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How situational competence beliefs and task value relate to inference strategies and comprehension during reading☆

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ABSTRACT

In two studies, we explored the associations among situational reading-related competence beliefs and task value, inference strategies, comprehension during reading, and foundational skills in college age students. In Study 1, 93 participants from a community college completed assessments of comprehension and two types of inference strategies (elaboration and bridging), each immediately followed by a survey of their competence beliefs and task value regarding the task. Results showed that competence beliefs and task value related positively to reading comprehension. In addition, task value was positively associated with both elaborating and bridging inferences, and competence beliefs correlated positively with bridging inferences. In Study 2, we investigated these associations further in a group of 418 students studying at three different colleges. Participants completed the same assessments for competence beliefs, task value, and inference strategies, as well as assessments of comprehension and foundational reading skills. Study 2 analyses revealed that foundational reading skills were a strong predictor of both types of inferencing and also comprehension. Further, when controlling for foundational reading skills, task value predicted elaboration and bridging inferences, whereas competence beliefs did not predict inferencing, but were trending as a predictor of comprehension. Finally, we created a path model to explore mediational effects, and found that task value positively predicted comprehension performance through increased elaborations while thinking aloud.

1. Introduction

Understanding how motivation affects student outcomes has been of long-standing interest in educational research, and particularly with respect to reading literacy (Schiefele et al., 2012; Wigfield et al., 2006). While it is well established that reading motivation is correlated with comprehension proficiency (Schiefele et al., 2012) and students' responses to reading interventions (Guthrie et al., 2004; Guthrie et al., 2013), an important question to ask is why? One possible mechanism stems from motivation being positively correlated with inferencing or reading strategies (Guthrie et al., 2004; Taboada et al., 2009). Students who are motivated while reading are likely to be more actively engaged in the reading task, thus developing goals and implementing strategies consistent with the task. In addition, Schiefele et al. (2012) noted that researchers assume students with high intrinsic motivation comprehend text more deeply, perhaps by using enhanced inference strategies, but empirical evidence is lacking. Comprehension processes, particularly those supporting inference strategies, are important because they can enhance readers' abilities to develop mental representations of text (McNamara & Magliano, 2009a, 2009b).

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Most studies that have explored relationships between reading motivation and reading strategies employ measures of general reading motivation that assess how motivated students typically are when they read (Davis et al., 2020; Guthrie et al., 2004). Such measures, including all 16 reading motivation scales reviewed by Davis et al. (2018), ask individuals to reflect upon their beliefs and values about reading generally. In contrast, situational reading motivation is one's beliefs and values about a specific reading activity. Outside the domain of reading, there is a growing literature investigating situational motivation and engagement in academic settings. For example, Dietrich et al. (2017) found associations between student effort and situational expectancies, task values and cost in a college-level psychology course. Shumow et al. (2011) used a situational motivation measure and found that parent involvement was related to motivational states in science classes among high school students. Also, Shernoff et al. (2016) found that the environmental complexity of high school classrooms predicted situational student engagement. The current paper uses a situational measure to investigate reading motivation constructs in the context of specific literacy activities.

Because there is little research on situational motivation to read, much less is known about the role it plays in how text is processed, which includes both the inference processes that readers engage in while reading, and the extent to which readers develop an understanding as they progress through the text. Understanding associations between reading motivation and these processes is important because it can provide additional insights into the role of motivation in reading comprehension.

We are particularly interested in understanding how motivation is related to inference strategies and comprehension in post-secondary students. Most reading motivation research has been conducted on early to adolescent readers; indeed Davis et al. (2018) found only 1 measure out of 16 has been developed for readers older than Grade 12. However, there are reasons to believe motivation is important for literacy outcomes in post-secondary settings. Studies show that college students' conceptualizations about themselves as learners play an important role in influencing academic behaviors (Nist & Holschuh, 2012; Paulson & Armstrong, 2011; Schraw & Bruning, 1996; Simpson & Nist, 2002). Alvarez and Risko (2009) found that college students' motivation for learning was influenced by beliefs that they can succeed on tasks assigned in their courses, suggesting there is variability in their perceptions of how competent they are as readers, which is related to motivation. Also, Hong-Nam and Leavell (2011) found that perceptions of self-efficacy improved reading performance for students enrolled in a developmental reading course intended to support under-prepared college students for the literacy expectations faced in college.

1.1. Competence beliefs and task value

To frame these studies, we used Guthrie and Wigfield's (2000) definition of reading motivation and the expectancy-value theory of achievement motivation. Guthrie and Wigfield define reading motivation as an "individual's personal goals, values, and beliefs with regard to the topics, processes, and outcomes of reading" (p. 405), implying that reading motivation is multifaceted and complex, such that any given student can possess various motivations to read, which can differ, depending on context and text type (Davis et al., 2020; Schiefele et al., 2012; Wigfield & Guthrie, 1997), Expectancy-value theory is a leading theory of academic motivation positing that a student's competence beliefs on and how much they value an activity help explain their performance, academic choices, and persistence on that activity. Therefore, we focus on two essential motivation constructs from expectancy-value theory: competence beliefs and task value (Eccles & Wigfield, 2020). These constructs align well with Guthrie and Wigfield's definition of reading motivation and research has shown they predict motivation-related outcomes in reading and other domains (Jiang et al., 2018; Schiefele et al., 2012; Wigfield et al., 2016).

Competence beliefs are defined in expectancy-value theory as students' evaluations of their current competence or ability (Wigfield et al., 2016). Competence beliefs specific to reading correlate with academic outcomes in students across the age spectrum (Schiefele et al., 2012). Although competence beliefs often reflect what students believe about their general competence in a domain such as reading, in this study we measured students' beliefs about their competence on a specific task they just completed.

To define task value, the other major motivation construct of interest in this paper, we adopt the consensus definition of value given by Conradi et al. (2014): "An individual's beliefs about the extent to which reading is generally useful, enjoyable, or otherwise important" (p. 154). Because we are concerned with the value students assign to a reading task, we keep the label "task value" from expectancy-value theory (Wigfield et al., 2016), which holds that task values are subjective in that different students can assign different values to the same task. In expectancy-value theory, there are four major components of value: attainment value or importance, intrinsic value or interest, utility value, and cost. We measured the first three in the current studies. These components overlap with intrinsic motivation from other theoretical perspectives, have been researched extensively in the reading motivation literature, and positively predict academic outcomes (Davis et al., 2020; Guthrie et al., 2004; Schiefele et al., 2012; Wigfield & Guthrie, 1997).

