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## To the best of my memory and belief: Learning new language forms



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### Abstract

We propose a previously unexamined factor instrumental in learning vocabulary accounting for the differences between learning a native and a foreign language: the development of critical thinking in adolescence. We hypothesize that the difficulties experienced in foreign vocabulary development result from the learner's readiness to question new information. Following Gilbert's (1991) claim that rigorous critical thought is the last to emerge and children are prone to accept propositions uncritically, we suggest that it is to this absence of doubt that children owe their success in remembering lexical items after a single exposure, a phenomenon referred to as *fast mapping*. The rationale is that the mental belief systems are memory's filtering mechanism for what to retain: information labelled as questionable is allowed to decay without being granted access to long-term memory. We present the results of an experiment suggesting that memory of new language forms is enhanced by the learner's conviction in their validity.

**Keywords:** lexical memory, belief, formulaicity

### Introduction

An important question in second language acquisition research is what is responsible for the varying levels of proficiency in different learners, or as Dewaele (2013) puts it:

A familiar question ... is why the learning process is a such struggle, leading to limited proficiency for some learners, while others in the same situation seem to breeze through and attain high levels of proficiency in the L2. (Dewaele, 2013, p. 159)

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**Data Availability Statement:** All relevant data are within this paper.

The struggle becomes all the more obvious when considered against the backdrop of children's all but offhand success in acquiring their mother tongue. A review of the ample literature, with its often conflicting hypotheses, suggests that little is really known about either the secret behind children's spontaneous linguistic development or the obstacles impeding foreign language learning; there is a sense that language mastery should depend on a number of factors, and not a single determinant. Indeed, it is only reasonable to assume that the picture is complex and it would perhaps appear naïve to postulate a single variable solely responsible for the entire process. However, it is important to be clear on what that complexity inherent to acquisition really means in practice. There may indeed be a number of variables at play (e.g., motivation, innate predispositions, attention span etc.), but the fact remains that the uniformity with which children become native speakers would not be possible if successful language acquisition were contingent on a rare alignment of unrelated factors. Further, the struggle of foreign language learning suggests that whatever the secret may be, it should be correlated with age. That is, the ease characteristic of child language acquisition and the laborious ways of language learning in adults point to the operation of some robust but elusive factor shared by children, but blocked, disrupted, or otherwise lost in later development.

This study will argue that one such factor has to do with the learner's perception of the validity of encountered input. More specifically, the key to successful retention is the learner's subjective sense of conviction in the new form being learned. Before it is committed to memory, knowledge is filtered through a set of criteria, one of which is the learner's critical evaluation of whether or not the new information can be believed.

It is important to point out that the kind of belief we wish to investigate here differs from another type of belief studied by SLA researchers, namely self-efficacy. Although both can be thought of as important manifestations of the learner's confidence, self-efficacy is understood as learners' perceived belief in their ability to perform specific tasks (Bandura, 1997; Saito, 2020). Self-efficacy is a learner's belief in his or her general potential, whereas the belief we examine in the present study has to do with the learner's grasp of a new language form found in the input. Self-efficacy has to do with the question, "Am I capable of what I'm about to do?" whereas belief in accuracy asks "Do I understand this new usage?"

However, despite their differences, the two kinds of belief are more alike than it seems. That is, belief in accuracy—the main focus of the present study—can be seen as a consequence of self-efficacy. If the range of tasks to be performed by the confident learner also includes inferring the meanings of new forms, then self-efficacy can also be understood as the learner's confidence in the accuracy of his or her guesses. Far from being a purely abstract notion, this confidence is a very specific experience of a learner who feels a strong sense of conviction about the meaning of a new word or expression.

We will now present this new variable—the learner's conviction in the validity of witnessed input—which has, to the best of our knowledge, not been considered in the SLA literature. This will be followed by a report of an experiment designed to test the hypothesized variable.

## **Literature review**

### **The role of belief and doubt**

Our subsequent discussion is strongly predicated on the assumption that the fallibility of memory does not result from any serious limitations in terms of storage capacity. As research on mnemonists (Luria, 1968; Brandt & Bakker, 2018) suggests, the brain has sufficient real estate to record perhaps

all information it is exposed to. If anything, it must make an effort to rein in a potentially rampant intake, and one way of doing so is to apply filters to block off any information that appears irrelevant. One such filter seems to rely on the heuristic that only what is seen more frequently is likely useful, and conversely information encountered only once may not be worth retaining (Dąbrowska, 2009, p. 207).

Another filter may exploit the human control of belief and doubt. Quite simply, because there is little point in remembering something that one has reasons to doubt, memory protects itself against overload by allowing in only that information which appears valid. This is in line with a more general notion that incorrect attitudes are maladaptive, so that people discard those thoughts they doubt (Petty & Cacioppo, 1986; Petty & Briñol, 2010).

Importantly, the parameter of control over belief and doubt is a strong correlate with age: research in psychology shows that children and adults differ in how they assess the truth of the information they are exposed to, or plainly speaking, how they handle belief and doubt. Children are generally ready to believe new information, while adults are in the habit of examining and questioning its validity. Thus, we would like to suggest that what may be responsible for children's rapid lexical acquisition is that they do not generally question what they are told. Their advantage may consist, perhaps paradoxically, in the fact that their sense of skepticism has not developed fully.

