THE INTERPLAY OF INCIDENTAL EXPOSURE, AFFECT, AND INDIVIDUAL DIFFERENCES IN L2 ACQUISITION

By

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ABSTRACT

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The role of *hot cognition*, or cognitive processing influenced by emotions, on second language (L2) learning is relatively understudied (Dörnyei, 2009; MacIntyre, 2002; Swain, 2013). The present research investigated how positive, negative, and neutral mood states influence aspects of second language acquisition (SLA), as well as potentially moderate the relationship between certain personality characteristics (i.e., openness, intuition, emotional intelligence, foreign language anxiety, and impulsivity) and L2 performance. After completing individual differences questionnaires, participants were divided into either a Comparison group or one of three emotionally induced treatment groups and subsequently exposed to a semiartificial language under incidental learning conditions. Immediate and two-week delayed testing measured grammatical accuracy of the target syntactic forms, while source attribution data and retrospective verbal reports gauged what types of knowledge (implicit, explicit, or a combination of both) were acquired by participants. Results suggest that positive emotions are the most beneficial to L2 learning. Although effects were small, negative mood states appeared to hinder the ability for long-term L2 retention. Findings also revealed that knowledge gains were chiefly guided by explicit means. Lastly, results demonstrated that the affective stimuli played a moderating role in the relationship between immediate L2 performance and the traits of intellect, stress management, premeditation, perseverance. This study contributes to SLA literature regarding emotions and their impact on L2 learning and individual differences.

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CHAPTER 1

REVIEW OF THE LITERATURE

1.1 Introduction

The role of hot cognitive influencers, such as emotions, on second language (L2) learning is a wholly recognized, yet an understudied phenomenon in the field of second language acquisition (SLA) (Dörnyei, 2009; MacIntyre, 2002; Swain, 2013). While many researchers know that emotions impact complex cognitive abilities (Storbeck & Maswood, 2015; Yang, Yang, & Isen, 2013) and learning (MacIntyre & Gregersen, 2012; Pekrun, 2014), studies measuring how affect influences L2 acquisition are limited. This is particularly true in the area of implicit L2 learning research, where the role of individual differences is ripe for further exploration (Andringa & Rebuschat, 2015). For the present dissertation, I investigated how positive, negative, and neutral emotions affected the learning and retention of an L2 syntax under incidental conditions. I also examined whether incidental exposure facilitated the acquisition of the target grammatical structure implicitly. Finally, I explored the relationships between individual differences (i.e., personality characteristics) and incidental task performance in both neutral and emotionally loaded settings. With this empirical work, I hope to lay a solid foundation on which additional inquiry into the function of affect and SLA may be built.

This dissertation is divided into five different chapters. The current chapter examines the literature from recent studies on the following areas: (a) emotions and adult education, (b) incidental learning conditions in SLA, (c) the role of emotions in implicit learning, and (d) the relationship between individual differences and implicit learning. In Chapter 2, I provide the research questions along with the methodological design of the study. I offer the results of my study in Chapter 3, and later discuss these findings in greater detail within Chapter 4. Lastly, in

Chapter 5, I address the pedagogical implications, limitations, and future research directions based upon my conclusions.

1.2 What is Hot Cognition?

Within the last fifty years, cognitive scientists have decidedly analogized mental processing with temperature scales: that is, cold versus hot. Cold cognitive processing, as described by Solomon (2001), focuses on the pursuit of information from a rational perspective, devoid of emotional influencers. *Hot cognition*, a term originating in the mid-1960s (Abelson, 1963), is succinctly defined as cognition colored by feeling (Brand, 1987). With this new definition, researchers attempted to wed cognitive functioning with more humanistic traits, such as feelings, desire, moods, and self-interest (Solomon, 2001). Emotions and cognition are generally thought of as interwoven entities (Barrett, 2009; D'Mello & Graesser, 2012; Dörner & Güss, 2013; Dörnyei, 2009; Lazarus, 1999) because human cognitive functioning rarely occurs in a neutral state. Basic examples include selecting a meal, voting for a candidate, or falling in love.

The influences of hot cognition have been studied and discussed across different domains of both cognitive (Corr, 2013; Madrigal, 2008; Thagard & Kroon, 2006; Unsworth, Heitz, & Engle, 2005; Worrell, 2014) and social (Lodge & Taber, 2005; Simon, Stenstrom, & Read, 2015; Simpson & Marshall, 2010; Wyatt et al., 1993) sciences. In one study, Lodge and Taber (2005) conducted a series of experiments using lexical priming to test whether hot cognition served as the foundation for motivated reasoning during sociopolitical activities. Results indicated that participants developed automatic links between political concepts (i.e., leaders, groups, and symbols) and positive or negative affect. In another study, Wyatt et al. (1993) discovered from verbal protocols that social scientists evaluated professional-level journal articles via partially

hot cognitive processing. The researchers suggested that in certain instances, reading charged with stronger reactions often occurred during interpretive-evaluations of the text. Cold cognition accounted for the remaining literal processing of the articles.

Thagard and Kroon (2006) demonstrated that even scientific thinking, normally associated with cold cognition, is influenced by feelings. The two researchers identified, coded, and analyzed the amount of emotional words used by scientists James Watson and Francis Crick, who discovered the DNA molecule's structure and its role in the operations of genes, during the time of their discovery. Using the text of Watson's 1969 short book *The Double Helix* that described the two scientists' work and discussion, Thagard and Kroon identified 235 emotional words as possessing either a positive (happiness) or negative (sadness) valence. While the researchers did admit that the author's emotional self-reports may not have been entirely psychologically accurate, the text nonetheless provided a rich example of the association between scientific thinking and emotional states.

1.3 Hot Cognition, Emotions, and Learning

The influence of emotions on learning has received much attention in the fields of neuroscience (Viinikainen et al., 2012; Wolfe, 2006; Zull, 2006) and cognitive psychology (Barrett, 2009; Dörner & Güss, 2013; Pekrun, 2006; Ranellucci, Hall, & Goetz, 2015). From a physical standpoint, human emotion is regulated by two small glands located in the brain, which are called the amygdala and which release adrenaline during heightened affective states, producing a memory imprint of the experience (Wolfe, 2006). The amygdala stimulates *affective attention*, or prioritized sensory processing for emotional stimuli over neutral items (Pessoa, 2010; Uusberg, Uibo, Kreegipuu, & Allik, 2013). In turn, whether the feeling impacts an individual's well-being will be reflected in an approach towards, or avoidance of, the stimuli

(Shanahan, 2008). With respect to learning, emotions facilitate the quality and strength of neural traces, influencing a person's ability to accurately recall what has been experienced (Dörnyei, 2009; Rager, 2009). Simply put, "emotion drives attention, which drives learning, memory, and problem-solving behavior" (Weiss, 2000, p. 46). How specific emotions influence this process, however, is still a matter of debate.

In general, the activation of positive emotions is seen to motivate learning (Arnold, 2011; MacIntyre & Gregersen, 2012; Pekrun, 2006), as well as promote creative learning strategies (Isen, 2000) and enhance cognitive functioning (Storbeck & Maswood, 2015; Yang et al., 2013). Negative emotions, on the other hand, disrupt the learning process and hinder information retention (Elnicki, 2010; MacIntyre & Gregersen, 2012; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Shang, Fu, Dienes, Shao, & Fu, 2013) and cognitive processing (Curci, Lanciano, Soleti, & Rimé, 2013). Within the context of general education, research has shown that different *achievement emotions*, or emotions tied to achievement outcomes in the classroom (Pekrun, 2006), impact student performance in a variety of manners (Goetz, Frenzel, Hall, & Pekrun, 2008; Lichtenfeld, Pekrun, Stupinsky, Reiss, & Murayama, 2012; Linnenbrink-Garcia & Pekrun, 2011; Luo et al., 2014; Pekrun, Goetz, Titz, & Perry, 2002; Pekrun et al., 2011). For example, while using an instrument to measure achievement emotions, Pekrun et al. (2011) discovered relationships between specific emotions and both academic learning and performance in a large number of Canadian undergraduate students (N = 389). The researchers found positive correlations between students' grade point averages and learning variables such as positive, activating emotions (enjoyment, hope, and pride). Conversely, negative, deactivating emotions (hopelessness and boredom) and negative, activating emotions (anger, anxiety, and shame) correlated negatively in the same areas. In the field of SLA, MacIntyre and Gregersen (2012)

argued that positive emotions tended to broaden students' perspectives (positive-broadening), facilitating L2 absorption within the classroom setting. Conversely, they viewed negative emotions as more restrictive in nature (negative-narrowing), impeding cognition and limiting input reception.

To be sure, the compartmentalization of positive emotions as "good" and negative emotions as "bad" for students in the classroom is not always a given (see Pekrun et al., 2002; Pekrun, 2014). Wolfe (2006), for instance, viewed emotions as a "double-edged sword" (p.40) that could benefit or hinder academic performance based on the individual or context. Pekrun (2014) admitted that positive emotions may pose a detriment to learning if they distracted students' attention away from classroom tasks or homework assignments. Excitement over a sporting event or falling in love are examples of positive emotions brought into the classroom that may serve to encumber an individual's learning potential. Pekrun also stated that negative emotions may be harnessed to increase classroom productivity under certain circumstances. Anxiety, self-related anger, and shame, in lower intensities, may promote learning if students are at least confident in their ability to succeed with the course material. Such inconsistencies reveal that the precise role of emotions in learning is still not clear and may impact individuals in different ways.

Related to Pekrun's (2006, 2014) findings, Pessoa (2009) introduced the *dual competition* framework to explain how certain emotions could enhance or hinder cognitive processing depending upon their relative intensity. His framework posited a mutual interaction between neurological executive systems and affect during behavior performance. For example, high-arousal emotional items, either positive or negative (e.g., erotic imagery or fear of shock), divert mental processing efforts toward the arousing stimuli and away from task execution. Low-threat

stimuli, on the other hand, improve task performance by enhancing target processing. Thus, the influence of emotions on behavioral performance relies primarily on the intensity of the emotional information (Pessoa, Padmala, Kenzer, & Bauer, 2012). Pessoa et al. (2012) validated components of the dual competition framework by testing two separate groups using stop-signal tasks paired with varying affective stimuli. The first group (N = 36), who were exposed to mild stop-signals (happy and fearful faces), enhanced their response inhibition time relative to the neutral stimuli (neutral faces). The opposite held true for the second group (N = 22), which recorded impaired inhibition responses with higher-threat emotional stop-signals (threat of a mild shock). The researchers did not test high arousing, positive stimuli in the experiment. Whether or not the dual competition framework applies to complex learning tasks (for the purposes of this study, L2 acquisition) remains to be investigated.

1.4 Hot Cognition and SLA

For decades, the relevance of emotions and their impact on SLA has been recognized within the field of L2 studies (Crookes & Schmidt, 1991; MacIntyre, 2002; Schumann, 1994; Swain, 2013). However, specific research in this area has been limited and "emotions have, in general, been neglected in SLA literature" (Swain, 2013, p. 195). Typically, inquiry into affect and L2 acquisition has been relegated into one of three categories: (a) foreign language anxiety, (b) acquisition of emotional vocabulary, and (c) the role of affect within the L2 classroom. The following provides a brief overview of each focus.

With respect to "primary" emotions (e.g., *joy*, *interest*, *sadness*; see Reeve, 1997), MacIntyre (2002) observed that, "the only emotion…to be studied in detail in the language learning area is anxiety, a variant of fear" (p. 64). Foreign language anxiety (FLA), as defined by Horwitz, Horwitz, and Cope (1986), reflects a type of situation-specific anxiety caused by

negative reactions to L2 learning. Horwitz et al. developed a popular instrument for measuring FLA in students, (appropriately) named the Foreign Language Classroom Anxiety Scale (see Section 2.3.4.4 of this paper for more details). The phenomenon has been discussed at great lengths within the realm of SLA and is generally perceived to hinder L2 acquisition efforts (Horwitz et al., 1986; Horwitz, 2001; MacIntyre & Gardner, 1989, 1994). Over the past ten years, researchers have analyzed FLA in a variety of foreign language learning contexts, such as corrective feedback (Rassaei, 2015; Sheen, 2008) and willingness to communicate (Baran-Łucarz, 2014; Liu & Jackson, 2008; MacIntyre, 2007). Different population samples, from adult (Lim, 2009; Zhao, Dynia, & Guo, 2013) to child (Sparks & Ganschow, 2007; Sparks & Patton, 2013) learners, have also been studied to measure age-related effects. While FLA is indeed an affective component of L2 learning (MacIntyre, 2002), it only represents one specific emotion that students may experience in the classroom.

Another area of emotion-related research is the mental representation of emotional lexical items in bilinguals and L2 learners (Caldwell-Harris, Tong, Lung, & Poo, 2010; Eilola, Havelka, & Sharma, 2007; Ferré et al., 2010; Pavlenko & Driagina, 2007). Affective lexis normally examined in this line of inquiry includes taboo and swearwords, insults, reprimands, endearments, and aversions (see Pavlenko, 2008). Generally speaking, an individual's L1 is viewed as more emotional than subsequent languages learned (Dewaele, 2004). In this case, age of LX acquisition matters, as earlier bilinguals appear to affectively process language to greater depths than later bilinguals or foreign language learners (Pavlenko, 2012). For example, Sutton, Altarriba, Gianico, and Basnight-Brown (2007) utilized a Stroop task to measure the interference effect of L1 and L2 emotional words on early Spanish-English bilinguals. The researchers found that participants experienced equal interference with the emotional stimuli from both languages,

suggesting a shared affective processing rate with the lexical items. Conversely, Winskel (2013) showed that late Thai-English bilinguals responded less strongly to the emotional arousal of L2 words than L1 words. She used both Stroop and emotionality-rating tasks to measure results. Recent findings from Ponari, Rodríguez-Cuadrado, Vinson, Fox, Costa, & Vigliocco (2015), however, have chipped away at this current paradigm. Their study of 156 English as a Second Language (ESL) learners revealed processing rates of emotional words in lexical decision tasks that were similar to their native English-speaking counterparts, regardless of L1 or age of acquisition. In the face of such processing discrepancies, researchers continue to explore and discern the mental effects of emotional lexicon in the L1 and target language.

