Even though these regions differed in length between items, the same 24 quotes were seen in all four conditions, such that the differences in reading times between the four conditions could be attributed to the verb and/or adverb preceding it.

Participants A group of 68 University of Illinois undergraduates participated for course credit or $7. All were native speakers of English with normal or corrected-to-normal vision.

Apparatus Eye movements were recorded via an SR Research Ltd. EyeLink 1000/2000 eyetracker, which records the position of the reader's eye once every millisecond (1000-Hz sampling rate) and has a high spatial resolution of 0.01°. Text was displayed in 12-point Courier New font. Participants were seated 69 cm away from a 20-in. monitor. At this distance, approximately 3.5 characters subtended 1º of visual angle. Head movements were minimized with chin- and headrests. Although viewing was binocular, eye movements were recorded from the right eye.

Procedure After signing of the informed consent, each participant's eye movements were calibrated using a 9-point calibration screen. In the testing session, each trial involved the following sequence: Trials began with a gaze trigger, consisting of a black circle presented in the position of the first character of the text. Once a stable fixation had been detected on the gaze trigger, the sentence was presented in full. The participant pressed a button on a standard game controller to indicate that he or she had finished reading the sentence. At this point, the sentence disappeared. After this, a question about the content of the sentence appeared, which participants answered by pressing the appropriate button on the controller. The question never asked about the content of the critical quote region. Then the next trial began. Sentences were presented in a random order for each participant. In addition to the 24 experimental trials, each list contained 148 other sentences with a variety of structures, all of which were also followed by comprehension questions.

Data analysis Within the EyeLink 1000 data analysis package, consecutive fixations shorter than 80 ms and less than 0.5º apart were merged into a single fixation, while other fixations shorter than 80 ms were deleted from the analysis. In addition, fixations longer than 1,200 ms were also deleted from the analysis, because these typically indicate track loss. For the direct-quote region, fewer than 1 % of the trials were excluded due to track loss or skipping; for the individual adverb analyses, 5.9 % of the trials were excluded due to readers skipping the adverb.

Results

Overall accuracy on the comprehension questions was 95.1 %, which showed that participants were paying attention to the sentences. We had no a priori predictions about how verb or adverb speed would affect comprehension question accuracy, and as such, further analyses of these data will not be discussed.

The eyetracking data for both Experiments 1 and 2 were analyzed using linear mixed-effect models (Baayen, Davidson, & Bates, 2008), in order to model the random effects of subjects and items together in a single analysis. Models were created using the *lmer*() function of the *lme4* (Bates, Maechler, & Dai, 2008) package in R (R Core Development Team, 2011). Because the quotations differed in length, residual reading times were used as the dependent measure, as advocated by Trueswell, Tanenhaus, and Garnsey (1994). Residual reading times were calculated by fitting a separate linear mixed model for each reading time measure, with the length (in characters) of the region as the fixed effect and with random intercepts and slopes for each participant. (Note that although analyses were performed on residualized reading times, the raw reading times are reported in all of the tables for ease of interpretation; analyses performed on raw reading times yielded no patterns of significant differences from the analyses of the residualized reading times.) Using the residual reading times, different models were fit for each reading time measure using restricted maximum likelihood estimation (REML) through the *lme4* package in R. Models included the fixed effects of verb speed and adverb speed (which were contrast coded), as well as random intercepts for subjects and items.[1] Only interactions that were significant ($p < .05$), as determined

[1] In order to avoid the risk of inflated Type I errors that could be associated with using random intercept-only models, at a reviewer's suggestion we reran every model using the maximal random-effects structure justified by our design (i.e., with random slopes for every fixed effect and interaction, for both subjects and items). These models produced no changes of significance for any of the measures. The maximal models were clearly overfitted, with large correlations between the random slopes and intercepts, so we next used likelihood ratio tests to fit the random slopes in a stepwise fashion, as recommended by several experts in the field (Baayen, 2008; Baayen et al., 2008; Jaeger, 2008). This also did not change the significance of any of the measures. Each stepwise model had a slightly different random-effects structure, making reporting cumbersome, so for the sake of clarity we report the intercept-only models here.

by using Markov chain Monte Carlo sampling, were retained in the models.

Reading measures for the entire quote region will be examined first. Because the quote region was always sentence-final, our definitions of these measures will vary slightly from standard usage. The reading measures included first fixation duration on the region, gaze duration on the region (the time spent reading the region before either regressing to the left or ending the trial, if no regressions were made), go-past time (which included all of the time from when the eyes first entered the region until participants ended the trial, including regressions to earlier parts of the sentence), and total reading time on the region (excluding regressions).

To examine reading times on the direct quote region, illustrated in Table 4, both first fixation durations and gaze durations were unaffected by adverb speed (see Table 5 for the model output). However, we did find a marginal effect of verb speed, such that both of these measures were numerically longer for quotes following slow as compared to fast action verbs. On the other hand, go-past times and total times on the direct quote were significantly longer when the quote followed a slow adverb rather than a fast adverb. Preceding verb speed did not have an effect on go-past or total times, nor did it interact with adverb type on any of the reading measures considered (all $ps > .61$). These results indicated that the speed at which a quote was described as being "said" in the text significantly influenced how quickly that quote was read, with readers spending less time reading quotes described as being said quickly than reading those described as being said slowly.