Our hypothesis is based on Gilbert's (1991) demonstration that the mental systems of belief and doubt function differently and are crucially *not* two symmetrical states of mind. Gilbert shows that belief is the basic default state activated each time a person is faced with new information. Indeed, belief is a precondition for comprehension: to consider a proposition, a person has implicitly to accept it (Gilbert, 1991; Kahneman & Frederick, 2002). Of course, the person is free to reject a proposition, but it is only after the new information has been comprehended that it can be evaluated and "*unaccepted*"; this critical revision is a subsequent mental operation. The two opposing forces of acceptance and rejection are not equal: one takes precedence over the other in two ways. First, acceptance precedes rejection temporally. Second, acceptance occurs by default, and likely with little if any effort, while rejection does take mental effort, so may sometimes be excessive, especially when a person's processing resources are depleted through stress or exertion (Petty & Cacioppo, 1986).

Relevant to the issue of language acquisition is the idea that not only is doubt a more advanced mental act, but it also comes later in development:

Children are especially credulous, especially gullible, especially prone toward acceptance and belief—as if they accepted as effortlessly as they comprehended but had yet to master the intricacies of doubt. (Gilbert, 1991, p. 111)

The hypothesis being proposed here is that the secret behind children's seemingly effortless language mastery is that learning in childhood proceeds freely, unimpeded by doubt. These conditions continue until adolescence, when the development of critical thinking starts in the course of Piaget's formal operational stage, characterized by the ability to reason logically and question beliefs (Piaget, [1928] 2002, p. 130). These newfound skills of critical thought become such an important presence in cognition that it is possible to suppose that learners often find themselves tempted to overuse them (it can be speculated that in adults a skeptical attitude is always "on standby"), all to the detriment of fluent learning. Older learners may be doing themselves a disservice by allowing hyper-skepticism to interfere with the acquisition of the lexicon.

Belief as a factor conducive to learning language is better understood in light of Vygotsky's observation that language emerges primarily as a product of the child's verbal interaction with other speakers. Socialization is a prerequisite to language development, as it is through communication with other speakers that meanings of language forms are negotiated and learned (Vygotsky, 1997, p. 133). Because other speakers are potential models providing examples of usage, the child's reliance on such models presupposes some implicit trust in them. Support for this implicit trust comes from observations of children's behavior. Derry (2013, p. 34) provides a familiar-sounding example of children being instructed to "look right, then look left" when crossing the street, a typical case of social interaction in the service of language acquisition. Afterwards children can be seen rehearsing a newly learned expression by repeating it to themselves, once alone. It is rather implausible to suppose that children would invest any effort in such private rehearsals if they did not assume by default the utility of what they gain through interaction with other speakers.

### **An (apparent but not actual) problem with belief as a factor**

It is now important to head off one potential objection. That is, belief as a precondition for learning may seem both obvious and banal to the point of insubstantiality reminiscent of fringe fads like "the power of positive thinking." That may be one reason why belief is not addressed even in passing in any study focusing on SLA and individual differences. Another reason may be that "belief by default" also seems to be in conflict with the basic intuition that when it comes to learning, doubt is an asset superior to unthinking certainty. After all, doubt is a reflection of a skeptical attitude in the service of accuracy of the learned material. A prerequisite for critical thinking, it is a quality assurance mechanism and a virtue that educators strive to instill in their students.

That may be true about learning subject matters like math or physics, defined by their logic and predictability. However, these two properties are not characteristic of language, and language learners can hardly benefit from constantly doubting the validity of the input they are exposed to—approaching it skeptically before accepting it as accurate. Language is an inherently *idiosyncratic* system, whose acquisition entails conformity through believing and indeed blindly following—not questioning—the input. Indeed, strict reliance on input is the main tenet of usage-based models of language acquisition (e.g. Tomasello, 2003; Lieven, 2003), being a consequence of the arbitrariness and formulaicity of language. Knowing a language involves storing tens of thousands (Jackendoff, 1997) of arbitrary fixed expressions like *on cue* or *string along*. These have variously been referred to as "prefabricated chunks," "fixed phrases," "multiword units (MWUs)," *etc.* A chunk or formulaic expression is defined as

a sequence, continuous or discontinuous, of words or other elements, which is, or appears to be, prefabricated: that is, stored and retrieved whole from memory at the time of use, rather than being subject to generation or analysis by the language grammar. (Wray, 2002, p. 9)

Formulaic phrases are all, to greater or lesser degrees, idiosyncratic and unpredictable. Just as in the case of constructions in general, with formulaic expressions too, some aspect of their meaning, function or form (Goldberg, 2006, p. 5) turns out to be an arbitrary detail which has to be learned from the available input.

In light of this predominant idiosyncrasy of language forms, it is reasonable to consider the role of the learner's conviction in the validity of what is found in input. Surprisingly, research has not focused on the learner's readiness to trust his or her understanding of the meaning and function of language forms found in input. However, we hypothesize that belief and doubt may be responsible for success in the acquisition of formulaic sequences, and the present study focuses on how

manipulating the variable of belief can affect the memorization of formulaic language.

The choice of formulaic language is motivated by recent claims that it is foreign learners' limited command of formulaicity that is mainly responsible for their limited proficiency in a second language (Arnon & Christiansen, 2017). Many researchers (e.g. Becker, 1975; Wray & Perkins, 2000) agree that it is the wrong choice of formulaic sequences that marks out advanced L2 learners as non-native. This could then be one part of the answer to the question posed in the introduction: what is responsible for the varying levels of proficiency in learners (native and foreign) is their mastery of (or failure to master) formulaic sequences. The other part of the answer has to do with the reason why learning formulaic language is a challenge. We assume that the foreign learner's deficits in formulaicity may result from excessive doubt which makes it more difficult for the adult learner to commit new forms to memory. Questioning the accuracy of input, on the grounds that something about it "does not make sense" naturally leads to rejecting (i.e. failing to learn) idiomatic expressions. Because most formulaic expressions are idiosyncratic in one way or another and not everything about their meaning or form "makes sense," learners may more often than not find themselves doubting their understanding of an expression.