The emotional interplay between L2 learning and teaching within the classroom rounds out the final branch of affect research in SLA. Researchers (Aragão, 2011; Brown & White, 2010; Johnson & Golombek, 2003; Golombek, 2015) have looked at how teachers and students reflect on and regulate emotions within the L2 classroom from a pedagogical standpoint. Researchers generally discovered that strong, negative emotions detract from the overall acquisition process (Arnold, 2011; Brown & White, 2010; MacIntyre & Gregersen, 2012). Some have identified a need for emotional awareness at the instructor level to facilitate learning and encourage positive student-teacher relationships (Cao, 2011; Horwitz, 1995; MacIntyre & Gregersen, 2012). Arnold (2011), for example, suggested that language instructors be concerned with their students', as well as their own, affective side to promote L2 development and assessment. The aforementioned studies, however, primarily focused on specific emotions generated within the context of the L2 classroom, such as fear and anxiety, which are subsequently related back to FLA (Horwitz et al., 1986; MacIntyre, 2002) or L2 motivation (Dörnyei, 2009; Papi, 2010). This leaves the role of positive emotions largely unexplored.

1.5 Pilot Study

In the current study, I build on my earlier collaborative research measuring the effects of hot cognition on explicit, L2 vocabulary acquisition (Miller, Fox, Moser, & Godfroid, under review). During this preliminary examination, two groups of thirty-five adult language learners acquired 24 novel, lexical items, in either a neutral or negative emotional state.[1] Stimuli used to induce emotionality derived from film clips known to elicit affective responses as measured on a 9-point Likert scale (1 = low valence, 5 = neutral, 9 = high valence) (from Carvalho, Leite, Galdo-Álvarez, & Gonçalves, 2012). The neutral group viewed six, 40-second scenery clips that measured mid-range valence (M = 5.77) and low arousal (M = 2.74) on self-reports. The negative group watched six horror clips known to produce low valence (M = 1.85) and high arousal (M = 7.25). Film exposure was 240 seconds for each group. Self-Assessment Manikins (SAMs), measured on a 9-point Likert scale, were used at various points in the study to capture the individuals' subjective emotional states.

Immediately following emotional induction, participants from both treatment groups participated in paired-associates, vocabulary learning. Participants viewed on a computer screen an Indonesian word, its English translation, and a pictorial representation (from Szekely et al., 2004) for eight seconds. Presentation of all 24 items as such constituted one complete block. Participants watched three blocks, each presented in a random order, for a total exposure time of 24 seconds per item. After the lexical training phase, three types of immediate and delayed posttests (48 hours later) recorded individual lexical performance. The tests included a (a) free

[1] The Miller et al. (under review) study also measured two additional components: (a) the effects of emotional induction on working memory and (b) the relationship between vocabulary acquisition and working memory within an emotional state. The results of these measures are not discussed here, as working memory is not a focus within the current study's design. As such, only the vocabulary acquisition portion of the Miller et al. study is examined.

recall (provide any English or Indonesian words remembered), (b) L1 to L2 recall (given the English word, provide the Indonesian equivalent), and (c) L2 to L1 recall (given the Indonesian word, provide the English word).

Examination of SAM data points for *valence* (from *sad*/*unpleasant* to *happy*/*pleasant*) pre and post film clips indicated successful emotional induction for participants in both treatment groups. Analysis of vocabulary scores from all three measures revealed that the negative group learned fewer words than the neutral group. However, significant and near-significant group differences only occurred during activities that involved L1 pairing or retrieval (i.e., L1 to L2 recall, L2 to L1 recall, and free recall of English words). This effect did not manifest when participants were asked to provide the L2 items (i.e., free recall of Indonesian words). The researchers speculated that *disembodied cognition*, or the inability of learners to assign affective status to newly acquired L2 forms, explained the disparity of group performance (see Pavlenko, 2005). Instead, participants suppressed L1 retrieval by projecting negative emotionality onto their native language, which is more susceptible to affective reactivity. From an SLA perspective, the findings revealed that negative emotional states can encumber students' abilities to establish L2-L1 form-meaning by disrupting L1 semantic activation.

Based upon this pilot study, I identified two areas for further inquiry with respect to emotions and SLA. First, more intense and persistent emotional inductions were likely needed to impact cognitive functioning in a laboratory setting. As such, a sustained exposure to hot cognitive influencers before, during, and after the L2 training phase should (a) better mirror L2 learners' persistent emotional states throughout an assessment period or classroom environment and therefore, (b) provide a more accurate picture of the role of emotions in learning. Second, I wanted to extend the examination of hot cognitive effects to incidental learning conditions,

where unconscious processing might occur. As evidenced from the pilot study, emotions can interfere with conscious L2 processing (through explicit instruction). Whether these findings hold true in the development of implicit L2 knowledge is yet to be determined. A logical progression extends this investigation to SLA on an unconscious level to understand what role, if any, emotions play on the type of learning.

1.6 Incidental Learning Conditions and SLA

Within SLA research, the use of training tasks that create incidental learning conditions has provided a window into unconscious L2 processing (Ender, 2014; Rebuschat & Williams, 2012). Simply stated, *incidental learning* is learning without intent (Rogers, Révész, & Rebuschat, 2015). In the context of L2 acquisition, Hulstijn (2013) informally described this process as, "'picking up' an unknown word [or expression] from listening to someone or from reading a text" (p. 2632), absent the conscious effort to do so. This type of learning process is in direct contrast with *intentional learning*, which involves a deliberate attempt to learn or memorize target material (Gass, Behney, & Plonsky, 2013; Hulstijn, 2003; Rogers et al., 2015). Examples of intentional learning include the application of mnemonic devices or other types of rehearsal techniques (Hulstijn, 2003, 2013).

Methodologically speaking, incidental learning is a type of learning condition. Within L2 experimental designs, incidental learning has been operationalized in training tasks so that, "subjects should not know that they are going to be tested, nor should they be informed about the nature of the rule system" (Rebuschat, 2013, p. 615; see also Hulstijn, 2003; Williams, 2009). According to Rogers et al. (2015), researchers interested in facilitating incidental learning often devise a, "'cover story' or task in their training conditions that is designed to orient participants' attention on the meaning of the input, rather than toward the grammatical features that will later

be tested" (p. 782). Recent studies have successfully employed this exact design, for example, to examine the acquisition of L2 syntax under incidental learning conditions (see Godfroid, 2015; Grey, Williams, & Rebuschat, 2014; Rebuschat & Williams, 2012).

It is important to note that incidental learning is not a particular type of cognitive process. Rather, it is learning that takes place under meaning-focused conditions. The terms *implicit learning* and *explicit learning*, instead, refer to the underlying cognitive processes that foment the acquisition of knowledge (Hulstijn, 2007). Ender (2014) noted that incidental learning can be the result of either implicit or explicit processes, or both. In this regard, incidental learning conditions can function as a conduit for one or both processing types to transpire. Subsequently, the type of knowledge acquired would largely depend upon which processes were activated. For the student involved in an incidental learning task, then, any *implicit learning* would likely result in *implicit knowledge* of the target L2 structure. Likewise, *explicit learning* would facilitate the formation of *explicit* knowledge (see Hulstijn, 2007). Table 1 provides the definition of terms used thus far in this section.

Table 1
Definition of Terms

Term	**Definition**
Incidental learning	Learning that occurs without intent (Rogers et al., 2015); principally a methodological condition in L2 experimental design.
Intentional learning	Learning that involves a deliberate attempt to acquire or memorize target material (Hulstijn, 2003).
Implicit learning	Acquisition that occurs without awareness or intent to learn (Rebuschat, 2013).
Implicit knowledge	Knowledge that is unconscious, procedural, and intuitive (Loewen, 2015; Zhang, 2015).
Explicit learning	Acquisition that involves a specific search for structure (Gass et al., 2013).
Explicit knowledge	Knowledge that involves awareness and can be accessed consciously (Loewen, 2015).

To gauge what specific types of learning occurred (and subsequently, what types of knowledge are acquired) during incidental learning conditions, SLA researchers have successfully employed two distinct measurements: retrospective verbal reports and subjective sources attributions (Godfroid, 2015; Grey et al., 2014; Rebuschat & Williams, 2012). Retrospective verbal reports, acquired at the study's completion, measure whether participants have gained implicit or explicit knowledge based upon their ability to verbalize any rules that were noticed during the experiment. According to Rebuschat (2013), the presence of unconscious knowledge lies at the intersection of a positive training effect (e.g., above-chance performance on follow-up tasks) and an inability to articulate any knowledge associated with that effect. This type of verbal report, however, only provides a partial assessment of awareness and should be accompanied by additional and more immediate measurements. To fill this gap, subjective source attributions can also discern what types of knowledge (implicit, explicit, or both) are attained, especially in concert with artificial grammar learning (Dienes, 2008). During grammaticality judgment tests (GJTs), for example, participants are afforded the opportunity to indicate what their decisions were based on (e.g., *guess*, *intuition*, *recollection*, or *rule knowledge*; see Dienes & Scott, 2005; Rebuschat, 2013; Rebuschat & Williams, 2012). Implicit knowledge normally corresponds to above-chance GJT performance when either guessing or using intuition. Explicit knowledge is related more with recollection and rule knowledge. I utilized both retrospective verbal reports and subjective source attributions in this dissertation to explore how knowledge is developed from incidental learning conditions.

Several SLA researchers have successfully combined incidental learning tasks with *semiartificial languages* (or, languages that adhere to a learner's L1 lexicon but exhibit different morphosyntactic structures) to mimic meaningful L2 acquisition contexts (Godfroid, Ahn,

Rebuschat, & Dienes, in preparation; Grey et al., 2014; Rebuschat & Williams, 2012; Williams & Kuribara, 2008). Rebuschat and Williams (2012), for example, used an aural, semiartificial language involving English words and German syntax to test native English speakers' (N = 30) acquisition of German syntax. Participants in the experiment performed significantly above chance on GJTs after incidental exposure to the German word order. The researchers noted that the addition of elicited imitations in the training phase may have facilitated learning as it forced the participants to process the word order more deeply. Analysis of source attributions linked with accurate GJT responses indicated that participants performed significantly above chance while using intuition (implicit knowledge) and rule knowledge (explicit knowledge). Post-study questionnaires revealed that participants acquired no conscious (verbalizable) linguistic rules for the syntax, further reinforcing the finding of successful acquisition of unconscious knowledge. Grey et al. (2014) found similar results using the semiartificial language of Japlish. After an initial incidental training phase, thirty-six undergraduates' accuracy on immediate grammaticality acceptability ratings was significantly above chance. The researchers also found that participants performed significantly above chance when utilizing aspects of unconscious knowledge (the source attribution of intuition). Delayed testing two weeks later showed that participants maintained their knowledge, highlighting the durability of L2 learning under incidental exposure for L2 acquisition. Given the good results that have been obtained with this paradigm in an incidental learning task, I also used an adapted form of the semiartificial German language designed by Rebuschat and Williams (2012) for the learning stimuli in this dissertation.

Studying implicit language learning in adults can help provide a better understanding of the relationship between human cognition and L2 acquisition (Godfroid, 2015; Godfroid & Winke, 2015). While SLA research into implicit processing is on the rise, more work in niche

areas is needed. One such area is how implicit learning, and subsequently implicit knowledge, develops through incidental learning conditions. The application of implicit learning within different contexts can also prove useful in fully understanding the limits of the learning mechanism (Andringa & Rebuschat, 2015). Two key aspects still requiring further inquiry are (a) the role of emotions on implicit learning and (b) how individual differences affect implicit learning (see Andringa & Rebuschat, 2015; Rebuschat, 2013; Tagarelli, Borges, & Rebuschat, 2015).

1.7 Emotions and Implicit Learning[2]

To my knowledge, there is no literature in SLA that details the effects of emotional states on unconscious processing. Limited to the domain of psychology, few researchers (Braverman, 2005; Naismith, Hickie, Ward, Scott, & Little, 2006; Pretz, Totz, & Kaufman, 2010; Schultheiss et al., 2005; Shang et al., 2013) have made specific inquiries into the area of implicit learning. Braverman (2005), for instance, tested the effects of different moods on the detection of covariation. Ninety-seven undergraduates were subjected to either a happy, neutral, or sad emotional manipulation via four-minute, mood-inducing, video clips. Immediately following, the participants saw a series of faces, accompanied by math and verbal scores. The researchers correlated the nose sizes of the faces with either higher math or verbal scores, establishing a strong covariation among the variables. Results indicated that individuals from the sad group learned the covariation significantly better than the happy group, but only slightly better than the neutral group. Naismith et al. (2006), however, found the opposite to be true with a clinical population. In their study, 21 subjects with moderate to severe unipolar depression and 21

[2] The term "implicit learning," as referenced throughout Sections 1.7 and 1.8, is taken directly from each cited author's study. Therefore, the term's use and meaning do not originate from me, but from the specific researcher.

matched “healthy” adults completed a serial reaction time (SRT) task to measure implicit learning. While appearing random, Naismith et al. had actually sequenced the task materials so that gradual improvements in reaction time indicated implicit learning of the sequence. The researchers discovered that participants suffering from depression performed significantly worse than those from the control group. While no group was explicitly induced for emotionality, the study did find that lower valence (i.e., *sadness*) impeded attempts at successful implicit learning.

In a more recent study, Pretz et al. (2010) examined emotional effects on two implicit learning measures: an artificial grammar (AG) task and a SRT task. The researchers initially divided undergraduates (N = 109) into three groups (positive, negative, and neutral) and utilized images from the International Affective Picture Database (Lang, Bradley, & Cuthbert, 2008) to induce a desired mood state. Subsequently, the students completed the AG task, which consisted of first learning, then identifying letter strings that either did or did not conform to a specific grammar. For the SRT task, individuals pressed a button corresponding to the location of a stimulus appearance on the screen, which unbeknownst to participants, followed a probabilistic pattern. Results for the two tasks were mixed. The researchers found that mood caused a significant effect on AG learning, with the negative group performing significantly better than both the neutral and positive groups. They did not measure significant effects, however, for the SRT task.

While these studies provide preliminary insight into the impact of emotions on implicit learning, none of the performance tasks relate to the acquisition of a second language per se. That is, ecologically valid lexical or grammatical structures (e.g., meaningful semiartificial language) have yet to be tested in concert with mood induction. In order to accomplish this endeavor, I attempt to facilitate implicit learning (via an incidental learning task) for participants

as they try to acquire syntactic structures of a semiartificial language under a variety of emotional stressors.