To study competence beliefs and task value situated in the context of specific literacy activities, we administered an instrument to measure these constructs immediately after participants completed two different literacy tasks. Students were instructed to reflect upon the recent literacy task when responding, thereby providing an assessment of these constructs just after completing the literacy tasks.

1.2. Inference strategies and mental model construction

Theories of text comprehension universally assume that comprehension arises with the construction of a durable memory for the text, called a mental model (McNamara & Magliano, 2009b). A mental model consists of a network of interrelated propositions that reflect the explicit information within a text and inferences (Kintsch, 1988). This network is constructed via *bridging inferences* that establish relationships between propositions representing explicit text content (e.g., how content conveyed in individual sentences are semantically connected; McNamara & Magliano, 2009a, 2009b). Another type of inference important for mental model construction is an *elaborative inference* which involves readers drawing upon knowledge beyond the text content (Graesser et al., 1994; McNamara & Magliano, 2009b; Singer, 1988). Elaborative inferences can be generated based on existing generic knowledge of the world (Graesser & Nakamura, 1982; Seifert et al., 1986), domain/text topic specific knowledge (McNamara & Kintsch, 1996), or on reasoning beyond the text content. We use the term inference strategies because some have characterized the extent that readers engaging in inferencing as being under strategic control (Graesser et al., 1994; Magliano et al., 1999).

Bridging and elaborative inferences have been studied via numerous methodological approaches (see Magliano & Graesser, 1991 for a review), but a variation of think aloud methodology was used in the present studies (Magliano & Millis, 2003; Trabasso & Magliano, 1996; van den Broek et al., 2001). Specifically, participants were asked to produce their thoughts after reading specific sentences (Magliano & Millis, 2003; Trabasso & Magliano, 1996). Thinking aloud under this instruction provides an assessment of the extent that readers produce bridging and elaborative inferences (Magliano et al., 1999; Magliano et al., 2011). There is considerable evidence that thinking aloud in this context is sensitive to individual differences regarding the extent to which readers engage in bridging and/or elaborative inferences during thinking aloud (Denton et al., 2015; Magliano et al., 2011; Magliano & Millis, 2003; Trabasso & Magliano, 1996). Moreover, these individual

differences correlate with performance on comprehension measures for both the texts from which the protocols were derived and other texts (Magliano & Millis, 2003).

1.3. Inferences strategies and motivation

Although the bulk of research on reading motivation has focused on reading in general, recently researchers have become interested in studying students' motivation for specific aspects of reading (Bråten et al., 2013) such as inferencing. Most relevant to the current studies, Clinton (2015) investigated two types of inferences, general motivation, and comprehension skills in a sample of undergraduates. Participants thought aloud while reading science texts, and protocols were coded to identify bridging and elaborative inferences. Clinton (2015) assessed the extent that an overall measure of motivation to read (i.e., a general measure of motivation to read, as opposed to a situational measure), and the sub-constructs associated with their measure were correlated with the propensity to generate bridging and elaborative inferences while controlling for comprehension skill (as measured by a standardized test of comprehension proficiency). Results showed that text-bridging inferences positively correlated with overall reading motivation and the motivation sub-constructs of reading as a part of self, reading self-efficacy, and reading to do well. Elaborative inferences positively correlated with one motivation construct, specifically reading for recognition from others. The present studies can be construed as a conceptual replication of Clinton (2015), but in the context of a situational measure of competence beliefs and task value while reading and thinking aloud.

1.4. Overview of present studies

The overall goals of the current studies were to assess 1) how reading competence beliefs and task value associate with inference strategies (i.e., bridging and elaborative inferences) during reading and 2) how competence beliefs and task value associate with comprehension outcomes. In both studies, we administered the Reading Strategy Assessment Tool (RSAT; Magliano et al., 2011) and an assessment of comprehension for separate texts. RSAT is a computer-based application that collects "think aloud" protocols and uses natural language processing tools to generate bridging and elaboration scores. Situational reading motivation measures were collected after the administration of RSAT and the comprehension tests. Study 1 was a preliminary study to assess if situational competence beliefs and task value correlated with inferences that occurred in a think aloud task and performance on a comprehension test involving answering open-ended questions while reading. Study 2 was conducted across multiple locations (two and four-year post-secondary institutions) with a considerably larger sample than Study 1. The comprehension test that was administered was intended to reflect complex and authentic literacy tasks that involve using multiple documents to solve a problem. Additionally, consistent with Clinton (2015), we measured foundational skills that support reading to control for proficiency in reading. This was done to ensure that the associations among competence beliefs, task value, processing, and comprehension outcomes were over and above the impact of reading proficiency.

2. Study 1

2.1. Methods

2.1.1. Participants

Ninety-three students from a community college in the Midwest region of the United States participated in the study for compensation ($25); 52.7% were male; 47.3% were female. Mean participant age was 19.39 ($SD = 3.23$). Twenty-one students indicated they spoke a language other than English as their first or primary language, which includes bilingual/multilingual. All study materials and procedures were approved by the institutional review board at the university of the first author, which indicates the study conforms to human subjects research protections. All participants provided informed consent, as well as separate consent regarding academic records.

2.1.2. Materials

2.1.2.1. Inference strategies. Measures of bridging and elaborative inferences were derived from a variant of RSAT, the RSAT-Inference Processes (IP) (Millis & Magliano, 2012). RSAT-IP is a web-based application in which texts are presented on a computer, and "think aloud" prompts occur after specific sentences. RSAT-IP consists of two texts, one on science (on the topic of Erosion) and one on history (on the topic of Louis XIV), ranging from 19 to 22 sentences long. There were 13 prompts across the two texts. To elicit think aloud responses, students were prompted by "What are you thinking now"? Participants were instructed to report whatever thoughts they had regarding how they were understanding the text at that point (Trabasso & Magliano, 1996). We followed the presentation format used by Magliano et al. (2011). Specifically, participants saw only one sentence at a time to ensure they relied on their mental model of the texts to report their thoughts (Magliano et al., 2011; Trabasso & Magliano, 1996).