Given the effect of adverb speed on go-past and total times for the direct-quote region considered as a whole, we next separated the quote region into its individual words to examine whether the effect of adverb speed was present at all quote positions. This analysis was designed to rule out the possibility that the effect on quote reading times might have been driven by reading times for just the first word of the quote. This pattern would be expected if automatic activation of the adverb's semantics simply accelerated or suppressed eye movements temporarily, thus affecting reading times on the word immediately following the adverb, but without enduring effects. If this were the case, we would expect adverb speed to interact with sentence position, which would indicate that the effect of adverb weakened as the quote progressed.

We limited the scope of this analysis to total time in order to focus on the perceptual simulation effects just for fixations occurring within the quote region, whereas go-past time includes fixations to all earlier parts of the sentence, including those that occurred outside of the quote region. All quotes were sentence-final, meaning that in this case the total time was equivalent to the selective go-past time (because there was no sentence region following the quote for readers to move into). Because the quotes ranged from four to seven words long and because wrap-up effects are present

Table 4 Mean reading times in milliseconds (and standard deviations) on all regions of interest in Experiment 1

Region	Measure	Verb Speed	Adverb Speed	
			Fast Adverb	Slow Adverb
Direct quotation	FF	Fast verb	210 (63)	212 (65)
		Slow verb	216 (63)	216 (68)
	GD	Fast verb	1,152 (533)	1,152 (560)
		Slow verb	1,173 (531)	1,209 (575)
	GP	Fast verb	1,925 (1,088)	2,051 (1,250)
		Slow verb	1,857 (1,044)	1,990 (1,268)
	TT	Fast verb	1,321 (617)	1,386 (667)
		Slow verb	1,310 (607)	1,390 (740)
Adverb	FF	Fast verb	223 (82)	230 (91)
		Slow verb	220 (75)	231 (86)
	GD	Fast verb	271 (167)	298 (170)
		Slow verb	267 (122)	297 (181)
	GP	Fast verb	368 (323)	400 (297)
		Slow verb	359 (303)	405 (313)
	TT	Fast verb	396 (265)	464 (340)
		Slow verb	401 (255)	459 (338)
			Fast Verb	Slow Verb
Postverbal prepositional phrase	FF		217 (85)	222 (97)
	GD		555 (326)	551(331)
	GP		685 (451)	706 (474)
	TT		879 (529)	858 (537)

FF, first fixation duration; GD, gaze duration; GP, go-past time; TT, total time.

Table 5 Mixed-model output for direct-quote region reading times (Exp. 1)

Measure	Predictor	Estimate	*SE*	*t* Value	*p*(*t*)
First fixation	Intercept	0.016	31.846	0.002	0.994
	Fast vs. slow adverb	0.846	21.658	0.807	0.770
	Fast vs. slow verb	5.105	21.658	1.722	0.078
Gaze duration	Intercept	0.046	1.968	0.008	0.999
	Fast vs. slow adverb	17.480	2.896	0.292	0.420
	Fast vs. slow verb	37.303	2.896	1.763	0.085
Go-past time	Intercept	–0.296	50.943	–0.006	0.995
	Fast vs. slow adverb	126.375	47.296	2.672	0.008
	Fast vs. slow verb	–67.751	47.296	–1.433	0.152
Total time	Intercept	–0.081	39.331	–0.002	0.998
	Fast vs. slow adverb	68.454	26.035	2.629	0.009
	Fast vs. slow verb	–6.317	26.034	–0.243	0.808

on sentence-final words (which were also the quote-final words; Just & Carpenter, 1980), we extracted the last word from every quote and grouped these together in a quote-final bin. Thus, every quote contributed words to the first three bins as well as to the final (7th) bin, leaving unequal numbers of items contributing to Quote Positions 4 – 6 (for Bin 4, 23 items; for Bin 5, 17 items; for Bin 6, four items). However, linear mixed models are robust to unequal cell counts (Baayen et al., 2008), so these analyses still served to answer the intended question. The sentence positions were dummy-coded, so that each was compared to the quote-initial word position.

The analyses revealed that adverb speed did not interact with any sentence position, indicating that the effect of adverb speed was not driven by any single word position within the quote (all *p*s > .50). However, we did find a significant effect of adverb speed when the total time for each word of the quote was included individually, $p < .01$, showing that the effect of adverb speed was distributed over the entire quote region. The speed of the preceding action verb did not affect reading times at any position, $p = .56$. These results show that the effect of perceptual simulation was present over the entire quote region, rather than being driven by any particular word of the quote (see Fig. 2). Additionally, certain quote positions exerted a significant effect (Positions 2, 4, and 5; $p < .001$), indicating that they were read for significantly longer than the quote-initial word. This result is tangential to our main question, however, and importantly does not detract from the significance of the adverb effects.