1.8 Implicit Learning and Individual Differences

Research into the role of individual differences on implicit learning is decidedly limited (Granena, 2013; Grey, Williams, & Rebuschat, 2015; Kaufman et al., 2010; Rebuschat, 2013; Toplak et al., 2010; Strack & Deutsch, 2004; Xie, Gao, & King, 2013). Findings of previous studies indicate some individual components are more related to implicit learning performance than others. Self-reported personality aspects, for example, may be among the best predictors in this area. In a study of 153 participants, Kaufman et al. (2010) correlated implicit learning performance on a SRT task with a variety of individual measures, ranging from psychometric intelligence to intuition. The researchers found significant relationships between implicit learning and the personality characteristics of impulsivity, intuition, and openness to experience. Woolhouse and Bayne (2000) also found strong correlations between implicit learning and intuition. They noted that intuitive individuals tended to better utilize unconscious knowledge when forming strategies on how to accomplish implicit learning tasks. In yet another study on individual differences, Grey et al. (2015) discovered that extraversion strongly (albeit negatively) correlated with an implicit, semiartificial language task. The authors suggested that participants with higher extraversion may have experienced processing interference from unknown, target-language features within the task, not initially explained with explicit grammar rules. Besides extraversion, the researchers examined other personality features, including neuroticism, openness to experience, conscientiousness, and agreeableness. They did not find significant relationships for these four variables. Given the findings above, it seems that openness, intuition, and impulsivity emerge as good candidates for further inquiry in the context of implicit learning.

Weaker relationships, however, have generally been noted between implicit learning and both intelligence (Gebauer & Mackintosh, 2007; Kaufman et al., 2010; Toplak et al., 2010; Xie et al., 2013) and working memory capacity (WMC) (Grey et al., 2015; Kaufman et al., 2010; Tagarelli, Borges Mota, & Rebuschat, 2011). Gebauer and Mackintosh (2007), for instance, correlated the results of three implicit instructional treatments with a battery of intelligence tests in a large number of German students (N = 401). The researchers failed to find strong links between implicit learning performance and measures of fluid intelligence, crystallized intelligence, and memory. Related to intelligence and cognitive ability, Xie et al. (2013) found no relationships between implicit learning and the thirteen thinking styles as described by Sternberg (1997) (categorized into *Type 1*, creativity and cognitive complexity; *Type 2*, preference for norms and cognitive simplicity; and *Type 3*, value differentiated). Their study, involving Chinese undergraduates (N = 87), correlated scores from the Thinking Styles Inventory-Revised II survey (Sternberg, Wagner, & Zhang, 2007) with scores on an artificial grammar learning task. The researchers measured no significant correlations between the any of the thinking styles and performance under implicit instruction. WMC has also shown to have a weak relationship with implicit artificial grammar learning. Both Kaufman et al. (2010) and Tagarelli et al. (2011) found no significant correlations with operation span tasks and implicit learning performance. Recently, Grey et al. (2015) tested thirty-six undergraduates and compared phonological working memory, using non-word repetition tasks, with implicit learning and found no significant correlations between the variables. Considering the findings from these studies, I did not focus on intelligence and WMC as mediating factors of implicit learning.

In addition to openness, intuition, and impulsivity, I also examined *emotional intelligence* (EI), or the "competence in perceiving emotions (both in oneself and others)" (Zeidner,

Matthews, & Roberts, 2009, p. 3), and FLA as characteristics that potentially mediate implicit learning. Less is known about how these two variables interact with implicit performance. In the case of EI, Fiori (2009) described how the trait may be linked with certain unconscious processing and automaticity, possibly facilitating the development of implicit knowledge. From an SLA perspective, Dewaele, Petrides, and Furnham (2008) discovered that multilinguals (N = 464) with high trait EI possessed lower levels of CA/FLA across languages learned, although implicit learning was not looked at in the study. The finding, at a minimum, provides evidence of a possible connection between EI and language learning. Undoubtedly, more research into this area is needed (Zeidner et al., 2009). Regarding FLA, no studies to my knowledge have examined the role of this variable in implicit learning. Due to the shortage of research on individual differences and implicit learning within SLA, I decided to investigate the role of FLA, EI, openness, intuition, and impulsivity in performance on an incidental, L2 task in both a neutral state and under emotional strain.

CHAPTER 2

CURRENT STUDY

2.1 Present Study

In this study, I sought to better understand how emotions influence aspects of SLA under incidental exposure. I also explored the relationships between L2 acquisition and certain personality characteristics to discern possible impacts from individual differences. The following research questions (RQs) guided my examination into these endeavors:

1. What is the role of positive, negative, and neutral emotional induction in the learning and retention of L2 syntax?

2. Can learners in a positive, negative, or neutral emotional state acquire L2 syntax implicitly?

3. How do mood states influence the relationship between openness, intuition, EI, FLA, and impulsivity and L2 learning performance?

2.2 Participants

One hundred and twenty (N = 120)[3] undergraduates from a major Midwestern university participated in this study. I randomly assigned individuals to a Comparison group (n = 30) or one of three experimental groups: the Positive (emotional) group (n = 30), the Negative (emotional) group (n = 30), or the Neutral (emotional) group (n = 30). All participants met the following criteria for eligibility: they were (a) between the ages of 18 and 30, (b) native-speakers of English, (c) not heritage speakers of German or any other verb-second (V2) language (e.g.,

[3] Power analysis (using a medium effect size and $\alpha = .05$) indicated that for four treatment groups, at least 116 total participants were needed to achieve *Power* = .8 for between-group effects.

Dutch or Yiddish), (d) not regularly exposed to V2 languages, and (e) emotionally fit to view violent, disturbing, or sexually explicit material (via a pre-screening questionnaire).

Out of the 120 participants, 37 were male and 83 were female. The average age was 21.3 years (*SD* = 2.68). Across each group, the demographics were nearly identical, as seen in the following breakdown: (a) Comparison group, males (*n* = 9), females (*n* = 21), age (*M* = 21.5, *SD* = 2.61); (b) Positive group, males (*n* = 9), females (*n* = 21), age (*M* = 21.2, *SD* = 3.45); (c) Negative group, males (*n* = 9), females (*n* = 21), age (*M* = 21.2, *SD* = 2.56); and (d) Neutral group, males (*n* = 10), females (*n* = 20), age (*M* = 21.1, *SD* = 2.06). Each student was paid $20 for their participation in this study.

2.3 Materials

2.3.1 Definitions of Terminology

Throughout the remainder of this dissertation, I use a variety of terms that may be unfamiliar to some readers or require further clarification in the context of my study. These items are briefly defined and operationalized in Table 2.

Table 2
Definition and Operationalization of Key Terminology

Term	**Definition**	**Operationalization**
Valence	A participant's emotional state.	9-point Likert scale from *sad/unpleasant* to *happy/pleasant*.
Arousal	A participant's level of stimulation.	9-point Likert scale from *relaxed/unaroused* to *stimulated/aroused*.
Endorsement	The acceptance of a sentence as grammatical.	GJT accuracy scores. Endorsements are grammatical sentences that are judged as grammatical (correct responses) and ungrammatical sentences that are judged as grammatical (incorrect responses).

Table 2 (cont'd)

Term	Definition	Operationalization
Grammatical accuracy	A measurement that reflects high endorsement rates for grammatical sentences and low endorsement rates for ungrammatical sentences.	The number of correct responses divided by the total number of items on the GJTs.
Learning	Above-chance performance on the GJTs.	GJT accuracy scores that are significantly higher than 50%.
Source attribution	A subjective measurement that indicates how a participant arrived at their grammaticality judgment; also known as *judgment knowledge*.	Four source attributions used in conjunction with the GJTs: *guess*, *intuition*, *recollection*, and *rule knowledge*.
Explicit knowledge	Knowledge that involves awareness and is consciously accessible.	Source attributions (*recollection* and *rule knowledge*) and verbal reports.
Implicit knowledge	Knowledge that is unconscious, procedural, and intuitive.	Source attributions (*guess* and *intuition*) and a lack of verbal reports.

2.3.2 Incidental Exposure and Testing Sentences

I adapted the sentences used for the L2 exposure and testing tasks from Rebuschat's (2008) study on implicit language acquisition under incidental conditions. All belonged to a semiartificial language that blended English words with German syntax. Three verb placement rules, detailed in Table 3, constituted the linguistic focus of the sentences.

Table 3
Descriptions and Examples of the Three Verb Placement Rules

Rule	Description	Example
V2	Finite verb placed in second phrasal position of main clauses that **are not** preceded by a subordinate clause.	*Last week **ate** Rose excellent dessert at a café.*
V1	Finite verb placed in first position in main clauses that **are** preceded by a subordinate clause.	*Since his teacher criticism voiced, **put** Chris more effort into his work.*
VF	Finite verb placed in final position in all subordinate clauses.	*George repeated today that the movers his table **scratched**.*

Note: V1 = verb first position; V2 = verb second position; VF = verb final position.

In total, I employed 180 sentences as the core materials for this study, divided in the following manner: 120 sentences for the exposure set (plus 4 practice items) and 60 sentences for the testing set (plus 4 practice items). The sentences were presented aurally to the participants. A female, native speaker of American English, recorded all sentences using an Olympus VN-8100PC digital voice recorder. I subsequently edited these recordings for audio consistency prior to inclusion into the SuperLab program. The specific information about the exposure and testing sentences is as follows:

2.3.2.1 Exposure Set

The exposure set, as detailed in Appendix A, consisted of 120 past-tense sentences (plus 4 practice items) that followed one of the three target verb placement rules (i.e., V2, VF-V1, and V2-VF). The number of sentences per verb rule equaled 40, half of which were semantically plausible and half of which were implausible. I specifically designed the items so that participants needed to process the entire auditory string before judging for plausibility. According to a frequency analysis, average sentence lengths in the exposure set were as follows: (a) 8.9 words per sentence for V2 items (8.9 for plausible, 8.9 for implausible), (b) 12.8 words per sentence for VF-V1 items (12.5 for plausible, 13.0 for implausible), and (c) 9.4 words per sentence for V2-VF items (9.2 for plausible, 9.5 for implausible). Table 4 provides the syntactic patterns, templates, and frequency counts for all items that appeared in the exposure set.

Table 4
Syntactic Templates for the Three Verb Placement Rules in the Exposure Set

Rule	Pattern	Template	Freq.
V2	V2	[[NP]$_{subj}$>[VP]>[AP|NP|PP]$_{temp}$>[AP|NP|PP]>[AP|NP|PP]]	(20)
		*Liz **heaved** today the boxes onto the table.*	
		[[AP|NP|PP]$_{temp}$>[VP]>[NP]$_{subj}$>[AP|NP|PP]>[AP|NP|PP]]	(20)
		*Often **sat** Sue in the seminar next to the door.*	
V1	VF-V1	[[[SUB>[NP]$_{subj}$>[NP|PP]>[VP]]>[VP]>[NP]$_{subj}$>[NP|PP]>[NP|PP]]	(40)
		*After the police her car **seized**, **expected** Rose a fine from the officer.*	
VF	V2-VF	[[NP]$_{subj}$>[VP]>[AP|NP|PP]$_{temp}$>[SUB>[NP]$_{subj}$>[NP|PP]>[VP]]]	(20)
		*Brian **contested** last June that his friend weapons **possessed**.*	
		[[AP|NP|PP]$_{temp}$>[VP]>[NP]$_{subj}$>[SUB>[NP]$_{subj}$>[NP|PP]>[VP]]]	(20)
		*Today **figured** Liz that her spouse an affair **conducted**.*	

Note: V1 = verb first position; V2 = verb second position; VF = verb final position; NP = noun phrase; VP = verb phrase; AP = adverb phrase; PP = prepositional phrase; SUB = subordinate clause. The sample sentences are in italics.

2.3.2.2 Testing Set

The testing set, listed in Appendix B, included 60 different, past-tense sentences (plus 4 practice items) which were all semantically plausible. Half of the sentences were grammatical and followed the verb patterns of V2, VF-V1, or V2-VF. The other half were ungrammatical and utilized one of the following verb placement patterns: *VF, *VF-V2, *V1-VF, *V1, *V3, or *V4. Frequency analysis indicated that the average length for grammatical items was 10.7 words, whereas ungrammatical items averaged 11.2 words. Table 5 displays the syntactic templates and frequency counts of all items that appeared in the testing set.

Table 5
Syntactic Templates for All Verb Placement Rules in the Testing Set

Pattern	Template	Freq.
V2	[[NP]$_{subj}$>[VP]>[AP|NP|PP]$_{temp}$>[AP|NP|PP]>[AP|NP|PP]]	(5)
	*Jim **loaded** in the afternoon the wagon with hay.*	
	[[AP|NP|PP]$_{temp}$>[VP]>[NP]$_{subj}$>[AP|NP|PP]>[AP|NP|PP]]	(5)
	*Yesterday **enjoyed** Emma the food in the dining hall.*	
VF-V1	[[SUB>[NP]$_{subj}$>[NP|PP]>[VP]]>[VP]>[NP]$_{subj}$>[NP|PP]>[NP|PP]]	(10)
	*Because her company capital **lacked**, **organized** Chloe a fundraiser with her boss.*	
V2-VF	[[NP]$_{subj}$>[VP]>[AP|NP|PP]$_{temp}$>[SUB>[NP]$_{subj}$>[NP|PP]>[VP]]]	(5)
	*Emma **said** in the afternoon that her parents the apartment **rented**.*	
	[[AP|NP|PP]$_{temp}$>[VP]>[NP]$_{subj}$>[SUB>[NP]$_{subj}$>[NP|PP]>[VP]]]	(5)
	*Some time ago **claimed** Jim that his mother Spain **liked**.*	
*VF	*[[AP|NP|PP]$_{temp}$>[NP]$_{subj}$>[NP|PP]>[NP|PP]>[VP]]	(5)
	Recently John the Boston Marathon in four hours **ran.*	
*VF-V2	*[[SUB>[NP]$_{subj}$>[AP|NP|PP]$_{temp}$>[NP|PP]>[VP]]>[NP]$_{subj}$.>[VP]>[NP|PP]	(5)
	When his parents recently to Paris **retired, Paul **flew** a lot to France.*	
*V1-VF	*[[VP]>[NP]$_{subj}$>[NP|PP]>[SUB>[NP]$_{subj}$>[AP|NP|PP]$_{temp}$>[NP|PP]>[VP]]]	(5)
	__Knew__ Chloe Sydney when her daughter some time ago in Australia **lived.*	
*V1	*[[VP]>[NP]$_{subj}$>[AP|NP|PP]$_{temp}$>[AP|NP|PP]>[NP|PP]]	(5)
	**__Hired__ Paul yesterday two new chefs for his restaurant.*	
*V3	*[[AP|NP|PP]$_{temp}$>[NP]$_{subj}$>[VP]>[NP|PP]>[NP|PP]]	(5)
	After dinner Chloe **smashed the guitar without any warning.*	
*V4	*[[AP|NP|PP]$_{temp}$>[NP]$_{subj}$>[NP|PP]>[VP]>[NP|PP]]	(5)
	Recently Paul much furniture **imported for her new weekend retreat.*	

Note: V1 = verb first position; V2 = verb second position; VF = verb final position; NP = noun phrase; VP = verb phrase; AP = adverb phrase; PP = prepositional phrase; SUB = subordinate clause. Sample sentences are in italics; (*) indicates ungrammaticality.