RSAT uses computer algorithms to generate bridging and elaboration scores, and we refer the reader to Magliano et al. (2011) for greater detail. RSAT uses literal word matching and Soundex matching, which detected misspellings and changes in verb forms (Birtwisle, 2002; Christian, 1998). Bridging scores are based on the number of content words (noun, verbs, adjectives, and adverbs) found in the prior text. Elaboration scores are based on the number of content words not found in the previous sentences. Final bridging and elaboration scores were computed by aggregating (i.e., computing means) across the 13 items, and scores show good construct validity, correlating robustly with human judgments of the presence of bridging and elaborative inferences ($r = 0.70$ to 0.74 for bridging; $r = 0.48$ for elaboration; Magliano et al., 2011; Millis & Magliano, 2012). The scores are correlated with comprehension proficiency, as determined by an independent comprehension test (i.e., comprehension test for texts not used in RSAT and standardized texts of comprehension proficiency; Magliano et al., 2011; Millis & Magliano, 2012; Magliano, Higgs, et al., 2020) and thus show predictive validity.

2.1.2.2. Reading comprehension. Comprehension proficiency was measured by RSAT-Comprehension (RSAT-C; Millis & Magliano, 2012), which embeds why and how questions in the text in a similar manner as the RSAT-IP think aloud prompts. After pre-selected sentences, participants are given an open ended "why" or "how" question targeting the content of the current sentence (e.g., *Why do we hear thunder after seeing the lightning flash?* or *Why were the British on heightened alert?*). Answers to the questions can be found in the prior text. RSAT-C also consist of a science ("How Lightning Forms") and history text ("The Amritsar Massacre"), ranging from 26 to 27 sentences long. There were 14 comprehension questions (7 per text), presented one at a time.

Comprehension scores in RSAT-C use computer-based algorithms, similar to those in RSAT-IP, to determine semantic overlap between student answers and an ideal answer (Magliano et al., 2011). These algorithms score student responses by determining the number of content words in the participants' answers that were present in an ideal answer created by test makers (Magliano et al., 2011). A final comprehension score was derived by aggregating items. Comprehension scores show good construct validity in that they are robustly correlated with human judgments of the completeness of user answers ($r = 0.70$) and convergent validity because they are correlated with standardized tests of comprehension (correlation with performance on the Gates-McGinitie, $r = 0.50$; correlation with ACT reading comprehension subscore, $r = 0.54$; Magliano et al., 2011).

2.1.2.3. Competence beliefs and task values. Like our comprehension measures, the measures of reading motivation constructs were designed to capture readers' thoughts, attitudes, and emotions as they occurred while taking RSAT-IP and RSAT-C. We used a variant of the Experience Sampling Method (ESM; Hektner et al., 2007; Csikszentmihalyi & Larson, 2014) to assess levels of these constructs directly after taking the two forms of RSAT. Although ESM was designed to be administered during an activity, administering an ESM survey during a reading activity would interrupt the reading task. Therefore, we administered it directly after the task was completed. In both cases (during and after an activity), participants are responding to items retrospectively about the task they were doing before being interrupted.

Given the exploratory nature of this study, we used an existing instrument previously used by Shernoff et al. (2016). The original survey was designed to measure motivations and emotions in a classroom, so we adapted it by asking participants to think about the task they just completed. The motivation survey contained 31 items; approximately half contained adjectives describing various states/emotions. Other items included questions about effort, usefulness of tasks, and beliefs about performance. For each item, participants were instructed to rate whether the items reflected their experience on a scale of one to five. Surveys were completed in a written packet and took around 5 min to complete. While the original survey contained 31 items, we determined that three items aligned with competence beliefs and six items aligned with task value, so we formed scales representing those constructs based on theory. Regarding the task value scale, Item 1 measured attainment value, Items 2, 3, and 4 measured intrinsic value, and Items 5 and 6 measured utility value. The appendix contains the nine items and rating scales used to assess competence beliefs and task value. We calculated scale means to arrive at scores for competence beliefs and task value. Internal consistency for both scales in Study 1 was acceptable (see alpha coefficients in Table 1). We administered the motivation survey twice: after the administration of RSAT-IP and after the administration of RSAT-C.

2.1.3. Procedures

Study 1 was administered in small groups ranging from one to six students, and lasted 60 to 75 min. The study session consisted of three parts. Part 1 involved administering RSAT-C and Part 2 involved RSAT-IP, and each was followed immediately by the motivation survey to assess competence beliefs and task value. The presentation of RSAT-C and RSAT-IP was fixed in that order, and the reasoning was twofold. First, students were arguably more familiar with the embedded questions in RSAT-C than RSAT-IP, because open ended "why" and "how" questions are more common in educational contexts than being asked to report "think aloud" like responses while reading. It was determined that starting the experiment with a more familiar task would benefit the students. The second stemmed from pilot testing for the time it took to complete the two forms of RSAT that showed that there was greater variability in finishing RSAT-IP than RSAT-C. Given that instructions for Parts 1 and 2 were always provided orally (described below), it was essential that participants completed Part 1 before Part 2 started. The third section involved administering a demographics questionnaire. Instructions for the demographics survey were self-explanatory and as such participants were allowed to start those surveys immediately after completing Part 2.

Prior to participants reading in RSAT, research study personnel provided both oral and printed instructions to participants as a group, using materials developed by Magliano et al. (2011). Participants were told the study's purpose was to learn about what makes students successful readers and that they would take two new types of tests to learn about how they read. For RSAT-C, they were told they would read texts and answer open ended questions about them, all on the computer. Participants were informed the texts would be presented one sentence at a time. They were given a practice text, containing five sentences, and two question prompts. Participants were instructed to sit quietly after completing RSAT-C and wait until all students finish.

When all students completed Part 1, the instructions for Part 2 were administered, again based on those developed by Magliano et al. (2011). Participants were told that when they received the question "what are you thinking now?", they should type any thoughts that came to mind in terms of how they understand what they are reading. Practice consisted of a five-sentence text, with two practice protocols. Experimenters instructed participants to avoid vague responses (e.g., "OK", "Makes sense", "I don't know"), and that they could start Part 3 after completing Part 2.

2.2. Results and discussion

Study 1 analyses consisted of computation of descriptive statistics, correlations, and multiple regressions. Table 1 presents means and correlations for two sets of variables. The first set displays the RSAT-C scores and two situational motivation constructs of competence beliefs and task value, and correlations among these. As can be seen, both reading motivation variables show significant positive correlations to comprehension. The second part of Table 1 displays scores for bridging inferences and elaboration inferences, corresponding competence beliefs and task value, and how they interrelate. Elaboration inferences were significantly and positively associated with task value, and bridging inferences related significantly and positively to both competence beliefs and task value.