In the case of children, this is a non-problem, given their trademark readiness to unquestioningly accept any new knowledge. Conversely, in adults, learning is complicated by what is a *de facto* mismanagement and overuse of an otherwise healthy skepticism. Instead of embracing new input at face value, adult learners tend to question and sabotage themselves into amnesia. Of course, doubt does not preclude the absorption of input completely; after all, however difficult it is to learn a foreign language, some material does get internalized. We suggest that this is possible by overriding "the skepticism block," and one way this happens is by means of another common psychological habit, that of delegating belief in matters beyond one's expertise. Quite simply, because people cannot seriously hope to verify the true merits of all new knowledge on their own, they often have no choice but to trust an authority whose reputation is a sufficient quality assurance test (*epistemic authority*). People seem to be willing to trust those kinds of evidence that "are 'incontrovertible,' because their source is deemed indubitable and beyond reproach." (Kruglanski, 2012, p. 205) When new information is accepted on the strength of an attractive source, learning is said to go through the *peripheral route* (Petty & Cacioppo, 1986, p. 125), or in other words, when people do not attempt to evaluate the information on their own, trusting it has been verified by a competent authority. The alternative is the *central route*, which involves independently evaluating the truth of new knowledge, through "thoughtful examination of issue-relevant considerations" (O'Keefe, 2002, p. 139). Although such thoughtful examination is a sign of a critical mind and common sense, it may be counterproductive when it comes to learning the meanings of language forms. We believe that child language acquisition proceeds primarily via the peripheral route; later, adult learners may find themselves actively analyzing the observed input, approaching it through the central route. However, although less travelled, the peripheral route is probably still available in adult learning: it is followed when a newly attested language form is given serious credence by an authority, another speaker known for his or her solid proficiency in the language.

In what follows we report on an experiment designed to test the hypothesis that doubt impedes language learning and that persuasion serves to disable the doubt loop. We attempt to isolate belief as a variable by inducing it via the peripheral route. Briefly, the validity of language forms to be learned is either corroborated or questioned by a native speaker.

## The Study

### Participants

A total of 77 subjects, 56 females and 21 males, aged 19-21, participated in the study. They were Polish first-year students of English Philology at the University of Silesia, Poland. They are non-native users of English with 12-14 years of exposure to the language. The subjects were divided into two groups, one of 44 participants, and another of 33. While some individual variation in terms of proficiency can be assumed to hold between the participants, the relative levels of the two groups were comparable on average. That is because the participants were divided into the two groups based on their availability at different time slots, and not on their proficiency.

### Materials

The experiment involved the use of a passage (included in its entirety in the Appendix) featuring five formulaic phrases whose retention was the main focus of the experiment:

- 1 *hold a candle, string along, take to the shed, bill and coo, scrape acquaintance*

These expressions had been selected for their relative infrequency to guarantee that the participants would not be familiar with any of them ahead of time. This was then confirmed when the subjects were asked if they had come across with them or knew their meaning (they did not). To further ensure the subjects' unfamiliarity with the expressions, the phrases *take to the shed, bill and coo*, and *scrape acquaintance* were included due to their common perception as being slightly dated. With the possible exception of *scrape acquaintance*, the meanings of the expressions could not be inferred from the passage with much precision or confidence.

The passage used in the experiment is a self-contained piece of fiction writing based on an invented story featuring emotionally-engaging "relatable" plot elements. It was fitted on one page that can be read in a few minutes. The passage was formatted to look like a non-fiction magazine article about an apparently real-life character. These manipulations were intended to enhance the subjects' sense of realism, creating maximally natural conditions, under which vocabulary retention can reasonably be expected to occur.

### Procedure

The participants were instructed to read the passage and prepare to discuss it soon afterwards. After the reading task, a group discussion focused on the meanings of the five expressions shown in (1). The subjects were encouraged to volunteer their best guesses on the semantics and / or usage of the phrases in question, but despite a number of attempts, none of them managed to offer an accurate guess. The meanings were then explained to the subjects and illustrated in detail for each expression. This stage of the experiment was conducted differently in each group. In the first group, the presentation of each definition was followed by a strong endorsement from a confederate assistant, a native speaker present in the classroom. The assistant authenticated each expression and its meaning with the words "that is exactly what it means," "that's how I'd use it" or "Yeah, I've heard this expression used many times." This group will therefore be referred to as "the belief group." In the other group, the confederate did the opposite: following the clarification of each definition, she acted out scripted reactions ranging from a hesitant "I haven't come across this expression before" or "I don't think it's used very often" to fairly dismissive comments like "Yeah, but not really." This group will be referred to as "the doubt group."

In each group, special care was taken to ensure that the subjects would not miss the native speaker's reactions, but would in fact perceive them as unequivocal verdicts. In the belief group, her endorsements were welcomed by the experimenter with follow-up comments like "It does sound like a very apt way to express the idea, doesn't it?"; in the doubt group, her dissenting reactions were acknowledged with expressions of sheepish surprise like "oh well, I guess I could be mistaken." Thus, while in the belief group the confederate's role was to highlight the validity and usefulness of expressions, her contrarian manner in the doubt group was intended to introduce an element of doubt and reduce the subjects' trust in the input at hand.