In addition to the quote region, reading times for the individual adverbs were analyzed to determine how quickly their semantic content came online and affected eye movements. All reading time measures were residualized on adverb length, in the manner described above. Centered adverb frequency was used as a continuous predictor, as well, to test for effects of adverb frequency on the reading time effects. Additionally, one fast adverb was excluded from the analyses due to a spelling error in the materials. The results revealed a significant effect of adverb speed for all four measures, indicating that reading times on slow adverbs were significantly longer than those on fast adverbs (see Table 6 for the output). Interestingly, this finding goes against what might be expected if reading times were determined by adverb frequency alone, as the fast adverbs were numerically (although nonsignificantly) less frequent than the slow adverbs. The speed of the preceding action verb did not affect reading times on any measure considered. Furthermore, for gaze duration and total time, adverb frequency significantly interacted with the effect of adverb speed, indicating that the effects of adverb speed were reduced for adverbs of higher frequency. However, even with the interaction in the model, the main effect of adverb speed was still significant. These findings suggest that the semantic content of the adverbs not only affected reading times on the following quote region, but came online quickly enough to affect reading times even on the adverbs themselves.

Because action verb speed exerted a weak effect on the first-fixation and gaze durations to the quote region, but not on later measures or on adverb reading times, the possibility remained that the action verb could have induced some level of perceptual simulation that later became swamped by the effects of adverb speed. If this was the case, we might expect to see similar effects of perceptual simulation on the prepositional phrase directly following the action verb, because it continued to describe the action being carried out (i.e., *John walked into the room*), making it plausible that readers might

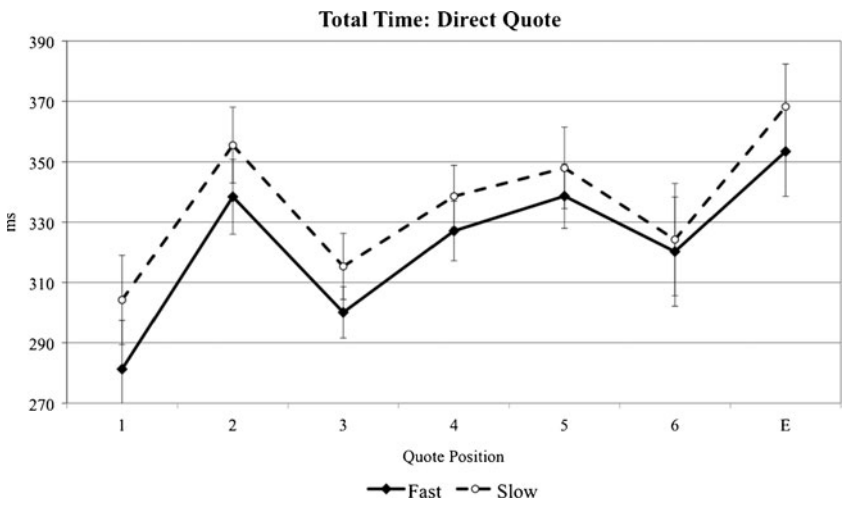

Fig. 2 Total reading times for each direct-quote position as a function of adverb speed. Mean reading times were derived by averaging over participants; *error bars* represent standard errors

Table 6 Model output for adverb reading times (Exp. 1)

Measure	Predictor	Estimate	*SE*	*t* Value	*p*(*t*)
First fixation	Intercept	–0.047	2.457	–0.019	0.985
	Fast vs. slow adverb	10.084	3.916	2.575	0.010
	Fast vs. slow verb	–0.125	3.904	–0.032	0.975
	Frequency	–0.075	0.059	–1.281	0.200
Gaze duration	Intercept	0.493	4.777	0.103	0.918
	Fast vs. slow adverb	36.547	7.042	5.190	0.000
	Fast vs. slow verb	–0.889	0.118	–0.866	0.899
	Frequency	–0.102	7.015	–0.127	0.387
	Adverb×Frequency	–0.469	0.208	–2.252	0.025
Go-past time	Intercept	–0.017	9.530	–0.002	0.999
	Fast vs. slow adverb	43.377	14.812	2.929	0.004
	Fast vs. slow verb	0.146	0.225	0.567	0.992
	Frequency	0.128	14.762	0.010	0.571
Total time	Intercept	1.060	10.345	0.102	0.918
	Fast vs. slow adverb	72.254	13.036	5.543	0.000
	Fast vs. slow verb	1.598	0.236	–0.519	0.902
	Frequency	–0.123	12.976	0.123	0.604
	Adverb×Frequency	–0.879	0.395	–2.224	0.026

perceptually simulate this action, which could affect their eye movements to this phrase as well. However, when similar models were constructed for reading times on these prepositional phrases (again using residualized reading times), no effects of action verb speed were found (all *p*s > .15). Thus, action verb speed did not induce readers to perceptually simulate the action that it described, at least not in a way that affected their eye movements.