We next used multiple regression analyses to assess the extent to which competence beliefs and task value predict inferencing and comprehension. Competence beliefs and task value were simultaneously entered into the regressions. The first regression analysis of Table 2 shows task value was a significant, positive predictor of elaboration, $F(2, 90) = 3.214$, $p < .05$, $R^2 = 0.067$. Task value was also a significant positive predictor of bridging, as the second regression analysis shows, $F(2, 90) = 6.159$, $p < .01$, $R^2 = 0.120$. The regression analysis showed that neither competence beliefs nor task value significantly predicted RSAT-C Comprehension, although the overall regression model was significant, $F(2, 90) = 4.497$, $p < .05$, $R^2 = 0.091$.

The results of Study 1 indicate that two reading motivation constructs are associated with comprehension performance and bridging

Table 1
Study 1 correlations among competence beliefs, task value, comprehension, and inference strategies.

	1	2	3	4	5	6	*Mean* (*SD*)	No. of items	Alpha
1. RSAT-C comprehension							1.80 (0.75)	N/A	N/A
2. RSAT-C competence beliefs	0.27**						3.50 (0.93)	3	0.86
3. RSAT-C task value	0.26*	0.53**					3.37 (0.78)	6	0.76
4. RSAT-IP elaboration	0.54**	0.13	0.22*				4.11 (1.89)	N/A	N/A
5. RSAT-IP bridging	0.36**	0.19	0.36**	0.45**			1.80 (0.79)	N/A	N/A
6. RSAT-IP competence beliefs	−0.02	0.57**	0.33**	0.04	0.22*		3.63 (1.00)	3	0.83
7. RSAT-IP task value	0.20	0.32**	0.65**	0.24*	0.34**	0.51**	3.28 (0.83)	6	0.80

Notes. $n = 93$; RSAT-C = RSAT-Comprehension; RSAT-IP = RSAT-Inference Processes.
* $p < .05$.
** $p < .01$.

Table 2
Study 1 regression coefficients: predicting inferences and comprehension from situational competence beliefs and task value.

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
1. DV: RSAT elaboration					
(Constant)	2.649	0.864		3.067	0.003
RSAT-IP competence beliefs	−0.212	0.224	−0.112	−0.948	0.346
RSAT-IP task value	0.680	0.271	0.297	2.505	0.014
2. DV: RSAT bridging					
(Constant)	0.640	0.353		1.813	0.073
RSAT-IP competence beliefs	0.047	0.091	0.060	0.518	0.605
RSAT-IP task value	0.301	0.111	0.313	2.714	0.008
3. DV: RSAT-C comprehension					
(Constant)	0.755	0.359		2.101	0.038
RSAT-C competence beliefs	0.144	0.096	0.178	1.500	0.137
RSAT-C task value	0.160	0.115	0.166	1.398	0.165

Notes. RSAT-C = RSAT-Comprehension; RSAT-IP = RSAT-Inference Processes.

and elaborations. The modest to moderate size of the correlations (*r* ranging from 0.27 to 0.45) is typical of studies exploring the relationship between motivation and comprehension outcomes, and likely reflects the fact that there are a plethora of other individual difference factors that account for variability in strategic processing and comprehension (Cromley & Azevedo, 2007; Kopatich et al., 2019). As such, this underscores the need to assure that these relationships still exist when controlling for proficiency in reading, which we did in Study 2.

3. Study 2

Study 2 was conducted across multiple sites and in two and four-year post-secondary institutions. Moreover, this study employed a different literacy task to measure comprehension performance than what was used in Study 1. Specifically, we used a scenario-based assessment (SBA). The purpose of an SBA is to assess students' ability to use texts to solve authentic problems that they may encounter in academic contexts (Sabatini et al., 2014a). Importantly, this study afforded an assessment of whether the results of the Study 1 replicate with a larger sample and in analyses that control for comprehension proficiency.

3.1. Methods

3.1.1. Participants

Study 2 was based on archival data reported in Magliano, Higgs, et al. (2020), who importantly did not explore the relationships between motivation and inference strategies or comprehension. The original sample consisted of 620 participants, and Study 2 uses 418 students who completed all measures relevant to this study. Participants were attending either a large, 4-year institution in the Midwest United States, a community college in the Southwest United States, or a community college in the Northeast United States. None of the participants in this study had participated in Study 1. Most participants were first year students and the sample included participants who were enrolled in developmental education courses and those who were not. Across all institutions, 248 students were designated as needing additional support in the form of a developmental literacy program. Compensation for participating in the study varied across the locations. Participants received either monetary compensation, course credit or gift certificates for participating in each session (or a combination of money and course credit across sessions). This study was approved by the institutional review board at the first author's university, conformed to human subjects research protections, and informed consent was obtained for participation and academic records. See Table 3 for further demographic information on the Study 2 sample.[1]

3.1.2. Materials

3.1.2.1. Foundational reading skills. A measure of general foundational reading skills was obtained based on the Study Aid and Reading Assessment (SARA:O'Reilly et al., 2012; Sabatini et al., 2015; Sabatini et al., 2019). This assessment measures multiple components of reading using a sequence of subtests that reflect a continuum of component reading skills. In the current study we utilized four of the six subtest scores to measure foundational skills (word recognition and decoding, vocabulary, morphology, and sentence processing). The assessment has been tested with tens of thousands of students and demonstrates high reliability (five of six subtests have Cronbach's $\alpha > 0.88$) and has evidence of concurrent validity in predicting state test scores (O'Reilly et al., 2012; Sabatini et al., 2015; Sabatini et al., 2019). We conducted factor analysis using principal axis factoring (PAF) to determine if the subtests of SARA loaded onto a latent factor representing foundational reading skills. The results of the PAF supported the construct validity for the foundational skills as a latent construct. Sampling adequacy (KMO =

Table 3
Demographic information for Study 2 participants.

Participant information	Total	Proportion
Participant count	418	
Developmental enrollment		
DE	248	0.59
Not DE	145	0.35
No info	25	0.06
School type		
2 year	156	0.37
4 year	262	0.63
Sex		
Female	241	0.58
Male	151	0.36
No response	26	0.06
First language		
English	310	0.74
Not English	93	0.22
No response	15	0.04
Race/Ethnicity		
Black/African American	173	0.41
White	109	0.26
Asian	51	0.12
Hispanic/Latino	70	0.17
American Indian/Alaska Native	3	0.01
Native Hawaiian/Pacific Islander	1	<0.01
No selection	11	0.03
Age range		
18–22	336	0.80
23–37	30	0.07
38–55	7	0.02
No response	45	0.11

[1] Note that although there are students who did not speak English as their primary language in the current sample, other research has been conducted with the data from Study 2 that has looked specifically at issues of second language learners. After accounting for foundational reading skills, there were no differences between native English speakers and English language learners in terms of reading processing (Feller, Kopatich, et al., 2020). Thus, in the current study, we have treated these groups as equivalent and not included this variable into the regression models described below.