One week later, the subjects were given a surprise test of the five expressions. Each subject was presented with a slip of paper as shown here in Figure 1. The five expressions were listed in three rows, intermixed among nine distracters. The subjects' task was to match the correct expressions with the corresponding definitions they had been exposed to a week earlier.

All expressions used in the test, both the actual phrases from the passage and the distracters, are verb phrases; no other grammatical categories were included. The rationale behind the use of a single category was to prevent matching the correct answers based on their grammatical fit.

From the suggestions listed below, choose the expressions that convey the following meanings.

1. "compare favourably with someone": \_\_\_\_\_
2. "to maintain someone's attention or romantic interest, insincerely and unfairly":  
\_\_\_\_\_
3. "to punish someone; teach them a lesson": \_\_\_\_\_
4. "talk softly and tenderly, the way lovers often do": \_\_\_\_\_
5. "make an effort to become familiar (with someone)": \_\_\_\_\_

<i>take (someone) to the shed</i>	<i>scratch up friendly</i>	<i>crush closeness</i>
<i>bring (someone) to the wall</i>	<i>sing and purr</i>	<i>throw a flame (at someone)</i>
<i>scrape acquaintance</i>	<i>hold a candle (to someone)</i>	<i>string (someone) along</i>
<i>wave a light (at someone)</i>	<i>bill and coo</i>	<i>carry (someone) around</i>
<i>tweet and chirp</i>	<i>call (someone) to the office</i>	

**Figure 1** *Vocabulary test given to the subjects*

## Results

The subjects were tested for recognition, a less demanding task than recall, which would all but rule out the possibility of random answers, but would be too insensitive to detect weaker degrees of retention. However, the format employed in this study is more demanding than in the case of typical multiple-choice tests with four options to key. In such formats, the probability of chance answers is 0.25, while in the present test, that probability drops to 0.07. As the data in Table 1 show, each expression was recognized by subjects in both groups with higher than chance accuracy, even the lowest scoring item *string along*, recognized correctly 12.12 % of the time.

**Table 1** Correct answers in the belief and doubt group

	Correct answers (belief)		Correct answers (doubt)	
	number	percent	number	percent
hold a candle	20	45.45 %	6	18.18 %
string along	11	25.00 %	4	12.12 %
take to the shed	35	79.54 %	12	36.36 %
bill and coo	23	52.27 %	10	30.30 %
scrape acquaintance	29	65.90 %	9	27.27 %
(Average)	23.6	53.63 %	8.2	24.85 %
(MAX)	44	100 %	33	100 %

Although the scores suggest generally above-chance retention, the two groups were found to differ greatly in their performance on each test item. Predictably, members of the belief group scored higher on each item than the doubt group. The phrase *string along* was the most challenging in both groups, but the belief group keyed it correctly with 25 % accuracy, which is twice as often as the doubt group. This tendency is found in the comparison of scores for each item, and is reflected in the average, with the belief group scoring an overall 53.63 % against the doubt group's 24.85 %.

Most of the differences reported in Table 1 can also be considered statistically significant, as can be seen in Table 2. The p-value is lower than 0.05 for three of the five items, namely *hold a candle* (0.0129), *take to the shed* (0.0001), and *scrape acquaintance* (0.0009), which can be taken to indicate that the difference is unlikely to have resulted from chance. The null hypothesis cannot be rejected as the explanation of the difference for *string along* (p-value=0.1606) or for *bill and coo*, whose p-value of 0.0555 is very close to—but not below—the required 0.05 level.

**Table 2** Parameters of difference between the belief and doubt group

	Difference	95% CI	Chi-squared	p-value	Significant?
hold a candle	27.27 %	6.0174% to 44.6266 %	6.189	0.0129	+
string along	12.88 %	-5.5553% to 29.0629 %	1.969	0.1606	-
take to the shed	43.18 %	21.1120% to 60.1356 %	14.592	0.0001	+
bill and coo	21.97 %	-0.2953% to 41.0051 %	3.668	0.0555	-
scrape acquaintance	38.63 %	16.1516% to 55.8984%	11.112	0.0009	+
(Average)	28.78 %	6.6207% to 46.8249 %	6.359	0.0117	+
(MAX)	0%	-10.4270% to 8.0296 %	1	1	

## Discussion

The numbers yielded by the experiment suggest that the “belief” variable is a factor affecting learners’ memory of new language forms. It is possible to postulate that whether or not learners will retain what they find in the input depends on their perception of its validity. However, any account postulating a single “silver bullet” factor should come with a qualification. We wish to offer a few.

### **Belief or doubt**

Our subjects were divided into two groups. In one, the subjects were given strong reasons to trust their understanding of the new elements of input. In the other, the subjects were given equally strong reasons for doubt. Our experimental design lacked a standard control group, where we would induce neither doubt nor belief in our subjects. One reason was that neutrality, even if attempted, could not be considered reliable. That is, it would have been very difficult to discuss the newly encountered meanings without providing absolutely any indications as to whether these definitions are true. Unfortunately, the absence of a control group makes it impossible to know exactly what accounts for the difference in performance between the two groups. As one anonymous Reviewer pointed out, it is unclear which of the two, the belief or the doubt in our subjects, affected their memory.