Discussion

The results of Experiment 1 revealed that an explicit description of a character's speaking rate can affect reading times on a direct quote from that character, as indicated by shorter go-past times and total reading times on quotes following a semantically "fast" adverb than following a semantically "slow" adverb. These results replicated and extended the findings of Yao and Scheepers (2011), who also found effects of perceptual simulation on go-past times for the entire quote region, providing additional evidence that readers create detailed perceptual simulations of direct speech acts during silent reading. Interestingly, the effect of action verb speed on the direct-quote reading times was marginal and limited to measures on which there were no effects of adverb speed. For the measures on which adverb speed did exert an effect—go-past and total times—action verb speed was not significant and did not interact with adverb speed. This finding suggests that the speed at which a character is performing an action may have a subtle effect on direct-quote reading times, but it is outweighed by the effect of explicit adverb speed. As a better test of whether the action verb encouraged perceptual simulation, we examined reading times on the postverbal prepositional phrases that described the action being performed. We found no reading time effects on this phrase as a function of action verb speed, suggesting that readers were not perceptually simulating the action (or if they were, it did not affect their eye movements).

The results of Experiment 1 also showed that readers do not require an extended context over which they can construct expectations about character talking rate in order to produce perceptual-simulation effects. Rather, the semantic content of a single speed-specific adverb can be integrated during online language comprehension to generate perceptual simulation of the talking rate for a direct quote. This effect was present over all quote positions, not just the first word following the adverb. The semantic content of the adverb also affected reading times on the adverb itself, with semantically "fast" adverbs being read faster than semantically "slow" adverbs. However, there was one caveat to this conclusion: In Experiment 1, the adverb was always followed by a direct quote. The fact that the adverb's effect came online so quickly and had such a strong impact left open the possibility that simply reading a speed-specific adverb may implicitly accelerate (or suppress) eye movements for the remainder of the sentence, regardless of whether or not it is followed by quoted speech. This possibility, together with the findings from Yao et al. (2011) and Yao and Scheepers (2011) that readers represent direct speech acts in a perceptually more vivid manner than indirect speech, naturally provided the motivation for Experiment 2. The next step was to ensure that the observed effects on the direct quote were in fact perceptual simulation and not an artifact of an accelerated or suppressed motor program after seeing a fast or a slow adverb, respectively. This could be accomplished by showing that the effect on quote reading times was not present when the speed-specific adverb was followed by indirect speech. In Experiment 2, direct quotations in the materials for Experiment 1 were replaced by nearly identical sentential complements describing the same idea expressed as an indirect quotation. For example, the sentence *John bolted into the room and said energetically, "I finally found my car keys"* was replaced with the sentence *John bolted into the room and said energetically that*

he finally found his car keys. In this way, we could determine whether the speed effects on the quote region observed in Experiment 1 were caused by perceptual simulation of the quoted speech, in which case we would not predict speed effects on the indirect quotes in Experiment 2, as perceptual simulation would not need to take place for an indirect speech act. On the other hand, if the speed effects on the direct quote were simply an artifact of implicitly accelerated or suppressed eye movements following a speed-specific adverb, we would predict speed effects similar to those from Experiment 1 on the indirect quote in Experiment 2, as well.

A second motivation for Experiment 2 was to further test the unexpected effects of adverb speed on adverb reading times with a different group of participants. One possibility for this effect, as expressed above, was that the semantic features of the adverb quickly came online to affect eye movements. It could also be the case that adverb reading times were affected by the adverb's semantic content only because the adverb preceded a direct speech act. In other words, when an adverb precedes a direct quote, it is very likely that readers simultaneously process the visual cues highlighting the fact that a direct quote is coming up (i.e., __, "___). When readers receive these cues, they might start ramping up their voice-related representations in anticipation of the upcoming information (Kukona, Fang, Aicher, Chen, & Magnuson, 2011). An interesting test of the effects on adverb speed would be to see whether they are still present when the adverb precedes an indirect quote, which would suggest that they stem from automatically activated semantic features of the adverb. Alternatively, if these effects were being driven by perceptual simulation of the upcoming quoted material, we would expect these effects on adverb reading speed to be reduced or eliminated in the presence of indirect speech.

Experiment 2

In Experiment 2, indirect quotes were embedded in sentences nearly identical to those in Experiment 1, in which the indirect quotes were descriptions of speech said by a character who was moving either quickly or slowly. By manipulating action speed separately from character speaking rate before indirect speech, we attempted to disentangle, on the one hand, the effects of implicit effects on the eye movement program stemming from automatic activation of the adverbs' semantics from, on the other, the effects of perceptual simulation of speech during silent reading.

Method

Materials The critical sentences were nearly identical to those in Experiment 1, with the important difference that in Experiment 2, speech was represented by an indirect rather than a direct quotation (e.g., *John walked/bolted into the room and said energetically/nonchalantly that he finally found his car keys*). The 24 items from Experiment 1 were altered to change the direct quotes to indirect quotes (see Appendix B for a full list of the stimuli). Both main-verb and adverb speed were again independently manipulated, creating four versions of each experimental item (fast verb/fast adverb, fast verb/slow adverb, slow verb/fast adverb, and slow verb/slow adverb), resulting in a total of 96 different sentence frames. Every participant saw all 24 items in only one condition, and saw six of the items in each speed condition.

The critical quote region varied from five to eight words (mean = 6.83), but as in Experiment 1, the same 24 quotes were seen in all four conditions, such that the differences in reading times between the four conditions could be attributed to the verb and/or adverb preceding it. In addition to the 24 experimental items, participants saw 122 other sentences with varying syntactic structures, for a total of 146 items overall.