0.83) was judged to be "meritorious" (Kaiser, 1974). A single factor solution accounted for 77% of the variance in subscales suggesting construct validity for the foundational skills as a latent construct (see Table 4 for factor loadings). Regression scores were then derived from this factor analysis and used in subsequent analyses as a measure of foundational skills.

3.1.2.2. Inference strategies. As was the case with Study 1, RSAT-IP was used in the present study.

3.1.2.3. Literacy task. The Global, Integrated, Scenario-based Assessment (GISA) was the SBA used to assess performance on a literacy task (O'Reilly & Sabatini, 2013; Sabatini et al., 2013; Sabatini et al., 2019). Items were presented in the context of an academically authentic task. Specifically, students are provided a goal (e.g., correct a wiki on a historical topic) and asked to read a collection of thematically related texts. Teacher and student characters within the activity provide context and scaffolding for the participants. GISA provides test takers with a realistic, domain-specific purpose for reading a collection of sources and materials, which affords for the measurement of skills associated with higher-level comprehension such as knowledge of text structure, evaluation, application, perspective taking and integration of information in service of completing a goal (see Bennett, 2011; O'Reilly & Sabatini, 2013; O'Reilly & Sheehan, 2009; Sabatini et al., 2013; Sabatini et al., 2018).

GISA has been shown to be reliable in elementary through high school populations as evidenced by good internal consistency (Cronbach's $\alpha > 0.80$; O'Reilly et al., 2014) and test-retest reliability ($r = 0.87$; Sabatini et al., 2014b). GISA has robust correlations with other reading measures such as state-based tests of proficiency in language arts (r ranges 0.52 to 0.68; O'Reilly et al., 2014) and correlates with measures of deep understanding including academic vocabulary, complex reasoning, and perspective taking (LaRusso et al., 2016). The version of the GISA used in the current study involved a scenario in which students were asked to update and correct a wiki about the Mona Lisa.

3.1.2.4. Competence beliefs and task values. The same survey used in Study 1 was used in Study 2. As was the case for Study 1, the survey was administered directly after RSAT and after GISA, and internal consistency for both scales in Study 2 was acceptable, as seen in Table 5.

3.1.3. Procedure

Study 2 was conducted across two sessions. In the first session, SARA and RSAT were administered, and in the second session GISA was administered. As was the case with Study 1, the motivation survey was administered after receiving RSAT-IP and after GISA, and participants were instructed to fill out the instrument with the prior task in mind.

3.2. Results

Table 5 shows means and standard deviations for the measures, as well as bivariate correlations. GISA comprehension had a significant positive relation to SARA foundational reading skills, elaboration and bridging inferences, and competence beliefs for the GISA. While task value was significantly correlated with performance on RSAT-C in Study 1, it did not correlate with GISA performance in Study 2.

Table 4
Factor loadings for SARA skill scores.

SARA subscale	Factor loading
Word recognition and decoding	0.83
Vocabulary	0.84
Morphology	0.89
Sentence processing	0.77

As in Study 1, we calculated three multiple regressions to investigate the extent to which the reading motivation constructs predict inference strategies and comprehension, simultaneously entering foundational skills, competence beliefs, and task value into each regression as predictor variables. An improvement over Study 1 was the inclusion of foundational skills as a control variable. As can been seen in the first regression analysis of Table 6, foundational skills and task value were significant and positive predictors of elaboration, $F(3, 414) = 22.161$, $p < .001$, $R^2 = 0.138$. Similarly, as can be seen in the second regression analysis in Table 6, foundational skills and task value were significant, positive predictors of bridging, $F\ (3,\ 414) = 16.909$, $p < .001$, $R^2 = 0.109$. The analysis predicting performance on GISA indicated that foundational skills was a significant predictor, $F(3, 414) = 100.126$, $p < .001$, $R^2 = 0.420$, and there was a non-significant trend with respect to competence beliefs, $p = .065$.

3.3. Exploratory analysis of direct and indirect relationships

The results regarding the relationships between our motivation constructs and comprehension were modest. However, there is growing evidence of both direct and mediational relationships among individual difference factors, inferencing strategies, and comprehension (Ahmed et al., 2016; Cromley & Azevedo, 2007; Kopatich et al., 2019; Magliano, Higgs, et al., 2020), and with respect to constructs related to motivation (i.e., interest; Clinton & van den Broek, 2012). As such, we conducted an exploratory path analysis to assess if the relationships between motivation constructs and GISA performance were mediated by inference strategies. Using the current study's data set, Magliano, Higgs, et al. (2020) found that the relationship between foundational reading skills and comprehension was partially mediated by elaboration scores, and therefore the model tested here took those mediational paths into consideration.

To further explore the potential role of competence beliefs and task value on comprehension, an exploratory path model was conducted as shown in Fig. 1. This partially mediated model was also tested against fully mediated and unmediated models. That is, in the fully mediated model, foundational skills, competence beliefs, and task value had no direct effect on GISA comprehension scores but had indirect effects through elaboration and bridging inferences. On the other hand, in the unmediated model, competence beliefs and task value were only allowed to have direct effects on GISA comprehension scores. Table 7 summarizes the fit of these three models. The partially mediated model had the highest CFI and the lowest BIC, indicating that this model fit the data best (see Fig. 2 for final model with coefficients). Table 8 contains the indirect effects of the final model. Importantly, there was a fully mediated path involving task value, elaboration, and comprehension. Students who perceived greater value in reading tended to produce more elaborative inferences, and the more participants elaborated when taking RSAT, the better they performed on GISA. One caveat is that the measures of motivation, inference strategies, and comprehension did not involve the same texts (see Clinton & van den Broek, 2012).

3.4. Discussion

Study 2 extended the results of Study 1, showing that situational motivation is correlated with inference strategies and performance on a literacy task. Importantly, Study 2 replicated the results of Study 1 and showed that perceived value in reading was positively correlated in the extent that participants engaged in bridging and elaboration when taking RSAT. Competence beliefs and task value were not directly related to performance on GISA. However, an exploratory path analysis indicated that perceiving value in reading the texts in GISA was positively correlated with the extent that readers elaborated when taking RSAT, which was in turn positively correlated with performance on GISA.

Table 5
Study 2 correlations among competence beliefs, task value, comprehension, and inference strategies.