However, it is reasonable to suppose that it is the doubt that was responsible for the poor performance in one group, and not the belief that was behind the better memory in the other group. According to Gilbert (1991), “belief” is the default state, which occurs and holds unless a person becomes aware of reasons for doubt. Gilbert shows that in order to even understand a piece of information, we first have to assume that it is true. If this trust is not shaken by any evidence to the contrary, it persists. This is what probably happened in the belief group, where the subjects can be hypothesized to have retained in memory what they saw as true information. On the other hand, in the doubt group, the subjects can be assumed to have first treated the new information as true and then rejected it in the face of the subsequent negative feedback. As a result, whatever trace in memory was left by these “dubious” new language forms was relatively weak.

It is important to stress that this is an idealization, all other things being equal. But matters can be more complicated, as people vary in terms of their self-efficacy. While some may trust their understanding of new information, others may routinely second-guess their conclusions, which means that they may reject them even without strong external reasons for doubt.

Be that as it may, whichever is a more accurate account of the exact mechanism, it stands to reason that belief and doubt have opposite effects on memory. The stronger the evidence in favor of an interpretation of a new language form, the better the chances that it will be remembered. Conversely, a person is less likely to learn a new word or expression, especially one encountered only once, if that person has serious doubts about its meaning or use.

### **Comparison with children**

In the present study, the subjects included only adult learners; we did not look at how children would perform under the same circumstances. This is because it may be unfeasible to compare memory retention in adults and children directly by using the same materials. It would be methodologically dubious to have children (especially preschool children) read the materials used in our study, nor would it be reasonable to attempt to teach them expressions like *string along*. Conversely, it would be equally difficult to find vocabulary items suited to children’s level of cognitive development that would be unfamiliar to adults. It seems to us that the only way adults and children can be compared is in separate experiments, using different sets of vocabulary items.

As it happens, such experiments have been conducted, and based on their results, one can attempt to draw careful conclusions about the role of belief in children’s lexical development. For example, in a widely-quoted experiment, Carey and Bartlett (1978) casually used colour terms in the presence of three- and four-year-old children involved in an activity whose main purpose was ostensibly not vocabulary learning. The children were shown two trays, a blue one and an olive one. They were then instructed to “Bring me the chromium tray, not the blue one, the chromium one.” Not only were

the children able to infer that the word *chromium* referred to a new colour, but when tested a week and then six weeks later, over half of them remembered some aspect of its meaning, either that it named a colour corresponding to olive or that it was some colour. It should be pointed out that the children had all the reasons to believe their idea of what *chromium* means; after all, the object to which *chromium* referred was right there before them. This ability to retain information following a single encounter has been referred to as *fast mapping*. In another study, fast mapping was found to improve under conditions of joint attention by listeners and speakers: “infants are more inclined to establish a new word-object link if the speaker displays clear-cut signs of intending to talk about the object in question.” (Baldwin et al., 1996, p. 3153) This can also be taken to bolster the child’s sense of conviction that he or she has grasped the new word’s semantics.

### **Preliminary knowledge and rich representations**

Another note of caution has to do with the issue of active vs. passive vocabulary. It should be obvious enough that in most situations, a single exposure to a lexical item will not lead to a solid understanding or ability to handle usage perfectly. It goes without saying that there is a lot about expressions like *take to the shed* that is not predictable from one encounter, and we do not suggest a way L1 or L2 speakers can somehow leapfrog the lengthy process of discerning the nuances of a lexical item. Instead, what we are mainly concerned with here is how a learner *starts* a lexical entry in the mental lexicon, however fragmentary or imperfect it may be. The knowledge of such entries will then be updated, enriched and revised with subsequent encounters; this much follows from usage-based models which claim that “each experience with language has an impact on cognitive representations.” (Bybee, 2010, p. 7). But for that to happen, the learner must, in the first place, be able to introduce a new lexical item to memory, something we think is contingent on the learner’s sense of belief.

However, our results show that the subjects were able to go much further beyond creating new entries in their lexicons. To key the correct answers, our subjects were required to tap their memory of the meanings in question; they did not merely recognize the expressions as “previously seen.” Their recall of the forms encountered a week earlier was high above chance levels (the probability of keying the correct expressions was 0.07). Additionally, in the “belief group” the recall rates were 2-3 times as high as in the “doubt group.” This suggests that a sense of conviction or trust (in the accuracy of newly encountered meanings) played a significant role in leaving durable traces in the learner’s memory.

### **The number of exposures**

In light of these facts, it is reasonable to ask, “If one exposure is not enough, how much is enough and what is even a sensible measure for the amount of exposure to target input: ... the concrete number of tokens encountered for each target structure?” (Madlener, 2015, p. 24). We believe that the results of our study bolster the possibility that a single exposure may indeed be enough to start a new entry in the lexicon, provided that the learner has every confidence in its validity.

Although we suggest that intense commitment is key to starting a new entry in the learner’s mental lexicon, i.e. learning a new word or multiword sequence based on a single experience, our position is not at odds with the common view that learning vocabulary is an incremental process. We do not take issue with González-Fernández and Schmitt’s (2017, p. 288) claim that learning a word requires multiples exposures (they propose that eight to ten seems a sufficient number). Similarly, we do not argue with the view of “the low rate of uptake” resulting from a single exposure (Schmitt, 2010, p. 33) or with the opinion that “functional vocabulary knowledge typically builds up through multiple exposures to a word in different contexts” (Read, 2004, p. 216). After all, traces laid down in

memory are known to be consolidated through repetition, as famously captured in the aphorism “neurons that fire together wire together” (Hebb, [1949] 2002). However, we believe that reliance on multiple exposures is also foreign language learners’ coping strategy in the face of the counterproductive ubiquity of critical thinking in adult cognition. The learner needs to have his or her habitual reservations assuaged by confirmatory evidence coming from multiple independent sources.