Participants A group of 44 University of Illinois undergraduates participated for course credit or $7. All were native speakers of English and had normal or corrected-to-normal vision. None had participated in Experiment 1.

Apparatus and procedure These aspects of the design were the same as in Experiment 1.

Data analysis As in Experiment 1, fixations shorter than 80 ms and less than 0.5º apart were merged into a single fixation, and other fixations shorter than 80 ms or longer than 12,000 ms were deleted from the analysis. Fewer than 1 % of the trials containing indirect quotes were excluded due to track loss or skipping; for the individual adverbs, 4.8 % of the trials were excluded due to track loss or because the reader skipped the adverb.

Results

The overall accuracy for the comprehension questions was 95.5 %, indicating that participants were attentively reading the experimental items. As in Experiment 1, we did not have a priori predictions about the effects of verb or adverb speed on comprehension question accuracy.

Reading measures on the entire indirect quote region were examined first (listed in Table 7). The measures

Table 7 Mean reading times in milliseconds (with standard deviations in parenthesis) on indirect-quote regions (Exp. 2)

Region	Measure	Verb	Adverb	
			Fast Adverb	Slow Adverb
Indirect quotation	FF	Fast verb	214 (67)	216 (71)
		Slow verb	215 (69)	210 (60)
	GD	Fast verb	1,243 (604)	1,197 (601)
		Slow verb	1,249 (618)	1,163 (592)
	GP	Fast verb	2,856 (2028)	2,803 (1851)
		Slow verb	2,734 (1819)	2,731 (1863)
	TT	Fast verb	1,686 (811)	1,736 (931)
		Slow verb	1,678 (874)	1,627 (835)
Adverb	FF	Fast verb	217 (74)	235 (92)
		Slow verb	229 (78)	230 (77)
	GD	Fast verb	265 (128)	285 (149)
		Slow verb	269 (120)	290 (156)
	GP	Fast verb	320 (201)	346 (245)
		Slow verb	326 (236)	357 (265)
	TT	Fast verb	445 (325)	502 (355)
		Slow verb	432 (284)	474 (310)
			Fast Verb	Slow Verb
Postverbal prepositional phrase	FF		215 (79)	217 (84)
	GD		573 (339)	557 (324)
	GP		774 (470)	769 (531)
	TT		1,142 (702)	1,110 (695)

FF, first fixation duration; GD, gaze duration; GP, go-past time; TT, total time.

Table 8 Model output for reading time measures on indirect quotations (Exp. 2)

Measure	Predictor	Estimate	*SE*	*t* Value	*p*(*t*)
First fixation	Intercept	0.004	2.257	0.002	0.999
	Fast vs. slow adverb	–1.159	3.692	–0.314	0.754
	Fast vs. slow verb	–2.176	3.692	–0.589	0.556
Gaze duration	Intercept	0.031	32.430	0.001	0.999
	Fast vs. slow adverb	–65.051	30.360	–2.143	0.032
	Fast vs. slow verb	–14.763	30.360	–0.486	0.627
Go-past time	Intercept	–0.256	93.656	–0.003	0.998
	Fast vs. slow adverb	–31.400	88.485	–0.355	0.723
	Fast vs. slow verb	–88.975	88.485	–1.006	0.315
Total time	Intercept	–0.050	45.948	–0.001	0.999
	Fast vs. slow adverb	–1.005	41.521	–0.024	0.981
	Fast vs. slow verb	–58.419	41.521	–1.407	0.160

used were first-fixation duration, gaze duration, go-past time, and total time; all of the measures were defined as in Experiment 1. The data were again analyzed using linear mixed-effect models (Baayen et al., 2008), which were constructed in the same manner as in Experiment 1. For reading times on the entire indirect-quote region, the results revealed that adverb speed did not have an effect on first-fixation or go-past time or on total time (see Table 8 for the model output), nor did we find any interactions with verb speed (*p*s > .22). These findings differ from those of Experiment 1, in which effects of adverb speed on go-past and total times were observed, suggesting that the readers in Experiment 2 were not perceptually simulating talker speed for indirect quotations. However, unlike in Experiment 1, there was a significant effect of adverb speed on gaze durations, indicating that readers spent *more time* reading sentences following fast as compared to slow adverbs. The present results are in the opposite direction from what would be predicted from perceptual simulation. Generally, the results support the idea that readers were not perceptually simulating the indirect quotes. When total times were examined for each position of the indirect quote region, we found no effect of adverb speed (p = .71) nor any interaction with quote position (*p*s > .11). This result reveals that at no point over the indirect quote did adverb speed exert a significant effect on total reading times. This finding differs from the results in Experiment 1, in which adverb speed did have a

Table 9 Model output for adverb reading times (Exp. 2)

Measure	Predictor	Estimate	*SE*	*t* Value	*p*(*t*)
First fixation	Intercept	–0.156	3.627	–0.043	0.966
	Fast vs. slow adverb	11.015	4.714	2.337	0.020
	Fast vs. slow verb	4.106	4.669	0.879	0.379
	Frequency	–0.217	0.077	–2.838	0.005
Gaze duration	Intercept	0.030	5.643	0.005	0.996
	Fast vs. slow adverb	21.500	7.618	2.822	0.005
	Fast vs. slow verb	4.252	7.548	0.563	0.573
	Frequency	–0.254	0.121	–2.091	0.037
Go-past time	Intercept	0.065	9.364	0.007	0.995
	Fast vs. slow adverb	33.643	13.549	2.483	0.013
	Fast vs. slow verb	9.288	13.433	0.692	0.489
	Frequency	–0.593	0.209	–2.842	0.005
Total time	Intercept	–0.005	12.901	0.000	1.000
	Fast vs. slow adverb	63.657	16.753	3.800	0.000
	Fast vs. slow verb	–17.305	16.594	–1.043	0.297
	Frequency	–0.695	0.272	–2.555	0.011

significant effect when the individual words of the quote were considered separately.