2.3.3 Emotional Stimuli

Researchers have incorporated a variety of visual stimuli to successfully elicit affective states from their subjects. These include both film clips (Braverman, 2005; Carvalho et al., 2012; Miller et al., under review; Storbeck & Maswood, 2015; Tsai et al., 2000; Viinikainen et al., 2012) and photographic imagery (Aldhafeeri et al., 2012; Aluja et al., 2015; Barke, Stahl, & Kröner-Herwig, 2012; Britton, Taylor, Sudheimer, & Liberzon, 2006; Pretz et al., 2010; Tok,

Koyuncu, Dural, & Catikkas, 2010). In the current study, I utilized a combination of the two formats to facilitate emotional induction in participants.

2.3.3.1 Emotional Movie Database (EMDB)

All movie clips were from the EMDB, a collection of modern film excerpts derived from a recent Carvalho et al. (2012) study. I selected film clips for each treatment group based on their specific measured valence (*unpleasant* to *pleasant*) and arousal levels, as measured on a 9-point Likert scale by Carvalho et al. All film clips were 40 seconds in length, did not have sound, and maintained a resolution of 720 x 576 pixels. Throughout the experiment, participants from each treatment group viewed a total of ten affective film clips. The Positive group watched *erotic* film excerpts from the EMDB known to stimulate high valence (M = 6.53, SD = 1.75) and high arousal (M = 5.89, SD = 1.88) in self-reports. The Negative group viewed *horror* film excerpts known to stimulate low valence (M = 2.01, SD = 1.58) and high arousal (M = 7.04, SD = 1.86) in self-reports. Finally, the Neutral group watched *scenery* film clips that registered mid-range valence (M = 6.02, SD = 1.59) and low arousal (M = 2.90, SD = 2.03) in self-reports. I selected one *objects* film clip, known to generate mid-range valence (M = 4.90, SD = 1.82) and low arousal (M = 2.44, SD = 2.23), for pre-treatment practice with all groups.

One-sample t test results indicated that the valence ratings for the positive, $t(9) = 17.80$, $p < .001$, $r = .99$, negative, $t(9) = -25.20$, $p < .001$, $r = .99$, and neutral, $t(9) = 8.07$, $p < .001$, $r = .94$ movie clips were significantly different from the neutral value of the Likert scale (i.e., "5"). However, an independent-samples t test showed that the positive clips rated significantly higher than the neutral ones, $t(18) = 3.29$, $p = .004$, $r = .61$, marking an appropriate valence

differentiation between the two genres.[4] Lastly, while the valence scores for the *erotic* and *horror* clips are not equally distanced from the neutral Likert value (and thus providing asymmetrical intensities), they are the only sets of clips from the EMDB that offer both extreme valence and arousal ratings. As such, I decided against including lesser potent film excerpts to level mean valence scores for the negative group in order to maintain the highest emotional impact for participants (see Miller et al., under review). Film clip descriptions and the mean ratings for valence and arousal as reported by Carvalho et al. (2012) are located in Appendices D, E, and F.

2.3.3.2 International Affective Picture System (IAPS)

The emotionally-charged images shown to participants came from the IAPS (Lang et al., 2008). Similar to the EMDB selection criteria, I chose all pictures from the IAPS database with specific valence (*unpleasant* to *pleasant*) and arousal (*calm* to *exciting*) ratings (from a 9-point Likert scale) in mind. The images were in the JPEG (Joint Photographic Experts Group) format and had been digitally color-corrected (by the IAPS managers) for optimal viewing on a computer screen. While the dimensions varied slightly, no picture exceeded a resolution of 1,024 x 768 pixels. Participants in the three treatment groups each viewed a total of 70 pictures at various points in the experiment. The Positive group viewed images with highly rated valence (M = 6.86, SD = 1.78) and arousal (M = 6.10, SD = 2.17) levels (e.g., *erotica*, *extreme sports*, *food*). The Negative group watched images that registered low valence (M = 1.94, SD = 1.34) but high arousal (M = 6.44, SD = 2.28) (e.g., *mutilations, aimed guns, attacks*). Lastly, the

[4] The inclusion of neutral film clips that have been rated as "slightly positive" did not interfere with emotional induction for participants in the Neutral group. The valence and arousal patterns reported by these individuals were similar to those within the Comparison group (see Tables 8 and 10).

Neutral group saw images associated with mid-range valence (M = 4.96, SD = 1.09) and low arousal (M = 3.13, SD = 1.94) (e.g., *tools, furniture*). Two neutral images with mid-range valence (M = 5.02, SD = .91) and low arousal (M = 2.54, SD = 2.03) ratings were chosen for the pre-treatment exercise.

One-sample t test results showed that the valence ratings for the positive, $t(69) = 30.91$, $p < .001$, $r = .97$, and negative, $t(69) = -70.04$, $p < .001$, $r = .99$, images were significantly different from the neutral value of the Likert scale. The neutral pictures, however, were not significantly different from "5," $t(69) = -1.07$, $p = .289$, $r = .13$. As with the EMDB film clips, the positive and negative images are not equally distanced from the neutral Likert value. Again, I made no attempt to balance valence ratings because this would have compromised the overall emotional impact in the negative group. The image descriptions and mean ratings for valence and arousal as reported by Lang et al. (2008) are found in Appendices D, E, and F.

2.3.4 Subjective Affective Ratings

To measure participants' subjective emotionality (i.e., self-reports) during the study, I utilized four SAMs. The SAMs evaluated participants' valence and arousal levels on a nine-point Likert scale (see Appendix G). For the purposes of this study, *valence* was defined as a positive (e.g. *happy, pleasant*) or negative (e.g. *sad, unpleasant*) emotional state, while *arousal* signified a high (e.g. *stimulated, aroused*) or low (e.g. *relaxed, unaroused*) level of stimulation (see Reevy, Oxer, & Ito, 2010). Students rated each emotional dimension at various points throughout the experiment, as explained in the subsequent *Procedure* section (2.4).

2.3.5 Personality Questionnaires

I used the following five questionnaires to measure individual trait characteristics of all participants at the beginning of the study.

2.3.5.1 Big Five Aspect Scale (BFAS)

The BFAS (DeYoung, Quilty, & Peterson, 2007) measures five distinct aspects (each divided into two sub-factors) of individual personality. For the current study, I only administered the items from the *Openness/Intellect* aspect to participants. Both sub-factors, *intellect* and *openness*, maintained good internal reliabilities from two large-scale studies within the DeYoung et al. (2007) publication (.79 and .72, respectively, from a sample size of $N = 480$ and .81 and .77 from a sample size of $N = 90$). Ten items measured each factor using a 9-point Likert scale labeled *strongly disagree* to *strongly agree*. The sum of the Likert values produced the score for each factor. According to DeYoung et al., a high *intellect* score represents a disposition towards ingenuity and ideas, which has been correlated with fluid intelligence and working memory (DeYoung, Peterson, & Higgins, 2005). A high *openness* score relates with fantasy, feelings, and aesthetics.

2.3.5.2 Rational Experiential Inventory (REI)

The REI (Pacini & Epstein, 1999) measures a preference to engage in either *rational* or *experiential* processing, as well as a self-reported ability to use each mode (Pretz et al., 2014). According to Pacini and Epstein, individuals with a *rational* thinking style tend to exert self-control, favor reasoning, and are analytical in nature. *Experiential* thinkers, however, are more open-minded and rely on intuition and affect when processing information. For the purposes of this study, I only used the *experiential* component of the REI for gauging intuitiveness. Cronbach's alpha for this scale, as reported by Pacini and Epstein, was high at $\alpha = .87$. There were 20 items on the *experiential* portion of the REI which were measured on a 9-point Likert scale (*strongly disagree* to *strongly agree*). Overall experientiality was obtained by summing the Likert values, with high scores representing an inclination towards intuition.

2.3.5.3 Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF)

The TEIQue-SF (Cooper & Petrides, 2010) provides a quick assessment of global trait emotional intelligence. Trait EI encapsulates a variety of emotional dispositions and self-perceptions (Petrides, Pita, & Kokkinaki, 2007) and has been linked with both communicative anxiety (CA) and FLA in multilinguals (Dewaele et al., 2008). According to Cooper and Petrides, the TEIQue-SF yielded a high Cronbach's alpha for both males ($\alpha = .88$) and females ($\alpha = .87$). This abbreviated version consisted of 30 items derived from 15 trait EI features in the longer, TEIQue test. Responses were measured on a 9-point Likert scale (*strongly disagree* to *strongly agree*) and scored by summing the Likert values. Possible scores ranged from 30 (low global trait EI) to 270 (high global trait EI).

2.3.5.4 Foreign Language Classroom Anxiety Scale (FLCAS)

The FLCAS (Horwitz et al., 1986) is an oft-used tool in SLA research to measure individual foreign language anxiety in the L2 classroom. Per Horwitz et al., the test has high internal reliability ($\alpha = .93$) and reflects the following three domains: communication apprehension, test anxiety, and fear of negative evaluation. Reponses to the 33-question survey were measured on a 9-point Likert scale (*strongly disagree* to *strongly agree*). Possible scores, attained by summing the Likert values, ranged from 33 (low foreign language anxiety) to 297 (high foreign language anxiety).

2.3.5.5 UPPS Impulsivity Behavior Scale

The UPPS (Whiteside & Lynam, 2001) combines four personality facets ((lack of) premeditation, urgency, sensation seeking, and (lack of) perseverance) to measure individual impulsivity. As reported by Whiteside and Lynam, the internal consistency coefficients were high for each scale (.91, .86, .90, and .82 respectively). The total number of items on the UPPS

equals 45 and were all measured on a 9-point Likert scale (*strongly disagree* to *strongly agree*). I calculated the scores for each scale by summing the Likert values. Scale interpretations, as explained by Whiteside, Lynam, Miller, and Reynolds (2005, p. 561), are as follows: (a) a *(lack of) premeditation* indicates a "difficulty in thinking and reflecting on the consequences of an act before engaging in that act;" (b) high *urgency* shows a "difficulty resisting cravings and temptations;" (c) high *sensation seeking* signifies a "tendency to enjoy and pursue activities that are exciting" or even dangerous; and (d) a *(lack of) perseverance* highlights a "difficulty completing projects and working under conditions that require resistance to distracting stimuli."

2.4 Procedure

2.4.1 The Five Phases of the Procedure

I divided this study, as seen in Figure 1, into five phases: (1) pre-experimental measures, (2) initial emotional induction, (3) incidental exposure and secondary emotional induction, (4) immediate language testing, and (5) delayed language testing and debriefing interview.

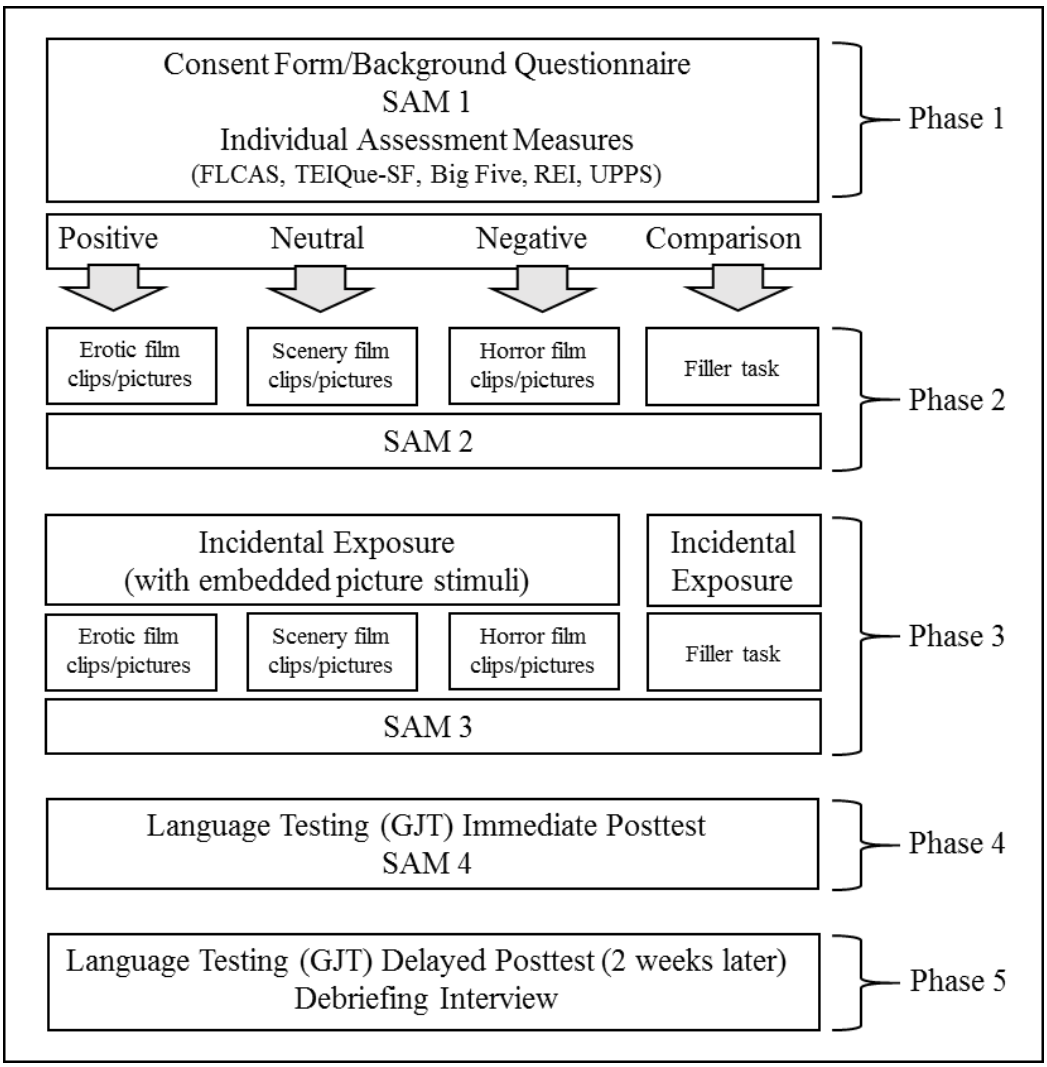

Figure 1. The graphic representation of the current study's procedure.