It should be noted that while the above quoted authors are skeptical of the feasibility of single-exposure learning, they do not rule out fast mapping in L2. Most language learners are familiar with the experience of a genuinely indelible memory of an expression witnessed only once, a welcome surprise attributed to the inherent memorability of the item in question. This heightened memorability may be typical of figurative expressions: “The initial impact of the image, and the effort taken to tease out the intended meaning, may make them more salient and thus more memorable.” (Wray, 2016, p. 49) This is when a stimulus is inherently striking, memorable or significant for personal reasons (Dąbrowska, 2009, p. 207). Inherent memorability and emotional investment are properties reminiscent of the phenomenon known as *flashbulb memories* associated with the learning “of a very surprising and consequential (or emotionally arousing) event” (Brown & Kulik, 1977, p. 73). It is safe to assume that remembering the circumstances of momentous events and fast mapping of lexical items share the same psychological dynamics which consist in a person’s recognition of the exceptional impact of the witnessed information justifying its place in memory:

a permanent memory for incidental concomitants of a surprising and consequential (in the sense of biologically significant) event would have high selection value and so could account for the evolution of an innate base for such a memory mechanism. (Brown and Kulik, 1977, p. 73)

It is reasonable to suppose that the strong impression accompanying a flashbulb memory is a direct reflection the person’s belief in what he or she has just observed.

### **Belief and accuracy**

It should be stressed that it is not our intention to equate belief with truth. Obviously, a person’s conviction in a proposition should not be confused with the truth of that proposition. As Weissman (2009, p. 22) put it, “‘true believers’ are distinguished by the intensity of their commitment, not by the truth of their beliefs.” But what we do argue is that at least for the purposes of language learning, a strong conviction in the validity of an element of input takes precedence over validity itself. In order to record an item in memory, it is more important to be committed to it than to understand it accurately or have a metalinguistic command of its logic.

### **Factors instrumental in language learning**

The variable we present is not intended to replace the wide range of factors postulated in the literature. Obviously, the variables of motivation, anxiety, openness to experience, degree of engagement (and others that cannot, for reasons of space, be enumerated or much less discussed in detail here) are all real phenomena, certainly not without consequences to SLA success. However, the belief variable makes it possible to explain the considerable individual variation in the many factors investigated in SLA research. Why is it that some learners attend to input and succeed in noticing language forms that others miss? What is responsible for the varying levels of engagement found in different learners? These variables can be viewed as parameters whose desirable settings depend on the learner’s realization of the validity of a language form about to be learned.

Furthermore, it may be speculated that belief can also be found behind many findings reported in the literature, such as enhanced fluency as a result of the consumption of moderate amounts of alcohol (e.g. Guiora, Beit-Hallahmi, Brannon, Dull, & Scovel, 1972; Renner, Kersbergen, Field, & Werthmann, 2017). Because alcohol is known to impair the prefrontal cortex, which subserves the cognitive functions of inhibition and self-critical thinking (e.g. Abernathy, Chandler, & Woodward, 2010), learners are less likely to be negative or skeptical of their abilities, which, like a self-feeding loop, actually results in improved performance.

Why does learning become paradoxically more effortful with age? Recall also that according to Piaget, the formal operation stage, in which the ability to question is hypothesized to set in, begins at around the age of 12. This coincides with what many researchers believe to be the end of the critical period for language. It may be responsible for the secret behind “the critical period,” when language is thought to be mastered apparently effortlessly and successfully: if children are not discouraged by the unpleasant feeling of doubt, they are more likely to engage in using—and thus *practicing* and *consolidating*—newly learned language forms than notoriously self-conscious adults. Thus, it is possible that the critical period, advocated by nativists and questioned by cognitive linguists, may turn out to be an epiphenomenon of children’s default affirmative approach to input, their straightforward single-minded acceptance undiluted by doubt.

In other words, belief may, in one way or another, be behind many (or at least some) observed phenomena. It may be in a cause-effect relationship with motivation and the affective filter. It may even help us rethink the critical period.

### **Conscious learning vs. incidental exposure to input**

Let us consider in some detail how the factor of belief may figure in learning from input in the context of expending attentional resources. One way to understand the varying degrees of competence in learners is by considering the Noticing Hypothesis (Schmidt, 1990), which claims that one cannot learn new language items unless they are consciously registered; conversely, people will not learn much about what they do not pay attention to (Logan, Taylor, & Etherton, 1996, p. 620; see also Baars, 1993). The potential of peripheral learning is indeed limited, as noted by other researchers. The phenomenon of subliminal learning has been investigated by many, but there seems to be no robust evidence for unconscious retention of input (Baars, 2002 p. 50). If this is correct, then the secret of successful learners may consist in nothing more mysterious than simply the ability to pay attention, or what Schmidt (1990, p. 132) calls “focal awareness” of elements of input.

However, for all its common-sense appeal, the Noticing Hypothesis has problems. First, awareness may not be necessary in children: Schmidt (1983) himself admits the “mysterious ability of children to acquire the grammatical forms of language while apparently not paying attention to them” (p. 172).