We also examined reading times on the adverbs themselves, to see whether the effects seen on adverb reading times in Experiment 1 would be replicated for a different group of participants in a different reading environment (i.e., preceding indirect as opposed to direct quotes). For all measures, we found significant effects of both adverb speed and adverb frequency (see Table 9), but no significant effects of preceding verb speed and no significant interactions (all *p*s > .06). These results show that reading times on fast adverbs were significantly shorter than reading times on slow adverbs. Additionally, reading times on high-frequency adverbs were shorter relative to those on lower-frequency adverbs, although frequency did not interact with the effects of adverb speed. These findings replicate those seen in Experiment 1, providing further evidence that the semantic content of an adverb can affect reading times on the adverb itself, even when the adverb is not seen in the context of a direct quote.

Even though reading times over the entire indirect-quote region were unaffected by adverb speed, we wanted to rule out the possibility that the adverb might have exerted weaker perceptual-simulation effects in the presence of an indirect quote that might have extended only into the spillover region of the adverb (i.e., the first word of the indirect quote). These phrase-initial words are particularly interesting, because in all 24 items the adverbs were directly followed by function words (71 % *that*, 21 % *if*, and 8 % *where*), which lack rich semantics of their own and thus may be more susceptible to exhibiting spillover effects from the adverb. The model outputs indicated that for all reading measures, there were no effects of adverb (*p*s > .29) or verb (*p*s > .29) and no interaction between the two (*p*s > .10). Thus, even though reading times on the adverbs themselves were affected by their semantic content, these effects did not extend into their spillover region, further suggesting that readers were not perceptually simulating the indirect quotes.

Finally, as in Experiment 1, we wanted to test the possibility that readers might perceptually simulate the action described in the prepositional phrase following the action verb. If perceptual simulation was taking place over this phrase, we would expect to see shorter reading times for the phrases when they followed fast rather than slow main verbs. However, as in Experiment 1, we found no evidence that the speed of the main verb affected any of the four reading measures considered (all *p*s > .37).

Discussion

Overall, reading times for indirect speech in Experiment 2 showed that readers were not perceptually simulating the indirect quotations, as we found no effects of adverb speed over the quote region. These findings are consistent with those of Yao and Scheepers (2011), who also found faster reading times on direct, but not indirect, quotes attributed to speakers with a faster implied speaking rate. The speed effects were still present on the adverb itself in Experiment 2, however, indicating that the reading time differences on the fast and slow adverbs also observed in Experiment 1 were likely due to automatic activation of the adverb's semantics, which implicitly affected fixations on the adverb, and not to the ramping up of voice-related representations in anticipation of a direct quote. Because the effects were isolated to only the adverb and did not extend to the rest of the indirect quotation, we concluded that readers did not perceptually simulate indirect speech acts. Furthermore, no effects of action verb speed were observed on either the indirect quote or the prepositional phrase directly following the action verb, suggesting that readers also did not simulate the speed at which that action was performed.

General discussion

In the present study, we found that readers spent less time reading direct quotes described as being said "quickly" rather than "slowly," but that these effects were not present on a nearly identical region of text when it appeared as an indirect quote. Our findings are consistent with those of Yao and Scheepers (2011) and likewise suggest that readers generate detailed perceptual representations of characters' speech in natural reading. This representation includes the speaking rate of the character and influences the amount of time that participants spend reading direct quotes said by that character. Interestingly, speaking rate in the present study was instantiated by a single adverb preceding the quote, rather than by a three-to-four-sentence passage, as presented by Yao and Scheepers. As such, our study is the first to show that perceptual simulation of a character's speaking rate can be triggered by a single adverb, and yet still persist throughout the quote. These findings are not only an important theoretical replication of the work by Yao and Scheepers, but they extend those findings by showing that readers do not need to have a previously constructed expectation of character talking rate, created in response to receiving multiple well-spaced cues to the implied talker speed, in order to generate perceptual simulation effects. Rather, readers can integrate information about an adverb's semantic content quickly enough to affect not only eye movements over the direct quote region, but also the reading rate on the adverb itself. The speed effects observed on

quote reading times in Experiment 1 were not an artifact of implicitly accelerated or suppressed eye movements following the comprehension of a speed-specific adverb, as there were no similar effects on the indirect quotes in Experiment 2, even though all quotes were preceded by the same adverbs. That the effect in Experiment 1 was distributed over the entire direct quote, not just on the first fixation or the first word following the adverb, adds further support to the claim that the effect reflects perceptual simulation rather than a simple speeding of the motor program, induced by seeing a "fast" adverb.