2.4.1.1 Phase 1, Pre-experimental Measures

After signing the consent form and completing an initial SAM and background information (to ascertain demographic information such as gender, age, foreign languages spoken, number of years of foreign language study, and film preferences), participants filled out a series of questionnaires (FLCAS, TEIQue-SF, Big Five, REI, and UPPS) to measure specific personality characteristics. I administered all surveys in a counterbalanced order via hardcopy. The completion time for Phase 1 was approximately 20 minutes.

2.4.1.2 Phase 2, Initial Emotional Induction

Upon completion of the individual personality measures, participants randomly assigned to one of the treatment groups were seated in front of a computer monitor and began their initial emotional induction (presented on the SuperLab 5 platform). The students underwent a brief preparatory session, watching one practice movie clip and two neutral images, for stimulus familiarization. Next, participants viewed a series of five, 40-second film clips from the EMDB, intermixed with 20 images from the IAPS (see Appendix D). Each image was displayed for three seconds, for a total stimulus presentation of 260 seconds. A white screen with a black crosshair, shown for 500ms, separated each visual stimulus. Figure 2 shows the display format for the emotional induction.

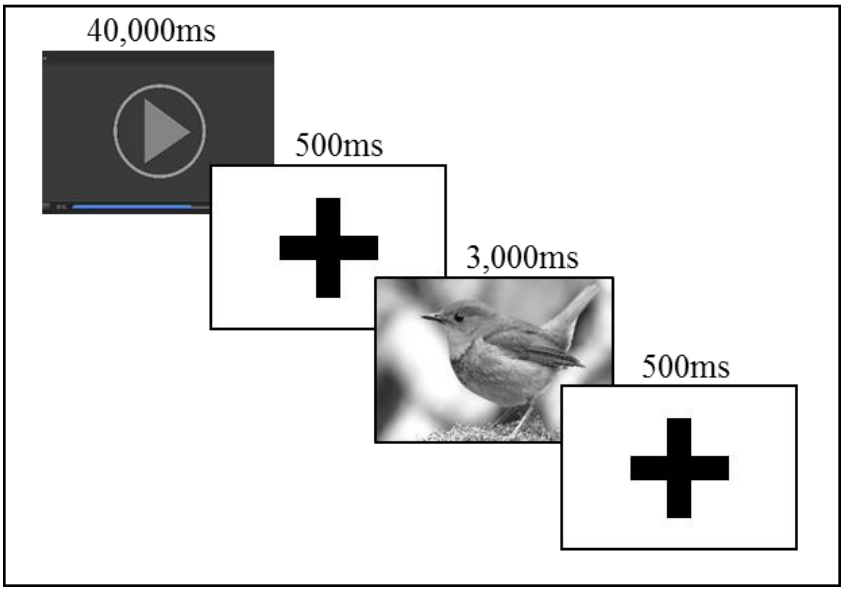

Figure 2. Diagram of the initial emotional induction format.

After watching all visual stimuli, participants completed a second SAM to record their subjective, emotional well-being. As a substitute task, individuals assigned to the Comparison group surfed the internet for six minutes (a comparable length of time to the emotional induction) prior to SAM 2. The completion time for Phase 2 was six minutes.

2.4.1.3 Phase 3, Incidental Exposure and Secondary Emotional Induction

Immediately after the first round of mood induction, I exposed participants to the semiartificial language under incidental conditions, mirroring the Training Phase in Experiment 2 of Rebuschat and Williams (2012). That is, I instructed individuals to: (a) listen to each sentence of the exposure set (see Appendix A); (b) repeat the sentence aloud; (c) and judge whether the sentence was semantically plausible or implausible. I did not inform participants that the sentences belonged to a new language system, nor that were to be subsequently tested on the material. A practice session with four sample sentences oriented participants to the procedure. All sentences from the exposure set were presented in a random order. I captured the elicited imitations on an Olympus VN-8100PC digital voice recorder and analyzed later for accuracy of repetition (i.e., verbs in the correct sentence position; lexical substitutions, insertions, or omissions were ignored). All tasks in Phase 3 were conducted on SuperLab 5.

For the three treatment groups, 30 new images (25% of the total exposure set sentences) from the IAPS were flashed onto the computer screen at three pseudo-randomized points throughout the incidental exposure session. The placement of emotional stimuli was informed by Tobias' (1986) model that identified three critical points where anxiety most directly affected learning from instruction (i.e., pre-processing, during processing, and after processing (before output)). Ten pictures were projected for 1,500ms between the aural presentation of the sentence and the elicited imitation prompt (pre-processing). Ten were shown for the duration of time needed for participants to produce an elicited imitation (processing). The remaining ten were presented for 1,500ms after the elicited imitation but before the sematic plausibility judgement (after processing (before output)). The inclusion of affective stimuli attempted to simulate persistent emotionality over the course of the incidental exposure and better represent L2

acquisition under emotional strain (see Pessoa, 2009). Individuals assigned to the Comparison group did not experience any visual stimuli during the exposure set. Figure 3 presents this procedure for the three treatment groups.

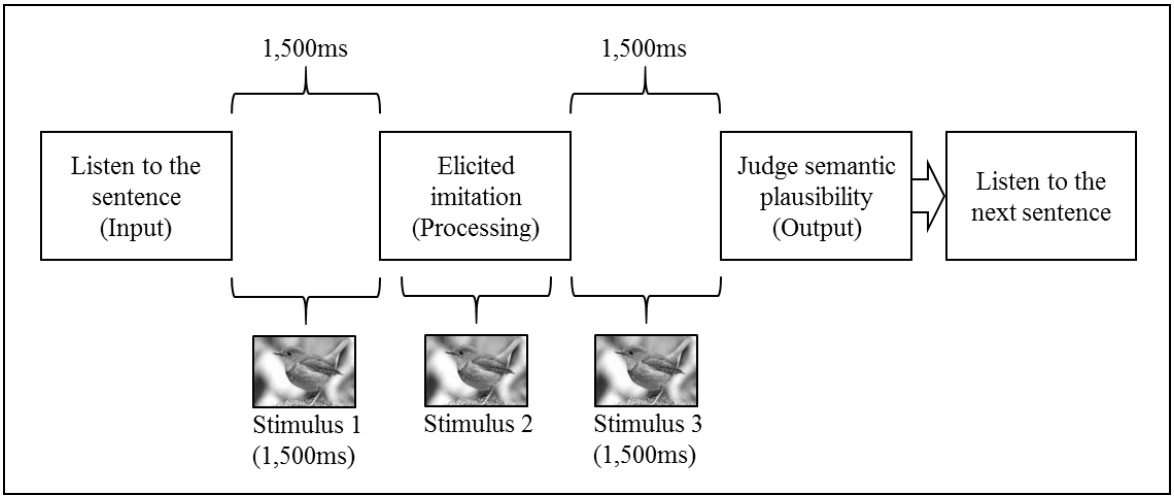

Figure 3. Incidental exposure for the positive, negative, and neutral treatment groups.

After finishing the exposure task, I subjected participants from the three treatment groups to a secondary round of emotional induction. Similar to Figure 2 in Phase 2, participants viewed a series of five different, 40-second film clips from the EMDB, intermixed with 20 images from the IAPS (different from the ones shown during Phase 2 and the exposure task from Phase 3). Again, the images were displayed for three seconds each with a total visual stimulus presentation time of 260 seconds. Lastly, participants completed a third SAM to gauge their emotional bearings. As in Phase 1, Comparison group participants surfed the internet as a substitute task for emotional induction prior to SAM 3. The completion time for Phase 3 was 45 minutes (including a short break after SAM 3).

2.4.1.4 Phase 4, Immediate GJT

Similar to the Testing Phase in Experiment 2 of Rebuschat and Williams (2012), I informed participants from all four groups that the sentences presented in the exposure set

represented a new, complex language system instead of an arbitrary pattern of words. I then asked them to listen to 60 more sentences (see Appendix B) and answer the following the questions for each item: (a) "is the sentence grammatical (in accordance with the new language system presented in the exposure set)?" and (b) "what is the basis of your judgment?" Table 6 provides the guidelines for using source attributions to determine one's basis of judgment. Here, the subjective measures of *guess* and *intuition* suggested the presence of implicit, unconscious knowledge, whereas *recollection* and *rule knowledge* implied the presence of explicit, or conscious knowledge.

Table 6
Guidelines for Source Attribution Ratings of Test Item Grammaticality

Source Attribution Ratings (select one of four)	
Guess	Judgement based on a guess (i.e., flipping a coin).
Intuition	Confident in the decision but not sure why.
Recollection	Recalled the partial or entire sentence from the exposure phase.
Rule knowledge	Acquired a rule during the exposure phase that can be articulated.

Within SuperLab 5, a practice session with four sample test sentences familiarized participants with the procedure. All sentences from the test set were randomized for each individual. Upon completion of the immediate posttest, I administered a fourth SAM to measure participants' final emotional state. The completion time for Phase 4 was 15 minutes.

2.4.1.5 Phase 5, Delayed GJT and Debriefing Interview

After a two-week period of non-exposure to the L2 syntax, the participants returned and completed a second GJT on SuperLab 5. The testing sentences (see Appendix B) and the format were the same as in Phase 4. That is, participants selected which items they believed were grammatical or ungrammatical based upon what they had heard and repeated during the incidental exposure period. After each response, participants reported their basis of judgment using one of the four source attributions listed in Table 5. After completing the delayed posttest,

students participated in a debriefing interview (see Appendix C) focused on the following requests: (a) verbalize any grammar patterns or regularities possibly discerned over the course of the experiment, and (b) describe any effects to performance from the film clips or images. I recorded the discussions on an Olympus VN-8100PC digital voice recorder and transcribed the responses at a later date. The completion time for Phase 5 was 25 minutes.

2.5 Analysis

The following three parts provide a general outline of the analytical processes used to answer each RQ. Based on the amount and variety of data examined, I provide a more in-depth account of these analyses alongside my findings within the Results chapter.

2.5.1 Analysis of Emotional Induction

To start, I tested whether the induction material used for this experiment succeeded in generating the appropriate mood changes for participants within the three treatment groups. To validate these effects, I analyzed valence and arousal from SAM data at four collection points throughout the study (i.e., *Start*, *Post Initial Induction*, *Post Exposure*, and *End*). Because the data were not normally distributed, I used non-parametric Kruskal-Wallis tests to assess emotionality differences between groups at the four self-assessment points and I used Friedman's ANOVAs to examine within-group changes over time. To add a qualitative dimension, I also included data and participant excerpts from retrospective debriefing interviews that discussed the effects of emotional stimuli throughout the exposure phase.

2.5.2 Analysis of RQ1

RQ1 focused on the role of emotion in the learning and retention of a novel grammar structure. I answered this RQ by examining two different parts of the study: (a) the exposure phase (i.e., elicited imitations and plausibility judgments) and (b) the testing phase (i.e.,

immediate and delayed GJTs). For the first portion, successful navigation of the exposure phase was a likely indicator of higher scores on the GJT (see Rebuschat & Williams, 2012). The presence of emotional induction, however, needed to be considered as a possible distraction to overall learning and knowledge retention (Tobias, 1986). To measure any affective impacts in these regards, I analyzed both the elicited imitations and the plausibility judgments for each experimental group.

For the elicited imitations, I awarded one point for every correct verb placement within a clause (note that VF-V1 and V2-VF have two clauses per item), for a total possible score of 200. Descriptive statistics provided accuracy rates for (a) total items, (b) plausible and implausible items, and (c) verb patterns, for each group. Due to non-normal distributions in the data, I used Kruskal-Wallis testing to compare between-group differences among the four abovementioned variables. Lastly, I divided the entire exposure set into 24 chronological stages (5 repetitions per stage) to measure within-group accuracy over time and to determine any impacts from emotional induction. I repeated this analysis for each of the three target structures individually, apportioning 20 chronological stages per verb pattern (2 repetitions per stage). With the plausibility judgments, I utilized descriptive statistics to gauge accuracy ratings among the groups for total items and plausible/implausible items. Non-parametric testing compared performances between the groups in each of the three categories.

Next, I analyzed participants' immediate and delayed GJT scores. Here, one point was awarded for each correct response (either a correct endorsement of a grammatical item or a correct rejection of an ungrammatical item) for a total possible score of 60. I then converted these scores to an overall accuracy rating. In order to examine whether participants from each experimental group *learned* the L2 syntax, I compared the mean immediate GJT accuracy rates

with chance (50%) using one-samples *t* tests. I also measured between-group differences with a one-way ANOVA. Second, I converted participants' GJT scores into *d* prime scores (see MacMillan & Creelman, 2005). *D* prime values account for the difference between *hit rates* (i.e., correctly endorsed grammatical sentences) and *false alarms* (i.e., incorrectly endorsed ungrammatical sentences) and help to gauge participants' response biases. Positive *d* prime scores suggest good discrimination among the two items, with a higher tendency to endorse grammatical sentences. Negative *d* prime values, however, indicate a bias towards endorsing ungrammatical items. A score of zero reveals an inability to distinguish between the sentence types. I compared these values both to chance (zero) and with between-group analysis. Third, I evaluated the endorsement ratings for all grammatical and ungrammatical verb patterns tested in the GJT to gauge group performance. To examine whether participants from each experimental group *retained* their knowledge of the L2 syntax over time (two weeks), I executed the same analyses with the delayed GJT results as described for the immediate GJT scores. Lastly, I assessed the relationship between the two GJT performances using Pearson correlations and mixed-design ANOVAs.