	1	2	3	4	5	6	7	*Mean* (*SD*)	No. of items	Alpha
1. Foundational skills								0.00 (0.95)		N/A
2. GISA comprehension	0.63**							16.72 (5.41)	N/A	N/A
3. GISA competence beliefs	0.08	0.17**						3.33 (0.99)	3	0.84
4. GISA task value	−0.18**	0.00	0.53**					3.00 (0.93)	6	0.86
5. RSAT-IP elaboration	0.32**	0.38**	0.02	0.07				2.99 (1.87)	N/A	N/A
6. RSAT-IP bridging	0.27**	0.26**	0.07	0.12*	0.40**			1.60 (1.04)	N/A	N/A
7. RSAT-IP competence beliefs	0.12*	0.07	0.45**	0.21**	0.11*	0.08		3.55 (0.90)	3	0.81
8. RSAT-IP task value	−0.17**	−0.07	0.29**	0.55**	0.12*	0.14**	0.41**	3.20 (0.86)	6	0.80

Notes. $n = 418$; GISA = Global, Integrated, Scenario-based Assessment; RSAT-IP = RSAT-Inference Processes.
* $p < .05$.
** $p < .01$.

Table 6
Study 2 regression coefficients: predicting inferences and comprehension from situational motivation and foundational skills.

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
1. DV: RSAT elaboration					
(Constant)	1.748	0.398		4.392	0.000
Foundational skills	0.702	0.093	0.357	7.539	0.000
RSAT-IP competence beliefs	−0.017	0.106	−0.008	−0.158	0.875
RSAT-IP task value	0.408	0.112	0.188	3.654	0.000
2. DV: RSAT bridging					
(Constant)	0.978	0.226		4.330	0.000
Foundational skills	0.339	0.053	0.309	6.419	0.000
RSAT-IP competence beliefs	−0.060	0.060	−0.052	−0.994	0.321
RSAT-IP task value	0.261	0.063	0.216	4.120	0.000
3. DV: GISA comprehension					
(Constant)	13.97	0.789		17.712	0.000
Foundational skills	3.630	0.220	0.640	16.482	0.000
GISA competence beliefs	0.452	0.245	0.083	1.848	0.065
GISA task value	0.410	0.266	0.070	1.544	0.123

Notes. GISA = Global, Integrated, Scenario-based Assessment; RSAT-IP = RSAT-Inference Processes.

4. General discussion

While it is well documented that reading motivation is related to academic outcomes (Guthrie et al., 2004; Schiefele et al., 2012; Wigfield et al., 2006), the empirical research on associations between reading motivation constructs and the processes and strategies that support mental model construction is scant. There are very few studies simultaneously measuring inference or reading strategies, reading motivation constructs, and text comprehension (Clinton, 2015; Clinton & van den Broek, 2012; Guthrie et al., 1999; Taboada et al., 2009). Prominent theories of text comprehension have been largely agnostic about the role of competence beliefs and task value in mental model construction (McNamara & Magliano, 2009b). As such, the present study addressed an important and understudied aspect of comprehension.

4.1. Relationships among competence beliefs, task value, inferences and comprehension

The results of the current studies provided evidence that task value for reading specific texts was related to bridging and elaborative inferences. Those who perceived greater value reading the texts in RSAT tended to generate more bridging and elaborative inferences. These relationships were replicated across the studies and in the context of both controlling for (Study 2) and not controlling for (Study 1)

Table 7
Model fit summary for RSAT ESM models.

Model	χ^2	df	CFI	BIC
Partial mediation	45.47	1	0.91	98.35
Full mediation	214.11	4	0.57	260.90
No mediation	78.78	5	0.85	123.53

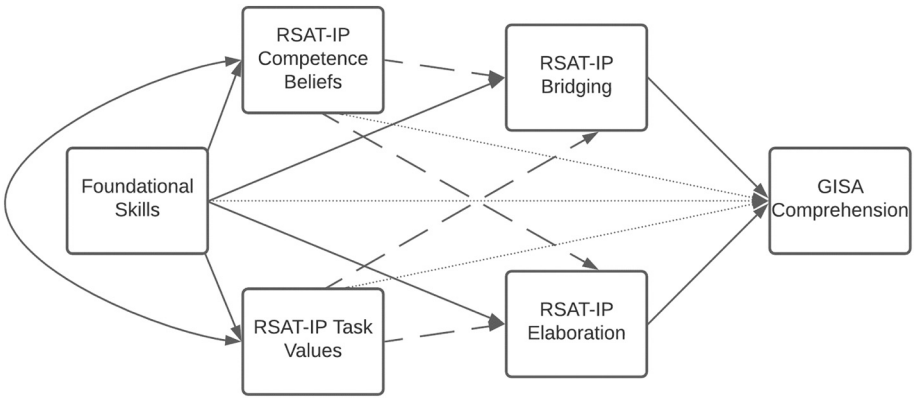

Fig. 1. Exploratory path analysis models tested (Study 2).
Note. Dotted lines represent relationships constrained to 0 in the Full Mediation model and dashed lines represent relationships constrained to 0 in the No Mediation model.

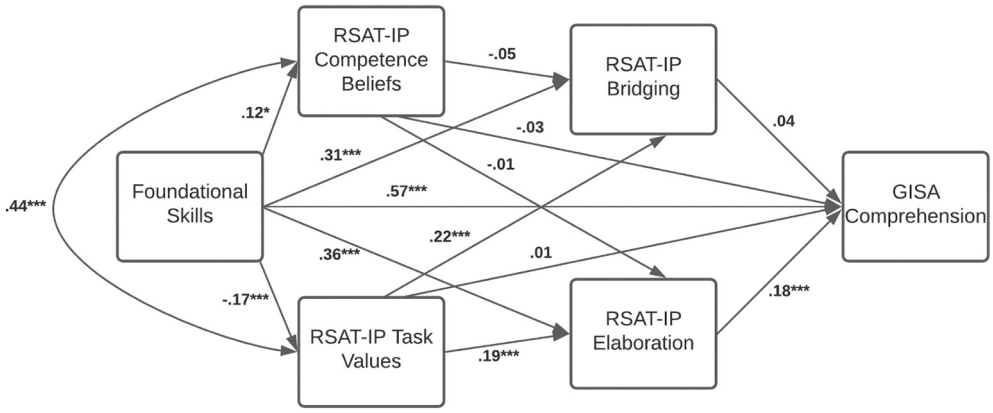

Fig. 2. Final partially mediated path model for exploratory analysis (Study 2).
Note. ***$p < .001$, *$p < .05$.

Table 8
Indirect effects for partial mediation RSAT ESM model.