Notably, in both the present study and Yao and Scheepers (2011), the speed effects on the quote region were only present on go-past and total reading times. Together, these studies suggest that perceptual simulation may not affect initial lexical access to words in the simulated region (as seems to be the case on the adverbs themselves, since these effects are present even on first fixation durations), but rather exerts its effect in determining how much time is spent on subsequent fixations on the words in the direct quote region, as well as on regressions out of the region. It could be the case that on their first pass through the region, readers focus on the fundamental tasks of reading, such as lexical access and syntactic parsing, and that only during later stages of reading do they generate their perceptual simulations and impose the character-specific voice-related representations.

In addition to the speed effects observed over the direct quote region, fast adverbs themselves were read significantly faster than slow adverbs on all reading measures considered in both Experiments 1 and 2, which served as an internal replication across two different groups of participants. This finding is unique, as Yao and Scheepers (2011) manipulated speaking rate implicitly, and thus did not use explicit speed-related adverbs directly before their quotations. To our knowledge, the present study is the first to demonstrate that the semantic content of a speed-specific adverb can affect online reading times of the adverb itself. Furthermore, that these effects were present when the adverbs preceded both direct and indirect quotes suggests that they do not represent a ramping up of voice-related representations in anticipation of the upcoming perceptual simulation, but likely stem from a different, more implicit mechanism. While other factors may be at play in determining reading times on the adverbs (e.g., predictability, degree of speed instantiation, or pronunciation rate), our data strongly indicate that when the sentence frame is held constant leading up to the adverb, its semantic features can quickly come online and implicitly affect its reading time.

We also manipulated the speed at which the character performed a physical action in the sentence orthogonally to the character's speaking rate. This allowed us to ask whether readers might perceptually simulate the speed at which the character performed the action, as well as whether action speed and character talking rate would have interactive effects on the perceptual simulation of direct quotations. The results showed that action verb speed did not affect reading times over the subsequent prepositional phrase that described the continuation of the action (i.e., *John walked into the room*), suggesting that action verbs did not generate the same type of perceptual-simulation effects produced for voice representations. This is not to say that those actions were not producing motor resonance of some kind; in fact, many past studies have shown brain activation of areas involved in the actions described in text (Hauk et al., 2004), as well as behavioral facilitation for performing actions after reading about them (Glenberg & Kaschak, 2002; Zwaan & Taylor, 2006; Taylor & Zwaan, 2008). The measures used in the present study cannot speak to whether different levels of motor resonance may occur for character actions of different speeds or intensities. However, we can conclude from the present data set that eye movements over the postverbal prepositional phrase were not influenced by action speed, nor were reading times on either the direct or indirect quote significantly affected by the semantics of the main verb. Thus, readers likely treat the speed at which a character is acting as independent from that character's speaking rate.

From the present study, we can suggest several future research directions. First, it is still unclear how the "fast" and "slow" adverbs moved reading times away from baseline, as our manipulation always included a speed-related adverb. It will be interesting to know whether one adverb type or the other has the greater impact on direct quote reading times, or whether both adverb types are equally effective in influencing reading speed. Second, although the global effect of character speed induced by the sentence's main verb did not significantly affect direct-quote reading times, the physical distance of a speed-related lexical item from the quote may play a role in determining perceptual-simulation effects. In the present study, the adverb always directly preceded the quote, leaving open the questions of whether the adverb would exert as strong of an effect if it were farther away than the verb (e.g., *John said energetically as he walked into the room, "I finally found my car keys."*) or whether the speed-related word closest to the quote has the largest effect. However, we do know that the action verb was unsuccessful at affecting eye

movements on its subsequent prepositional phrase, and so might not be expected to significantly affect quote reading times when it directly precedes them. Additionally, previous studies have found that individual differences in imaging abilities influence readers' ability to engage in auditory imagery (Alexander & Nygaard, 2008), so it is possible that certain readers may engage in more perceptual simulation than others do, which could modulate their reading times on the direct, and possibly on the indirect, quotations.

In sum, we found that direct quotes described as being said "quickly" are read faster than those described as being said "slowly," an effect that we attribute to perceptual simulation of character speech. Our results demonstrate that perceptual simulation can be generated with only a single adverb preceding a quote to establish a character's speaking rate. This is also the first study to show that adverbs with a semantically "fast" meaning are read faster than adverbs with a "slow" meaning, likely caused by the automatic activation of semantic features during lexical access, rather than by perceptual simulation. These findings add to those of Yao and Scheepers (2011) that readers perceptually simulate direct, but not indirect, speech, as well as extending their findings by demonstrating that a single adverb denoting speaking rate can be integrated online and used to generate perceptual simulation of direct quotes.

Author note This work was funded in part by NIH Training Grant T32-HD055272 and NSF Graduate Research Fellowship NSF DGE 11-44245 FLLW to M.C.S., and by NSF CAREER Award BCS-0847533 to K.C. We thank Christoph Scheepers, Kara Federmeier, Maureen Gillespie, and Brennan Payne for fruitful discussions about various aspects of this research. We also thank the members of the Educational Psychology Psycholinguistics Lab at the Beckman Institute for assistance with the data collection.