2.5.3 Analysis of RQ2

The second research question centered on the ability of individuals in positive, negative, or neutral mood states to acquire an L2 syntax implicitly. For this inquiry, I first checked whether mood influenced participants' propensity to select the four different source attribution categories: *guess*, *intuition*, *recollection*, or *rule knowledge*. I consolidated these attributions further (see Dienes & Scott, 2005), combining *guess* and *intuition* to represent the presence of unconscious (implicit) structural knowledge, and *recollection* and *rule knowledge* for conscious (explicit) structural knowledge. Next, I compared the accuracy ratings of the two source

attributions with chance performance. Accuracy ratings significantly above 50% would signal the successful formation of either implicit or explicit knowledge (or a combination of both types) of the L2 syntax. In order to examine the individual verb patterns more specifically, I performed binomial logistic regression using Generalized Estimating Equations (GEE) to model the odds of selecting an explicit category over an implicit one. For each variable, a significant Wald chi-square value ($p < .05$) for the intercept specified a reliance on explicit knowledge by the reference group (i.e., Comparison group). Regression coefficients for the different treatment groups indicated how participants' reliance on explicit knowledge changed as a result of a mood induction, with positive values signaling greater use of explicit knowledge and negative values suggesting a shift towards implicit knowledge. The analysis also supplied an odds ratio value (*Exp*(*B*)). According to Field (2013), an odds ratio greater than 1 means that as the predictor increases, so too do the odds of the outcome occurring. The converse relationship occurs if the value is less than 1. Finally, I provided excerpts and analyses from post-experiment verbal reports to examine if participants from any group had consciously recognized or established grammatical rules for the target syntax during incidental exposure. An ability to formulate grammatical patterns or regularities would indicate explicit knowledge acquisition, whereas an inability to do so would suggest a lack of evidence for explicit knowledge.

2.5.4 Analysis of RQ3

For the final research question, I examined whether connections existed between individual differences (i.e., openness, intuition, EI, FLA, and impulsivity) and L2 performance within the context of positive, negative, and neutral emotional states. I conducted this investigation in two parts. First, I performed an exploratory factor analysis on participants' subjective ratings from five different personality questionnaires to identify the most relevant

constructs in each questionnaire. Subsequently, I examined these factors, along with corresponding interaction terms, in a linear regression model to determine which explanatory variables contributed to overall accuracy rates on the immediate GJT. I chose the immediate posttest as the dependent variable, rather than the delayed posttest, because of its proximity to the emotional induction. Based on moderation analysis from the linear regression model, I identified four significant interactions. To examine these interactions further, I graphed the immediate GJT performances by participants' self-reported factor (or, trait). For each group, participants were divided into categories of low (< mean -1SD), average (mean ±1SD), and high (> mean +1SD) trait levels. After performing within-sub categorical comparisons, I correlated group trait levels with related source attribution data to ascertain any possible relationships between the two variables.

CHAPTER 3

RESULTS

Within this chapter, I have organized the results based upon the three research questions for my study. I first examined the effectiveness of my emotional stimuli and their ability to alter participants' mood states within the Positive, Negative, and Neutral groups. Secondly, I investigated the role of affect in an incidental learning task, with a focus on the learning and retention of an L2 syntax. Next, I looked at GJT accuracy for different source attribution categories to measure whether participants could acquire an L2 syntax implicitly. Lastly, I described the relationship between individual differences and learning performance from a hot cognitive perspective.

3.1 Emotional Induction

3.1.1 Valence

I examined valence data first, and the descriptive statistics are found in Table 7. According to the initial SAM ratings, participants from all groups began the experiment at a similar affective state. However, Friedman's tests revealed significant emotional changes for all groups over the course of the study. Figure 4 graphically depicts these various fluctuations.

Table 7

Descriptive Statistics and Results of Friedman's Testing for Valence Ratings

Group	*N*[c]	Start[a] *M (SD)* 95% CI	Post Initial Induction *M (SD)* 95% CI	Post Exposure[b] *M (SD)* 95% CI	End *M (SD)* 95% CI	Change from *Start* to *End* $\chi^2(3)$	*p*
Comparison	30	7.30 (1.09) (6.89, 7.71)	7.57 (0.94) (7.22, 7.92)	6.70 (1.29) (6.22, 7.18)	5.97 (1.67) (5.34, 6.59)	29.46	<.001
Positive	29	6.83 (1.17) (6.38, 7.27)	6.14 (1.48) (5.57, 6.70)	5.79 (1.50) (5.22, 6.36)	5.72 (1.28) (5.24, 6.21)	20.72	<.001
Negative	30	6.80 (1.40) (6.28, 7.32)	3.40 (1.55) (2.82, 3.98)	3.07 (1.74) (2.42, 3.72)	4.87 (1.36) (4.36, 5.37)	65.12	<.001
Neutral	30	6.80 (1.24) (6.34, 7.26)	6.47 (1.28) (5.99, 6.94)	5.87 (1.66) (5.25, 6.48)	6.03 (1.45) (5.49, 6.57)	20.15	<.001

Note. The scale for the valence ratings is 1 (low valence) to 9 (high valence). During the primary induction period (i.e., *Start* through *Post Exposure*), changes in mean valence ratings (ΔM) by gender are as follows: Comparison group: male, ΔM = -0.33, female, ΔM = -0.72; Positive group: male, ΔM = -0.75, female, ΔM = -1.14; Negative group: male, ΔM = -3.22, female, ΔM = -3.95; Neutral group: male, ΔM = -0.80, female, ΔM = -1.00.

[a] Kruskal-Wallis testing revealed no differences between groups, $H(3) = 4.26$, $p = .235$.

[b] Accounts for both the induction during incidental exposure and the post-exposure, secondary emotional induction period.

[c] One participant was removed from the Positive group due to incomplete data.

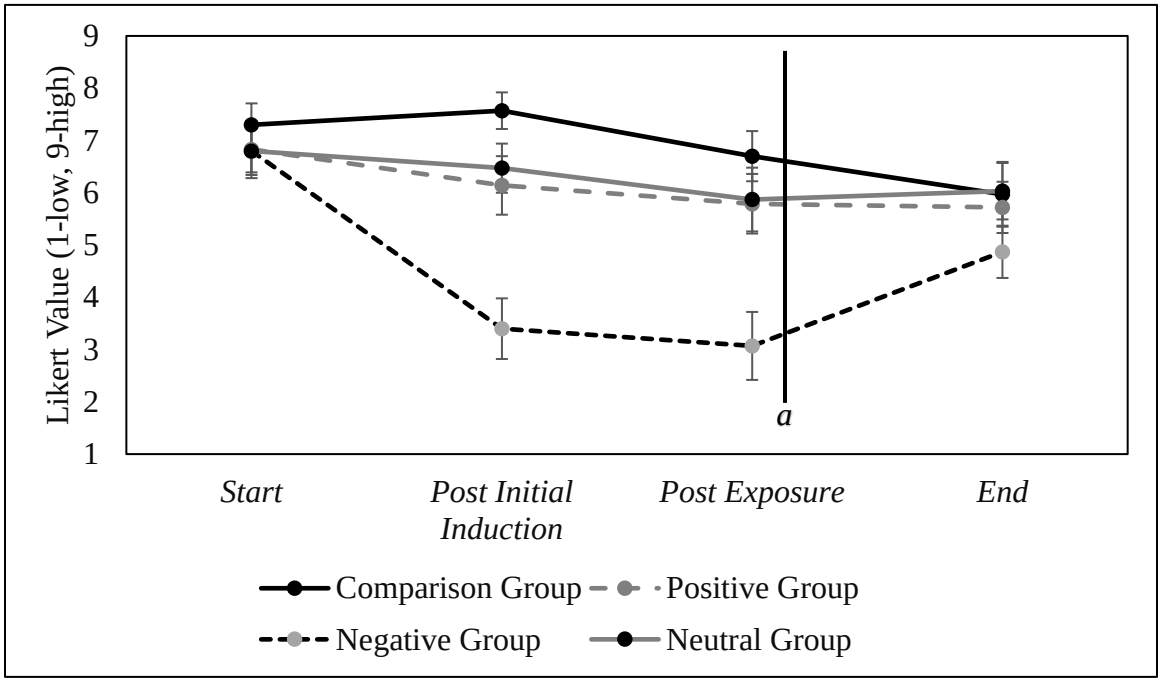

Figure 4. *Valence ratings for each group over the course of the experiment*. Here, *a* denotes the start of the immediate posttest. Error bars represent the 95% confidence intervals for each mean value.

For post-hoc analysis, I used Wilcoxon signed-rank tests, with $\alpha = .004$ to adjust for multiple testing. These results are listed in Table 8. For the Comparison group, no significant changes were recorded between *Start* and *Post Initial Induction* (which, for this group, consisted of surfing the internet for six minutes). However, a significant decrease in valence occurred between *Post Initial Induction* and *Post Exposure*, indicating a more unpleasant state prior to the immediate posttest. This drop likely resulted from experimental fatigue. After this point, the participants' mood remained stable through the completion of the study. Individuals from the Positive group recorded no significant changes in mood between any of the data collection points, suggesting that the film clips and images helped to sustain a consistent emotionality throughout the experiment. Interestingly, the positive induction material did not elevate participants' valence levels at any point in the study, demonstrating an overall lack of effectiveness in this regard. Participants in the Negative group measured a significant decrease in mood from *Start* to *Post Initial Induction*, which remained steady through *Post Exposure*. Here, the induction material successfully depressed valence levels over multiple SAM points and led to a generally sad or unpleasant emotional status both during incidental exposure and prior to the immediate posttest. Valence ratings sharply increased by the end of the experiment, indicating a significant recovery in mood. Lastly, participants from the Neutral group behaved similarly to those from the Comparison group, registering a significant drop in emotionality only between *Post Initial Induction* and *Post Exposure*. These results suggest that the neutral induction material performed as expected and did not function to alleviate experimental fatigue.

Table 8
Results of Wilcoxon Signed-Ranks Testing between Valence Ratings

		Start* to *Post Initial Induction	***Post Initial Induction* to *Post Exposure***	***Post Exposure* to *End***
Group	***N***	***z*** ***r***	***z*** ***r***	***z*** ***r***
Comparison	30	1.64 .17	-3.00** -.32	-2.73 -.29
Positive	29	-2.59 -.27	-1.47 -.16	-0.29 -.03
Negative	30	-4.64** -.49	-1.58 -.17	4.20** .44
Neutral	30	-1.82 -.19	-2.88* -.30	1.17 .12

*p = .004; **p <.004

3.1.2 Arousal

I evaluated the arousal data using a similar analysis, for which the descriptive statistics are in Table 9. Initial SAM data again indicated that participants from all groups began the experiment at comparable levels. Friedman's testing showed significant changes in arousal levels throughout the experiment only for the Comparison, Positive, and Negative groups. Figure 5 provides a graphical representation of this data set.

Table 9

Descriptive Statistics and Results of Friedman's Testing for Arousal Ratings

Group	*N*	Start[a] *M* (*SD*) 95% CI	Post Initial Induction *M* (*SD*) 95% CI	Post Exposure[b] *M* (*SD*) 95% CI	End *M* (*SD*) 95% CI	Change from *Start* to *End* $\chi^2(3)$	*p*
Comparison	30	3.40 (1.59) (2.81, 3.99)	3.53 (1.91) (2.82, 4.25)	4.23 (2.27) (3.39, 5.08)	3.87 (2.11) (3.08, 4.66)	8.23	.041
Positive	30	3.93 (2.07) (3.16, 4.71)	4.93 (2.02) (4.18, 5.69)	4.83 (2.07) (4.06, 5.61)	3.33 (1.67) (2.71, 3.96)	17.89	<.001
Negative	30	3.13 (1.85) (2.44, 3.82)	5.33 (2.54) (4.39, 6.28)	5.67 (2.68) (4.67, 6.67)	3.87 (1.94) (3.14, 4.59)	41.18	<.001
Neutral	30	3.27 (1.72) (2.62, 3.91)	3.43 (1.72) (2.79, 4.07)	3.90 (2.30) (3.04, 4.76)	3.60 (1.77) (2.94, 4.26)	3.66	.301

Note. The scale for the arousal ratings is 1 (low arousal) to 9 (high arousal). During the primary induction period (i.e., *Start* through *Post Exposure*), changes in mean arousal ratings (ΔM) by gender are as follows: Comparison group: male, ΔM = 0.67, female, ΔM = 0.90; Positive group: male, ΔM = 1.77, female, ΔM = 0.52; Negative group: male, ΔM = 1.66, female, ΔM = 2.91; Neutral group: male, ΔM = 1.80, female, ΔM = 0.05.

[a] Kruskal-Wallis testing revealed no differences between groups, $H(3) = 2.50$, $p = .475$.

[b] Accounts for both the induction during incidental exposure and the post-exposure, secondary emotional induction period.