Indirect effect	β	*SE*	95% bootstrapped CI for β	
Foundational skills → RSAT IP bridging	−0.04*	0.02	−0.08	−0.01
Foundational skills → RSAT IP elaboration	−0.03*	0.02	−0.06	−0.00
Foundational skills → GISA comprehension	0.06*	0.02	0.03	0.11
RSAT IP competence beliefs → GISA comprehension	−0.00	0.01	−0.02	0.02
RSAT IP task value → GISA comprehension	0.06*	0.01	0.02	0.07

Notes. GISA = Global, Integrated, Scenario-based Assessment; RSAT-IP = RSAT-Inference Processes.
* $p < .05$.

proficiency in reading. As such, task value, rather than competence beliefs, was most robustly related to inference strategies, predicting both elaboration and bridging, even after controlling for foundational skills (Study 2). In their review, Schiefele et al. (2012) noted that reading-related task values resemble intrinsic motivation for reading, and concluded that there is ample research showing moderate, positive associations between intrinsic motivation and reading competence (defined as reading skills and comprehension). In that sense, generation of inferences is one type of reading competence, and our findings are consistent with past research. As noted previously, reading researchers assume that intrinsically motivated students comprehend text more deeply by using enhanced inference strategies, but this lacks support in the research literature (Schiefele et al., 2012). Although the processes underlying this are not well-documented, we speculate that reading-related task values may cause students to read deeply to satisfy their comprehension needs, which would lead to them engaging in inference strategies.

However, surprisingly, associations between the reading motivation constructs and comprehension performance were modest at best. There were no significant effects found in the regression analyses for Study 1, and only a non-significant trend between confidence beliefs and performance on GISA in Study 2. The literature is somewhat mixed regarding such relationships. While some studies found direct relationships between aspects of reading motivation and comprehension (Anmarkrud & Bråten, 2009; Bråten et al., 2013; Bråten et al., 2017; Clinton & van den Broek, 2012), some studies have not (Bråten et al., 2014) or only with specific texts (Clinton & van den Broek, 2012).

We conducted an exploratory analysis to assess if there were indirect relationships that involved inference strategies, which was motivated by growing evidence that there are both direct and mediational relationships between individual difference factors, inference strategies, and comprehension (Ahmed et al., 2016; Clinton & van den Broek, 2012; Cromley & Azevedo, 2007; Kopatich et al., 2019; Magliano, Higgs, et al., 2020). Study 2 utilized data from Magliano, Higgs, et al. (2020) and as such the direct and indirect relationships between foundational reading skills and inferences on GISA performance were consistent with those reported in that study. Importantly, there was an indirect path from task value on comprehension performance through elaborative inferences. These findings indicate that the relationship between task value for a text and comprehension is partially explained by how task value affected inference strategies.

These results are consistent with those reported by Clinton and van den Broek (2012) who tested a mediation hypothesis with the variables of topic interest, inference strategies, and comprehension. Different conceptualizations of reading motivation include some form of interest (e.g., topic, personal) when reading (Schiefele et al., 2012; Wigfield & Guthrie, 1997). Like the current studies, Clinton and van den Broek (2012) used think aloud procedures to measure inference strategies, but importantly they also collected comprehension measures on the same text for which the participants thought aloud. Those authors found that topic interest correlated with inference strategies and comprehension test scores, and inference strategies partially mediated the relationship between topic interest and comprehension performance. However, this relationship was only manifested in one of the two texts used in the study, specifically the one with a higher level of coherence. Bråten et al. (2014) similarly found that the relationship between perceived interest in the topic of texts on comprehension performance was fully mediated by perceived effort devoted to the task. Topic interest may be related to task value of reading, as measured in this study. Importantly, these studies underscore the need to replicate the present study in the context of measuring reading motivation constructs, inference strategies, and comprehension for the same texts.

The exploratory path model also showed that the relationships between foundational skills and reading motivation constructs are complex. Foundational skills were positively correlated with competence beliefs regarding the text in GISA, but negatively correlated with the task value of reading them. It makes sense that more proficient readers would be more likely to feel confident in their ability to comprehend those texts, but why would they be more likely to see less value in GISA? We do not have data that can help answer this question. However, it could be that more proficient readers tended to find the text topic (i.e., the subject depicted in the Mona Lisa) relatively uninteresting and/or were less likely to perceive value in reading these texts in the context of a standardized test, such as GISA. Nonetheless, our results suggest that competence beliefs and task value specific to texts are dissociable and may be differentially related to foundational skills. This finding warrants further exploration, specifically to determine the extent that the relationships between foundational skills and dimensions of reader motivation are stable or vary across situations. We suspect that the latter is

more likely to be the case.

4.2. Methodological contributions

Regarding methodology, some studies have measured reading motivation constructs situationally, but typically as an outcome rather than a predictor variable of processing (Bråten et al., 2017) and thus our paper makes an important methodological contribution to the reading motivation literature. Our situational measure of competence beliefs and task value was based on the experience sampling method (Hektner et al., 2007) to measure students' beliefs directly after each of two reading activities. This data collection method contrasts with previous measures of students' reading motivation, such as the Motivation for Reading Questionnaire (Wigfield & Guthrie, 1997) for younger students, or the Adult Motivation for Reading Scale (Schutte & Malouff, 2007), which measure general reading motivation that is not specific to a task. It is possible that our more specific measure of reading motivation is a stronger predictor of comprehension and future studies should investigate whether this is true. Our results indicate that a variant of ESM provides a viable and practical alternative for measuring reading motivation constructs at a specific level.

On a similar note, current models of reading motivation and engagement, such as Guthrie and colleagues' engagement model of reading development (Guthrie & Wigfield, 2000) have been tested exclusively using measures of reading motivation at a general level (Guthrie et al., 2004). Results of the present studies show that situational reading motivation is related to specific reading processes essential to comprehension. While we are not refuting past research and current models, we believe that situational motivation needs to be incorporated into such models and doing so would help better explain connections between student motivation, engagement and ultimately comprehension.

Developing and refining measures of situational motivation is essential for the application of this research to practice. We know that low motivation is related to poorer academic performance (Schiefele et al., 2012), and the current studies show a more specific mechanism possibly underlying that process. Our results suggest that low motivation for specific tasks may be a potential barrier to academic reading because of its relationship to inference strategies. Low motivation certainly impacts initial college student experiences, which underscores the importance of developing interventions that increase engagement for academic reading. There is evidence that individuals' reading motivation is malleable through teaching and classroom activities (Guthrie et al., 2007; Guthrie & Klauda, 2014). Valid and reliable measures of situational motivation will lead to a better understanding of how to promote motivation that improves student outcomes.