Second, noticing does not sit well with the nature of formulaicity. True, the Hypothesis makes sense when it comes to noticing a single word, whose novelty all but guarantees its saliency to trigger “focal awareness.” But multiword expressions, for the most part, consist of familiar words and as such they simply cannot attract attention as easily as single items. It is unlikely that people learn formulaic expressions by attending to each one, especially if we consider their numbers. Take reading as a source of input: on any given page, new individual words are by far outnumbered by new fixed expressions (that are not part of an advanced learner’s lexicon). If people had to pay conscious attention to the composition of multiword expressions, they would have to concentrate intensely on unending stretches of words and that would mean constantly diverting attention from

content. That contradicts our intuitive idea of what reading is: after all, we read for content, discernment or entertainment, not for vocabulary enrichment.

Yet, multiword expressions do enter the lexicons of both L1 and L2 users. What is more, people would most often be at a loss to recall where they had encountered them (Truscott, 1998, p. 110). Indeed, it has been proposed that whenever a language user is exposed to linguistic input, his or her lexical representations are perforce affected: “each linguistic encounter lays down a trace in memory.” (Taylor, 2012, p. 3) In a widely-quoted study, Gurevich, Johnson, and Goldberg (2010) show that people have the potential for verbatim recall of specific expressions encountered in the input even when they do not seem to pay attention to form. In this study, after listening to a story, the subjects were given a surprise quiz about the expressions they just heard and were found to display above-chance recall of their exact wording. These findings suggest that some retention of multiword sequences without conscious awareness is possible. When a piece of information is not attended to consciously, it must rely on some other factors that help ease it into memory. It is our hypothesis that one such crucial factor is the learner’s perception of that piece of information as valid.

### **Learning through attentional bottlenecks**

Incidental learning seems to be the only reasonable account of how speakers manage to acquire formulaic expressions, given that conscious attention is too costly a mental resource (Kahneman, 1973; Christiansen & Chater, 2016) to be expended for each encountered expression. To appreciate why attention cannot be divided, it is helpful to consider how attention is managed. While there are a number of competing theories, the consensus is that perception is constrained by “bottlenecks” making it difficult to focus on two stimuli at the same time. According to one model, when two stimuli are presented, the mind can only analyze one of them fully. The other is “held briefly as an unanalyzed echo” (Kahneman, 1973, p. 6) and may only be attended after the first one has been processed. More often than not, however, the unanalyzed stimulus fades away.

In the case of language, the two stimuli correspond to content and form. The informational content is the stimulus that enjoys right of way when passing through the perceptual bottleneck, while the exact wording associated with that content is the accompanying evanescent stimulus held in the working memory as an echo or afterimage. And just like any afterimage, this accompanying stimulus will typically not be retained for long. This may explain how people manage to retain the exact expressions briefly after reading a passage, but not indefinitely.

The upshot is that while some expressions may indeed be learned by being noticed consciously, some (perhaps most) come from the “afterimage stimulus” processing. In fact, the heated debates about conscious or incidental learning miss the main point. There is no single route to learning; both routes of conscious or incidental learning seem to be available, as long as the learner is properly predisposed toward the input. We think that the factor of belief is compatible with and conducive to both modes of learning. In the conscious noticing mode, it makes the stimulus more salient, guaranteeing its retention in flashbulb memory fashion. In the incidental learning mode, it can be responsible for amplifying the afterimage stimulus to keep it from fading.

### **Conclusions**

It may be tempting to dismiss the variable of belief as a non-starter for many reasons. On top of the inevitable associations with dogmatic religion or self-help movements, it has the disadvantage of being a highly subjective part of cognition, difficult to quantify. However, these facts should not eclipse the significance of its undeniable correlation with the developmental differences between

children and adult learners. It is thus a very reliable discriminator accounting for the distinct characteristics of L1 and L2 learning. Adult learners are given to episodes of hesitant self-challenge, a side effect of the mature ability to assess the validity of novel propositions. This indecision is interpreted by the learner's memory as a signal to put on hold the retention of information of questionable adaptive value. In other words, this may be how an element found in input—a potential addition to the lexicon—fails to become intake.

While the experiment reported here did not investigate children's performance, so it cannot be used to make any strong statements about belief in children, some conjectures can be offered, based on other experiments, such as Carey and Bartlett (1978), where children can be assumed to have accepted the validity of their encountered input, as it was confirmed by visual feedback. Results from such experiments and the insights from psychology studies about children's "belief by default" (Gilbert 1991) make it reasonable to hypothesize that children are better positioned than adults to accept their understanding of the encountered input. Children are more likely to fix in memory new language forms if their high value is guaranteed by their heightened sense of conviction, or at least by the absence of second thoughts and afterthoughts. This sense of conviction is especially important given that "learners do not care about the units of language as long as they map onto accessible meanings" (Ellis, 1996, p. 111). Now, to map any units onto any meanings, learners must feel confident about their understanding of these meanings in the first place. Forming a hypothesis about a new form's meaning is not the best moment to second-guess oneself.

Although belief as a major factor in language learning is a simple idea, it is not a simple solution or a way of overcoming difficulty in L2. In adulthood, it is far from simple to disable one's habitual over-critical thinking and will oneself into believing one's idea of what this or that expression means. Indeed, this may be as hard as attempting to tap into nativist "innate predispositions" after the critical period is over. It is possible that the default ability to believe, unweakened by doubt, *is* part of those predispositions.