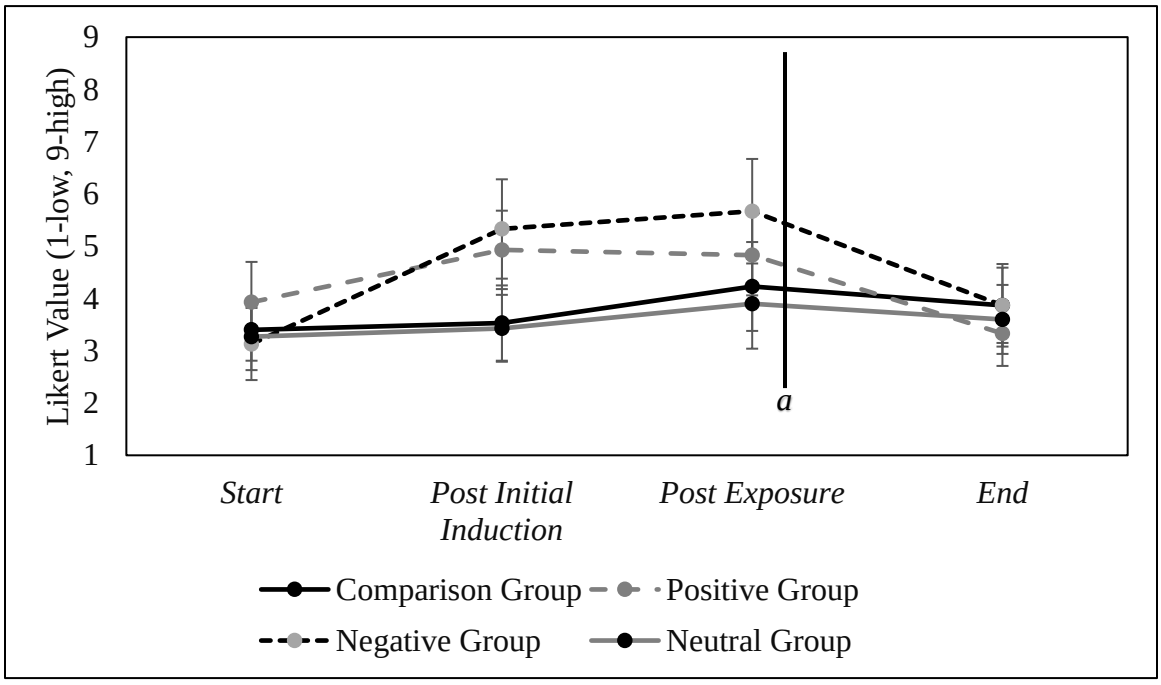

Figure 5. Arousal ratings for each group over the length of the experiment. Here, *a* denotes the start of the immediate posttest. Error bars represent the 95% confidence intervals for each mean value.

Table 10 displays the results from post-hoc analysis with the Bonferroni correction (α = .006). As expected, participants from the Comparison group indicated no fluctuations in their arousal between any of the SAM data points. For the Positive group, participants only demonstrated a significant change to arousal between *Post Exposure* and the end of the experiment, which measured as a decrease. This suggests that the positive induction material failed to function as a stimulator, leaving those from the Positive group reportedly unaroused throughout the incidental exposure. Conversely, participants from the Negative group showed a significant increase in arousal from *Start* through the *Post Initial Induction*, which remained stable prior to the immediate posttest. This rise in arousal levels again confirmed the efficacy of the negative treatment. Subsequently, individuals from the Negative group significantly recovered from their agitated state prior to the end of the experiment.

Table 10
Results of Wilcoxon Signed-Ranks Testing between Arousal Ratings

		Start* to *Post Initial Induction	***Post Initial Induction* to *Post Exposure***	***Post Exposure* to *End***
		z	***z***	***z***
Group	***N***	***r***	***r***	***r***
Comparison	30	.64	2.22	-1.44
		.07	.23	-.15
Positive	30	2.11	-.51	-3.47**
		.22	-.05	-.37
Negative	30	3.95**	1.84	-3.69**
		.42	.19	-.39
Neutral	30	.35	1.92	-.68
		.04	.20	-.07

*p = .006; **p <.006

3.1.3 Qualitative Data

At the completion of the experiment, I conducted retrospective interviews with participants from the three treatment groups regarding possible impacts from the film clips and

images. The specific questions were: (a) "Do you think that the film clips or images affected your performance in any of the experimental tasks?" and (b) "How did the content of the film clips and images make you feel during the experiment?" I present the results for each treatment group within the following sections. Transcriptions of these reports can be found in Appendix J.

3.1.3.1 Positive Group

Within the Positive group (n = 30), 24% of participants reported experiencing a *definite effect* from the emotional stimuli, while 43% felt *some effect* and 33% reported *no effect*. 60% of individuals found the film clips and images distracting from the exposure task, using qualifying terms and phrases such as "annoying" (105), "kind of strange" (108), and "it threw me off" (123). No one described their emotional state as "positive" during the induction and only two participants found the stimuli "arousing" (both males). Three participants (all females) claimed that the induction material made them feel uncomfortable, with one commenting that "it's pretty much like porn and I kind of think porn is gross" (114). These findings, in conjunction with SAM data, suggest that the emotional stimuli did not positively alter valence levels (although it did sustain them) nor increase arousal rates for participants within this group.

3.1.3.2 Negative Group

For the Negative group (n = 28; two did not return for the second session), 57% of the participants experienced a *definite effect* from the film clips and images, while 25% claimed *some effect*. Only 18% felt *no effect*. 75% of individuals described the stimuli as a distraction from learning. For example, one participant remarked that, "when they [images] would pop up, I would forget almost instantly what was just read to me" (213). 57% experienced some type of negative emotion during the induction, which included feeling "nervous" (201), "uncomfortable" (217), and "scrambled" (230). One individual claimed that the stimuli made her "sad and not

really that excited to do the task" (216). Two participants also directly felt "aroused" by the content (one male and one female). Interestingly, two participants (both females) thought that the material helped them to better remember sentences from the exposure set. Combined with SAM data, I concluded that the negative film clips and images successfully reduced valence levels and increased arousal rates for participants in this group.

3.1.3.3 Neutral Group

Within the Neutral group (n = 30), 38% of participants reported feeling *some effect* from the film clips and images. 62% experienced *no effect* and 0% claimed a *definite effect*. Only 28% felt that the stimuli were distracting. Eight participants found the induction material calming, with one individual commenting that "they were pretty relaxing, so it was kind of chill" (310). No one reported a change in their emotional state while watching the film clips or images. Finally, three individuals felt that the material helped them focus better during the exposure phase. These findings, along with the SAM data, confirmed that the treatment material maintained participants' valence and arousal rates at neutral levels, which were comparable to those from the Comparison group.

3.2 The Role of Emotion in the Learning and Retention of an L2 Syntax

The first RQ focused on the role of positive, negative, and neutral mood states in the learning and retention of an L2 syntax. Before analyzing results from the immediate and delayed grammaticality judgment measures, I first examined whether emotionality influenced group performance during the incidental exposure phase. Measured impacts found at this stage could offer insight into the relationship between affect and the ability to learn a new, L2 syntax (see Tobias, 1986). The following analyses address the two main tasks from this period: elicited imitations and plausibility judgments.

3.2.1 Exposure Phase

3.2.1.1 Elicited Imitations

As a component of the incidental exposure requirements, participants from all groups were afforded only one elicited imitation per sentence from the exposure set (or, 120 total). This allowed me to measure and compare any possible impacts from affect more directly on learners' ability to recall the syntax correctly. I awarded one point for every correct verb placement within a clause (for a maximum score of 200 points; see Section 2.5.3) and subsequently converted the scores into accuracy rates. Table 11 shows the descriptive statistics for the elicited imitation performance on total items, plausible/implausible items, and the three target verb placement patterns.

Table 11
Descriptive Statistics for Elicited Imitations

		Comparison Group (*n* = 30)	**Positive Group (*n* = 27)[a]**	**Negative Group (*n* = 30)**	**Neutral Group (*n* = 30)**
	no. items	***M (SD)*** **95% CI**	***M (SD)*** **95% CI**	***M (SD)*** **95% CI**	***M (SD)*** **95% CI**
Total Items	120	91.35 (7.88) (88.41, 94.29)	88.11 (11.44) (83.59, 92.64)	88.67 (8.25) (85.59, 91.75)	87.78 (11.58) (83.46, 92.11)
Plausible Items	60	91.07 (8.98) (87.71, 94.42)	88.74 (11.59) (84.16, 93.33)	88.47 (9.49) (84.92, 92.01)	88.13 (12.04) (83.64, 92.63)
Implausible Items	60	91.63 (7.52) (88.82, 94.44)	87.48 (11.58) (82.90, 92.06)	89.20 (7.49) (86.41, 92.00)	87.43 (11.67) (83.08, 91.79)
V2 Pattern	40	94.42 (5.90) (92.22, 96.62)	89.35 (15.36) (83.28, 95.43)	94.17 (7.17) (91.49, 96.85)	90.00 (13.36) (85.01, 94.99)
VF-V1 Pattern	40	85.94 (13.94) (80.74, 91.14)	82.39 (17.67) (75.40, 89.38)	81.32 (13.16) (76.41, 86.24)	80.52 (18.48) (73.62, 87.42)
V2-VF Pattern	40	95.27 (4.89) (93.44, 97.10)	93.28 (6.58) (90.67, 95.88)	93.32 (6.21) (91.00, 95.64)	93.98 (7.17) (91.30, 96.65)

Note. The scores, rated on a scale of 0-100%, indicate the repetition accuracy of correctly placed verb patterns from the clauses in the exposure set.
[a] Due to equipment malfunction, recordings from three participants were incomplete and their data were excluded from this analysis.

Overall, the Comparison group achieved the highest levels of accuracy with elicited imitations, outperforming the treatment groups on all measures. This group also recorded the lowest overall standard deviations from the mean value in each category. Larger standard deviations within the treatment groups suggest that the emotional stimuli may have affected individuals differently during this task, potentially helping some and disadvantaging others. Further analysis using Kruskal-Wallis testing, however, revealed no significant differences between the groups in terms of total performance, $H(3) = 2.30$, $p = .513$, or performance in any of the three verb placement patterns of: V2, $H(3) = 3.42$, $p = .331$; VF-V1, $H(3) = 2.00$, $p = .394$; or V2-VF, $H(3) = 2.32$, $p = .508$. The four groups performed equally on both the plausible sentences, $H(3) = 1.95$, $p = .583$, and implausible sentences, $H(3) = 2.72$, $p = .437$. Finally, all groups exhibited similarly higher accuracy levels while repeating the V2 and V2-VF verb patterns. I attribute lower accuracies for the VF-V1 verb pattern to longer average sentence length and greater syntactic complexity.

In addition to comparing between-group performance, I also analyzed within-group elicited imitation performance for all 120 sentences from the exposure set. Figure 6 graphically depicts the groups' repetition accuracies of this entire set, divided into 24 chronological stages. Friedman's testing indicated no significant differences in performance accuracy for the Comparison group, $\chi^2(23) = 25.16$, $p = .342$, and Neutral group, $\chi^2(23) = 19.76$, $p = .657$, throughout the experiment. Near-significant differences, however, were recorded for the Positive group, $\chi^2(23) = 34.25$, $p = .062$, and Negative group, $\chi^2(23) = 34.22$, $p = .062$. These findings suggest that participants in the neutral conditions exhibited a generally stable performance overall, whereas participants exposed to positive or negative stimuli performed somewhat erratically over time.

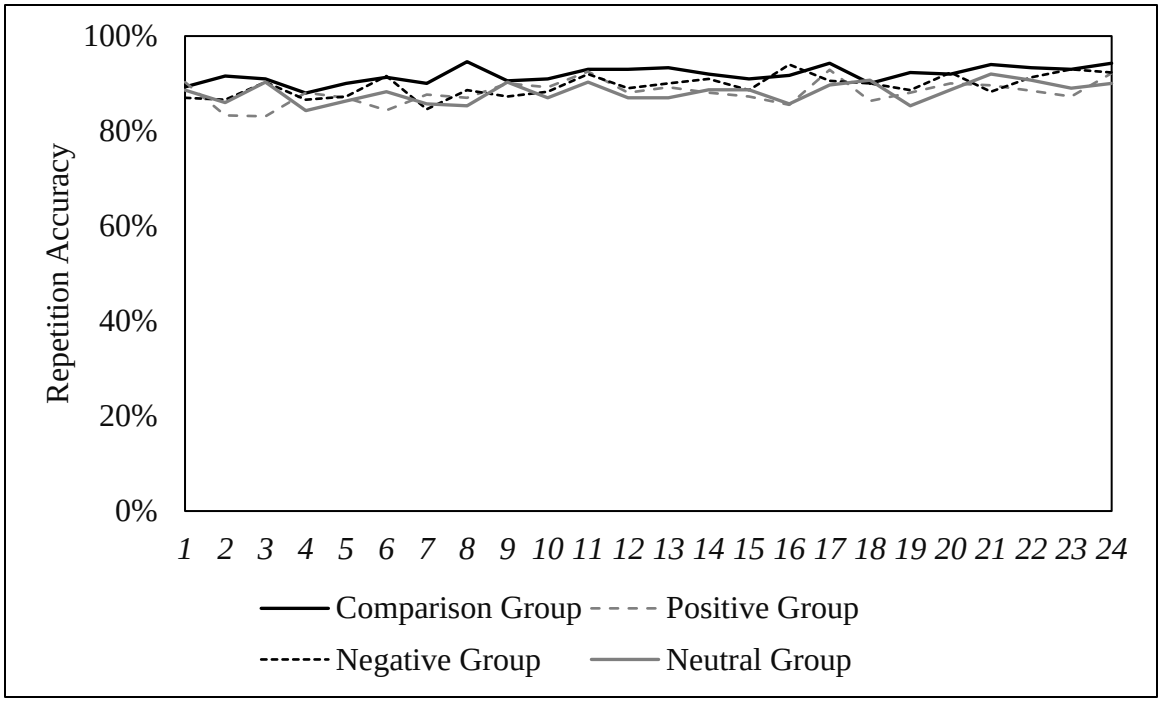

Figure 6. Repetition accuracy of the correct verb forms for all 120 sentences from the exposure set across 24 chronological stages. Each stage represents the mean accuracy score of five sentences.

Next, I analyzed elicited imitation performance for the three verb patterns separately. These data were all measured over 20 chronological stages. Figure 7 illustrates the results for the V2 verb pattern. Friedman's testing indicated no significant changes in performance for any group, with the results of this analysis as follows: Comparison group, $\chi^2(19) = 19.83$, $p = .405$; Positive group, $\chi^2(19) = 23.74$, $p = .206$; Negative group, $\chi^2(19) = 25.54$, $p = .144$; Neutral group, $\chi^2(19) = 9.18$, $p = .970$. Here, all groups maintained a high level of consistency while eliciting the V2 verb pattern with no signs of interference from the emotional induction.