4.3. Strengths, qualifications, and limitations

One strength of these studies is that we replicate our results across the two studies using different literacy tasks. While these tasks varied in complexity, they also varied in other important ways. Responding to items in RSAT-C required responding to open-ended questions by accessing one's mental model to compute the answers to those questions. On the other hand, GISA relied on multiple choice questions in which the texts were available to the reader. Another important difference between the literacy tasks used in Studies 1 and 2 is that RSAT-C involves comprehending a single document, whereas GISA is intended to reflect multiple-documents tasks. While there are overlapping processes that support comprehending single and multiple documents, there are requirements, processes, and strategies that are unique to processing multiple documents (Britt et al., 2018). While competence beliefs are positively correlated with both tasks, the relationship is stronger with RSAT-C than with GISA. There are many reasons why this might be the case, but the differences in the tasks may be one of them. These results underscore the need to explore the relationship between reading motivation constructs and literacy outcomes for both single and multiple documents literacy tasks.

These studies involved a diverse sample of students from two- (Study 1 and Study 2) and four-year (Study 2) post-secondary institutions. We encourage researchers who focus on post-secondary literacy to conduct research with diverse samples, and if possible, from multiple institutions. Such diverse samples should provide a more representative range of college students than samples restricted to one institution. We especially encourage researchers to conduct studies in community college settings and to focus on reading motivation. Many community college students, particularly those underprepared to read in college, are challenged with low reading competence beliefs and intrinsic motivation (Alvarez & Risko, 2009). As such, developing interventions to increase engagement for academic reading in this context merits the intention of the field, but such interventions should be informed by research and theory.

Moreover, college-level reading comprehension and reading strategies are precursors to success in post-secondary education at any level (Fike & Fike, 2008). Studies that explore factors related to comprehension processes and strategies in a community college setting could contribute to our understanding of how to help underprepared and struggling college students. For those college students who are deemed not "college ready," college reading readiness is one area often identified as requiring improvement with most community colleges offering developmental reading courses for new college students who are at risk (Bailey & Cho, 2010; Gruenbaum, 2012; Rao, 2005). Our study results suggest that situational reading competence beliefs and value are factors that could be targeted, but more research is warranted to guide the nature of such interventions.

It is important to note that our reading motivation measure asked students how motivated they were to complete the RSAT or GISA activity, which included both reading the text and responding to the question prompts. It did not ask specifically about motivation for *just* reading the text. However, reading in academic contexts is almost always grounded in reading for a purpose or to achieve a task (Britt et al., 2018). As such, while it is possible to isolate the reading and the activity when measuring general reading motivation (i.e., how motivated students tend to be when they read), it may not be viable to do so in the context of measuring situational motivation. Our approach was to embrace this perspective, although it is worthwhile to explore the possibility of isolating situational motivation for reading and completing the task in future research.

It is also important to note that the assessment of reading motivation relied on relatively few items to assess competence beliefs and task value. Measures of general reading motivation typically have more items to assess the sub-constructs of reading motivation (see Davis et al., 2018). However, the instrument was based on ESM (Hektner et al., 2007), and studies have shown that situational assessments of student engagement for a particular task can be reliably assessed with this approach (Shernoff et al., 2016). Nonetheless, the results of these studies underscore the need to further refine an instrument to assess situational reading motivation.

Several limitations of this study warrant discussion. First, there are well noted limitations to RSAT particularly with respect to the detection of elaborative inferences. RSAT scores for elaboration are considerably lower than for bridging. Detecting elaborative inferences in verbal protocols through computational methods is more challenging than bridging, in part because elaborative inferences are considerably more idiosyncratic (Millis et al., 2007). However, there have been dramatic improvements in the application of advanced machine learning techniques in natural language process for the detection of meaning making processes reflected in verbal protocol (Allen et al., 2015), and as such the further refinement of these algorithms is warranted. Nonetheless, researchers have used RSAT successfully to investigate individual differences in inferences strategies (Feller, Magliano, et al., 2020; Higgs et al., 2017; Kopatich et al., 2019; Magliano, Higgs, et al., 2020), demonstrate

similar findings with hand coding of inference strategies in struggling and non-struggling college students (Magliano, Lampi, et al., 2020). While the precision of RSAT algorithms relative to human judgments can be construed as a limitation, we have some confidence that we would see similar results with analyses based on human judgments.

Second, one must recognize the limitations of the inferences we can derive from the data given the correlational nature of the studies. We are inferring that task value affects inference strategies, but it is also possible that students who are competent at generating bridging inferences during reading also perceive higher value in what they are reading. It is likely that the relationship between task value and engagement in successful comprehension processes and strategies is bi-directional.

Third, there are a host of other individual difference factors (e.g., working memory, prior knowledge) that are related to reading motivation and inference strategies in addition to the foundational skills that support reading (Cromley & Azevedo, 2007). Moreover, given that texts are presented one sentence at a time, factors such as working memory capacity could have a more robust relationship with inference strategies, creating error variance in the models that were run in the current studies. While the exploratory mediational model is promising, future research should take into consideration other individual difference factors such as working memory capacity and prior knowledge.

4.4. Conclusion

In summary, these studies are part of a growing body of research suggesting that aspects of reading motivation are related to inference strategies that are important for comprehension (Clinton & van den Broek, 2012). Moreover, exploratory path analysis is consistent with a growing number of studies showing direct and mediational relationships between aspects of the readers that affect processing and literacy outcomes (Cromley & Azevedo, 2007). These relationships are complex, and while some may be stable across tasks, some may be variable. As such, it is hoped that these studies encourage more research directed at understanding these relationships. With these endeavors in mind, the current paper illustrates the potential for assessing situational reading motivation constructs and exploring how these factors affect academic outcomes. In doing so, one can gain insights into the mechanisms that underlie why assessments of reading motivation are or are not correlated with such outcomes.

Appendix A

Competence Beliefs Scale

1. Did you feel successful at the activity?
2. Successful*
3. Confident*

Task Value Scale

1. How important was this activity to you?
2. Was it interesting?
3. Did you enjoy what you were doing?
4. Curious*
5. Was the activity relevant to life outside of class?
6. How useful was this activity to you?

Notes: Participants were instructed to answer items regarding the task they just completed (i.e., RSAT-C, RSAT-IP, or GISA). Answer choices were on a 5-point scale from "Not at all" to "Very much."

*Participants were asked: "Describe your mood during the previous activity." Answer choices were on a 5-point scale from "Not at all" to "Very much."

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