To the extent that it is possible to foster the learner's sense of belief, its potential benefits suggest obvious teaching implications. It should be within the teacher's power to present new language forms in vivid contexts and in ways that should inspire the learners' trust in the accuracy of their inferences. The main advantage and real secret of a graphic context, such as when the learner witnesses an expression used in a real-life situation he or she is part of, is that its meaning is as compelling and believable as a flashbulb memory. Ideally, most new vocabulary items should appear in meaningful teacher-learner interaction, realistic situations that highlight a new form's meaning, the kind of interaction envisioned by Vygotsky. After all, Vygotsky's emphasis on the interactive nature of learning applies equally to children and older learners. The difference is that children assume by default that the model provided by the adult is valid, whereas classroom learners rely on the teacher to silence their doubts.

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## Appendix

## Chicago Times Magazine

Sunday, November 25, 2018

Home	Video	News	World	Sport	Business	Film	Tech	Life
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By Robert T. Corona  
6:00AM GMT Nov. 19, 2018



Vincent Newmeyer admits that life trumps fiction – especially his own life. And this is quite a statement, straight from the horse's mouth, because if there's one thing Newmeyer knows inside out, it's fiction. And he has got it all too: millions of copies sold, each new novel topping bestseller lists for weeks, and fans with a good old-fashioned crush on him. He receives daily fan mail, some of which flirtatious and some openly seductive, complete with pictures of girls ready to get married, like, tomorrow. To Newmeyer, these are all touching gestures, but if he replies at all, it is to offer his thanks for the kind words and make it clear enough he is not interested. To be really honest, he feels nauseous at the very thought of billing and cooing with any of his fans.

One girl was luckier though. At a book signing, when she stood in front of his desk, he asked the usual "Who for?" and proceeded to write "For Antonina, with every best wish". Next, he looked up at the woman, paused and realized it was he who suddenly wanted to scrape acquaintance. Acting more than out of character, put the book down again and, pen in hand, wrote "Sorry about last night. Write me." He knew the line was perfect paparazzi fodder, but if confronted, he could always hide behind the otherwise true observation that authors get asked to write all kinds of bizarre lines at book signings. He could claim that he simply did as he was asked. But Antonina did not show Newmeyer's pick-up line to the paparazzi. She wrote. He responded and before he knew it, he would sneak out of her apartment almost every morning, a pattern that repeated itself for months until Antonina started talking about a baby. She had suggested getting pregnant and living together with Newmeyer, a notion at which he balked, and the magic had vanished in a puff of smoke. As he later confessed in a rare interview, "It made no difference when she insisted she was not pregnant, and that she only meant it hypothetically. I had just discovered a jerk in me." He wanted out and she understood she had seen too much in him, suspected him of too much depth and maturity.

Months later, it dawned on Newmeyer he could not stop thinking about what he had thrown down the drain. Was there any way he could make it up to her? Had the ship sailed or maybe, just maybe, would she still take him back? Only one way to find out. At first he got no reply for a week. When a message came, he understood he had blown his chance. "From her perspective, I looked like an asshole who fails even when life throws him an easy ball. What would I do if I got a really mean curveball?" After a few desperate attempts to shock the relationship back to life, he realized that he was only making himself look even more pathetic and immature. It was clear to him that in her way, she had taken him to the shed. She never said "it's over, deal with it." but that, to his mind, was even worse because he was clinging to a false hope. He had been stringing *himself* along and sinking deeper into his own personal hell.

In his epiphany moment, he thought of one thing that might just work: he could write a book based on their story, make it a poignant masterpiece, one so profoundly cathartic and addictive that it would make Tolstoy look like an unimaginative dilettante. The book would be for the most part practically biographical, and he would only use his literary imagination to think of an ending, with a sort of redemption twist that would come at some point in the future, where she resurfaces to inform him that she'd found someone. That someone is now history, but she has a daughter (the other guy disappeared when she told him she was pregnant). Now is his chance to redeem himself. The only way he could prove to her that he is in fact a dependable guy was if he is ready to marry her, a single mother, and raise somebody else's kid. He replies almost right away, writing a single line "So happy".

The twist looked promising and he thought if he told the story like only he could, the book would be huge. He would have to write under a penname, out of respect for Antonina's privacy, and once the book was out, he would send her a copy with one last "forgive me" note. But he was in for a rude awakening. Twelve editors rejected the manuscript; he was initially unfazed ascribing his setbacks to anonymous submissions. After all, it is unknown authors' regular experience to have to go through constant rejections until they are discovered. If need be, he would just send the manuscript under his real name and that would be that. He would thus make all those editors look stupid when they realized who they had been rejecting. But this was different. The rejection notes were all rather consistent. "You sound like a Vincent Newmeyer wannabe, but without his humor, talent, or any imagination whatsoever," read one editor's reply. Another wrote, "the worst Newmeyer knockoff I've seen. Really, you don't hold a candle to him." He put the book on hold, agreeing that maybe the story needed work. Maybe he needed to give his redemption project a little extra time.

Eventually, like a convict who accepts that all his naïve appeals have been and will be denied, he was coming to terms with his own fate too, when, completely out of the blue, he got a message from Antonina reading "I have a child. We can only talk if you're ready to raise her as your own." He replied instantly and they agreed to meet. Her daughter, looking about two years old, came too. "Look, I'd marry you even if you had quintuplets by another guy. I wish this amazing girl here were really mine, and I'd be lying if I said otherwise, but I'll make her mine, if you just let me." She shook her head. "You won't have to pretend. I really was pregnant when I 'hypothetically' asked you about a baby. She's your daughter."