Appendix A: Experiment 1 materials

Table 10 Experiment 1 materials

	Sentence
1	John bolted/walked into the room and said energetically/nonchalantly, "I finally found my car keys."
2	The waiter whisked/came up to the table and declared hurriedly/lazily, "I'll be right back to take your back for your order."
3	The young woman sprinted/wandered onto the bus and asked frantically/calmly, "Do you go to the train station?"
4	Macy skimmed/pored over her recipe and said impulsively/idly, "I need to go grocery shopping."
5	Dan burst/walked into the office and asked urgently/sluggishly, "Has anybody seen my cell phone?"
6	Andy rushed/strolled up to his mom and announced excitedly/casually, "I just got accepted to Harvard!"
7	The professor raced/meandered up to the cheating student and remarked swiftly/unhurriedly, "You need to leave the exam."
8	Julie dashed/plodded through the room and announced hastily/lethargically, "I'm going to be late for work."
9	The woman impulsively/tentatively took her husband's hand and whispered quickly/slowly, "We're having a baby."
10	The doctor sped/went into the patient's room and declared rapidly/calmly, "Your tests came back normal."
11	The dad barreled/wandered into his son's bedroom and announced speedily/listlessly, "It's time to get up."
12	The student hurried/sauntered up to the teacher and said briskly/unexcitedly, "I can't make it to class Friday."
13	Joe's boss darted/ambled into his cubicle and declared excitedly/nonchalantly, "You gave a great presentation."
14	Ellen shot/walked out of the dressing room and asked insistently/carefully, "Does this dress look good on me?"
15	The stylist quickly/slowly held up a mirror and asked energetically/idly, "Do you like your new style?"
16	The lawyer glanced/stared at the jury and asserted swiftly/unhurriedly, "I know my client is innocent."
17	The coach ran/went onto the court and yelled urgently/deliberately, "You have to make your free throws!"
18	The reporter dashed/ambled up to the politician and inquired hastily/casually, "Are you running for mayor?"
19	Amy bounded/strolled up to the store manager and asked enthusiastically/lethargically, "Where is the shoe department?"
20	Nick glanced/stared at his watch and said briskly/slowly, "The movie starts in five min."
21	Leslie hurried/strolled into the gym and said enthusiastically/listlessly, "I'm nervous for my first yoga class."
22	Jake hopped/climbed into his car and muttered rapidly/unexcitedly, "I need to get gas today."
23	Andrea flew/pulled into the parking lot and yelled hysterically/slowly, "Somebody parked in my space again!"
24	The cab driver speedily/sluggishly turned around and asked frantically/lazily, "Where do you need to go?"

Appendix B: Experiment 2 materials

Table 11 Experiment 2 materials

	Sentence
1	John bolted/walked into the room and said energetically/nonchalantly that he finally found his car keys.
2	The waiter charged/came up to the table and declared hurriedly/lazily that he'll be back for their order.
3	The young woman sprinted/wandered onto the bus and asked frantically/calmly if it goes to the train station.
4	Macy skimmed/pored over her recipe and said impulsively/idly that she needs to go grocery shopping.
5	Dan burst/walked into the office and asked urgently/sluggishly if anybody had seen his cell phone.
6	Andy rushed/strolled up to his mom and announced excitedly/casually that he just got accepted to Harvard.
7	The professor raced/meandered up to the cheating student and remarked swiftly/unhurriedly that he must leave the exam.
8	Julie dashed/plodded through the room and announced hastily/lethargically that she's going to be late for work.
9	The woman impulsively/tentatively took her husband's hand and whispered quickly/slowly that she's having a baby.
10	The doctor sped/went into the patient's room and declared rapidly/calmly that the tests came back normal.
11	The dad barreled/wandered into his son's bedroom and announced speedily/listlessly that it's time to get up.
12	The student hurried/sauntered up to the teacher and said briskly/unexcitedly that she can't come to class Friday.
13	Joe's boss darted/ambled into his cubicle and declared excitedly/nonchalantly that he gave a great presentation.
14	Ellen shot/walked out of the dressing room and asked insistently/carefully if the dress looks good on her.
15	The stylist quickly/slowly held up a mirror and asked energetically/idly if she likes her new style.
16	The lawyer glanced/stared at the jury and asserted swiftly/unhurriedly that he knows his client is innocent.
17	The coach ran/went onto the court and yelled urgently/deliberately that they have to make their free throws!
18	The reporter dashed/ambled up to the politician and inquired hastily/casually if she's running for mayor.
19	Amy bounded/strolled up to the store manager and asked enthusiastically/lethargically where the shoe department is.
20	Nick glanced/stared at his watch and said briskly/slowly that the movie starts in five min.
21	Leslie hurried/strolled into the gym and said enthusiastically/listlessly that she's nervous for her first yoga class.
22	Jake hopped/climbed into his car and muttered rapidly/unexcitedly that he needs to get gas today.
23	Andrea flew/pulled into the parking lot and yelled hysterically/slowly that somebody parked in her space again.
24	The cab driver spun/turned around and asked frantically/lazily where they need to go.

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