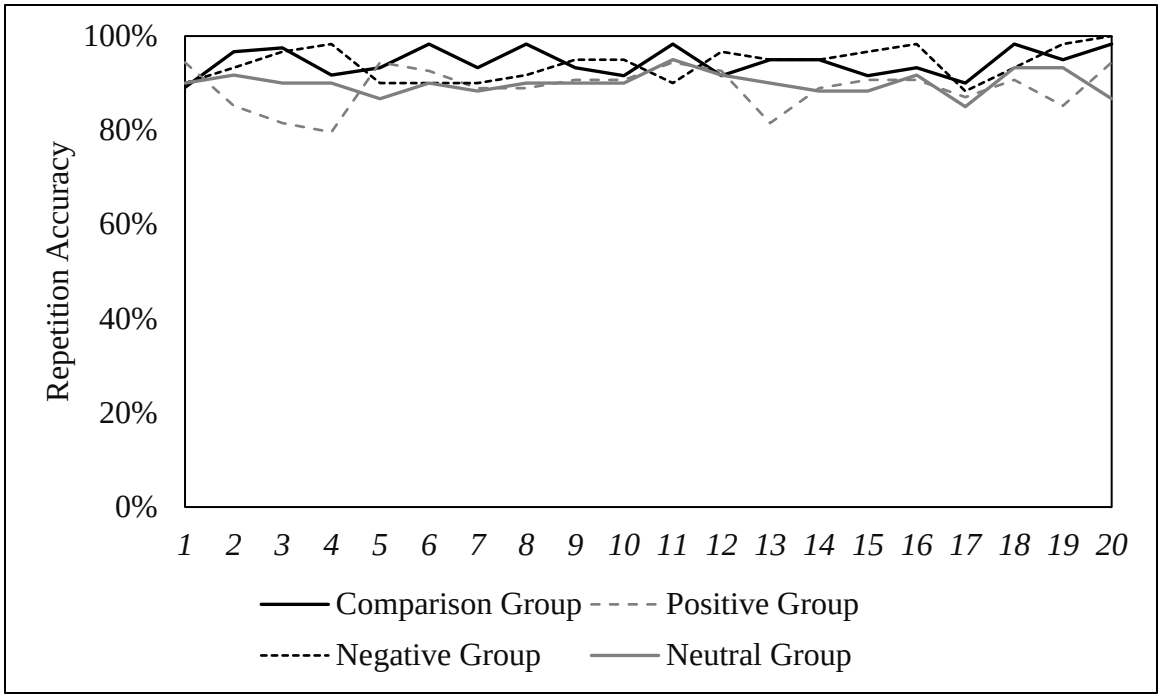

Figure 7. Repetition accuracy of the V2 verb pattern for all 40 sentences from the exposure set across 20 chronological stages. Each stage represents the mean accuracy score of two sentences.

For the VF-V1 verb pattern (Figure 8), I found no significant differences across the chronological stages for the Comparison group, $\chi^2(19) = 27.31$, $p = .098$, Positive group, $\chi^2(19) = 19.15$, $p = .447$, or Neutral group, $\chi^2(19) = 15.75$, $p = .674$. Although this verb pattern was the most difficult to reproduce (per mean accuracy scores), participants from the three groups still performed uniformly over time. Conversely, the Negative group, $\chi^2(19) = 42.09$, $p = .002$, registered inconsistencies in performance that were significant across time. The results suggest that exposure to negative stimuli hindered the processing and repetition of the most complex grammatical structure from the L2 system.

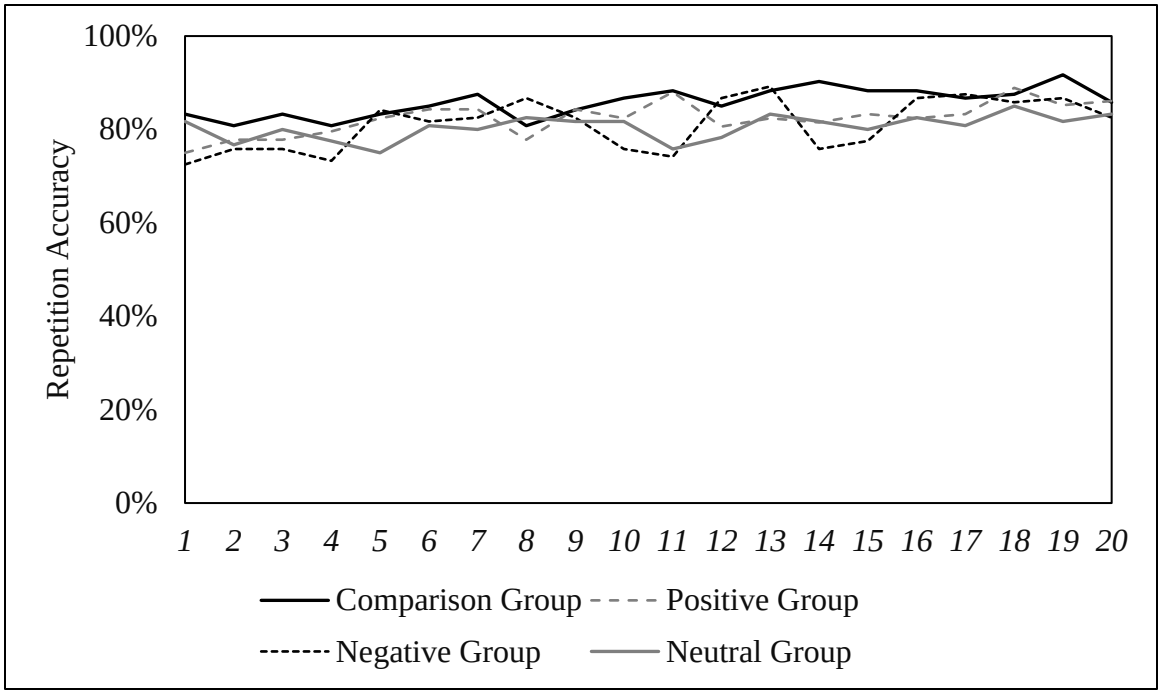

Figure 8. Repetition accuracy of the VF-V1 verb pattern for all 40 sentences from the exposure set across 20 chronological stages. Each stage represents the mean accuracy score of two sentences.

Lastly, Friedman's testing of the V2-VF verb pattern (Figure 9) indicated no significant differences in performance over the 20 stages for any group. The results were: Comparison group, $\chi^2(19) = 25.85$, $p = .134$; Positive group, $\chi^2(19) = 18.46$, $p = .492$; Negative group, $\chi^2(19) = 21.74$, $p = .298$; Neutral group, $\chi^2(19) = 27.50$, $p = .094$. As with the V2 form, which shared almost equally high rates of elicitation accuracy (see Table 11), there appeared to be no detrimental effects from the emotional induction.

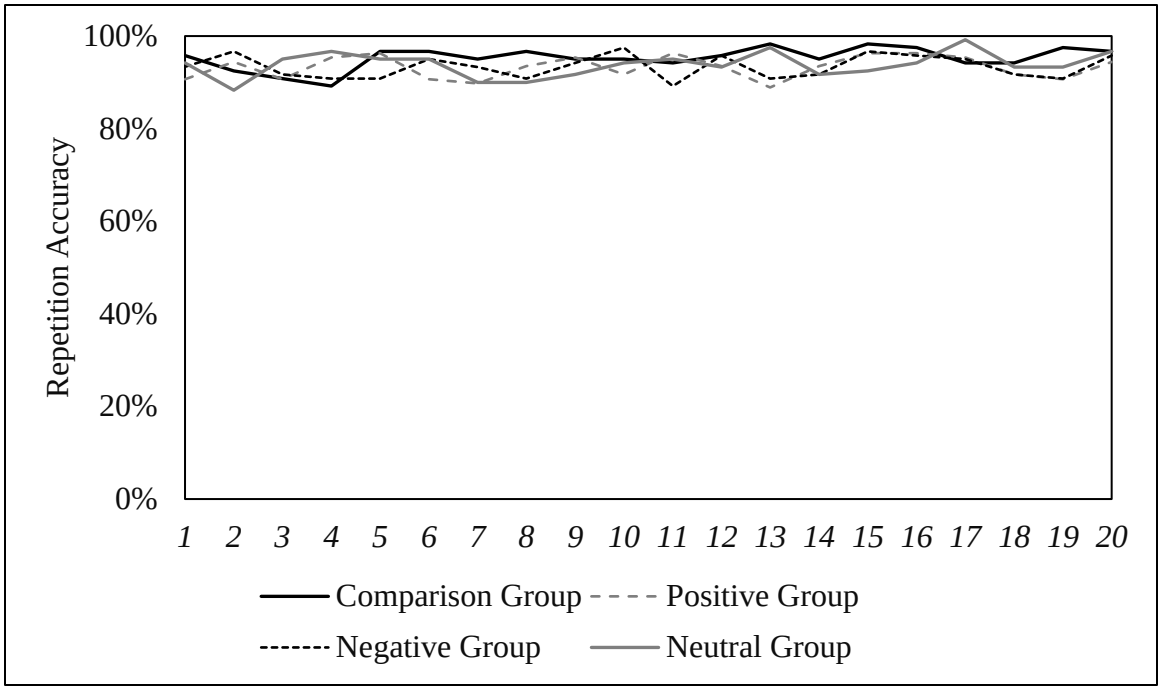

Figure 9. Repetition accuracy of the V2-VF verb pattern for all 40 sentences from the exposure set across 20 chronological stages. Each stage represents the mean accuracy score of two sentences.

3.2.1.2 Plausibility Judgments

The second task from the incidental exposure phase required participants to correctly rate sentences from the exposure set as either plausible or implausible. The descriptive statistics in Table 12 indicated that the Comparison and Positive groups scored the highest on this activity. Kruskal-Wallis testing, however, revealed no significant between-group differences in performance for total sentences, $H(3) = 4.39$, $p = .222$, or for the separate plausible, $H(3) = 4.21$, $p = .240$, and implausible items, $H(3) = 4.21$, $p = .240$. These findings suggest that all participants performed with equal accuracy, with no measured impacts from the emotional stimuli. Wilcoxon signed ranks testing showed that the Comparison group, $z = -0.38$, $p = .706$, $r = -.05$, Negative group, $z = -0.29$, $p = .776$, $r = -.04$, and Neutral group, $z = -0.51$, $p = .611$, $r = -.07$, displayed similar accuracy rates among both the plausible and implausible sentences. The

Positive group, z = -2.56, p = .010, r = -.49, was significantly better at categorizing implausible sentences than plausible ones.

Table 12
Descriptive Statistics for Plausibility Judgements

	Comparison Group (n = 27)[a]	**Positive Group (n = 27)[b]**	**Negative Group (n = 30)**	**Neutral Group (n = 30)**
	M (SD) **95% CI**	***M (SD)*** **95% CI**	***M (SD)*** **95% CI**	***M (SD)*** **95% CI**
Total Items	90.78 (8.19) (87.54, 94.02)	91.08 (6.33) (88.58, 93.59)	88.92 (7.24) (86.21, 91.62)	87.08 (9.76) (83.43, 90.73)
Plausible Items	90.98 (14.00) (85.45, 96.52)	87.28 (13.08) (82.11, 92.45)	88.89 (10.83) (84.84, 92.93)	84.39 (20.28) (76.82, 91.96)
Implausible Items	90.55 (10.50) (86.40, 94.71)	94.87 (4.06) (93.27, 96.48)	88.94 (10.71) (84.94, 92.94)	89.78 (10.09) (86.02, 93.55)

Note. The scores, rated on a scale of 0-100%, indicate the accuracy of correctly identifying sentences in the exposure set as either plausible or implausible.
[a] Scores were removed for three participants that achieved less than 50% accuracy on either the plausible or implausible judgements. Here, the individuals likely overemphasized the elicited imitation task at the expense of the plausibility judgment task.
[b] Due to equipment malfunction, plausibility judgements from three participants were incomplete and their data were excluded from this analysis.

3.2.2 Testing Phase

In order to determine if positive, negative, or neutral mood states affected the learning and retention of an L2 syntax, I analyzed data from both the immediate and two-week delayed GJTs. The first section addresses whether participants *learned* the syntax (i.e., immediate posttest) and the second section focuses on the *retention* and *consolidation* of that knowledge (i.e., delayed posttest). The final section examines the relationship in performance over time between the two testing periods.

3.2.2.1 Overall Performance, Immediate Grammaticality Judgments

Based upon the descriptive statistics from the immediate grammaticality judgment posttest (see Table 13), participants within the Positive, Negative, and Neutral groups performed

at higher accuracy rates than those from the Comparison group. Higher standard deviations within the Positive and Negative treatment groups (over 1.5 times greater than the Comparison group) suggest that the mood induction may have affected participants differently in these groups. Further analysis, using one-sample *t* tests, revealed that all groups performed significantly better than chance. I also measured no differences between the four groups in terms of overall accuracy, Welch's $F(3, 62.44) = 1.14$, $p = .339$, $\omega^2 = 0.00$. This means that participants generally showed a learning effect towards the L2 syntax immediately after exposure, despite the presence of emotional influencers.

Table 13
Grammaticality Judgement Accuracies, Immediate Posttest

				Mean Difference from Chance (50%)		
Group	***N***	***M* (*SD*)**	**95% CI**	***t***	***p***	***r***
Comparison	30	52.45 (4.21)	(50.88, 54.02)	3.19	.003	.51
Positive	30	54.94 (7.23)	(52.24, 57.64)	3.74	.001	.57
Negative	30	54.45 (7.32)	(51.71, 57.18)	3.33	.002	.53
Neutral	29	53.39 (4.81)	(51.56, 55.22)	3.80	.001	.58

Note. The scores, rated on a scale of 0-100%, indicate the accuracy of correctly identifying sentences in the testing set as either grammatical or ungrammatical. Scores ±3 standard deviations were removed prior to analysis.

Next, I analyzed how each group performed over the course of the immediate posttest. Figure 10 graphically displays the groups' scoring performance over ten chronological stages. Results from one-factor, repeated measures ANOVAs (with sphericity assumed), indicated no learning effects throughout the posttest for the Comparison group, $F(9, 261) = 0.71$, $p = .702$, $\eta_p^2 = .02$, Positive group, $F(9, 261) = 0.41$, $p = .929$, $\eta_p^2 = .01$, and Neutral group, $F(9, 252) = 0.58$, $p = .810$, $\eta_p^2 = .02$. The Negative group, however, did measure a significant learning effect, $F(9, 261) = 2.14$, $p = .027$, $\eta_p^2 = .07$, over time. According to Figure 10, the learning effect was

negative, meaning participants from this group performed better at the start of the grammaticality judgment task than at the end.

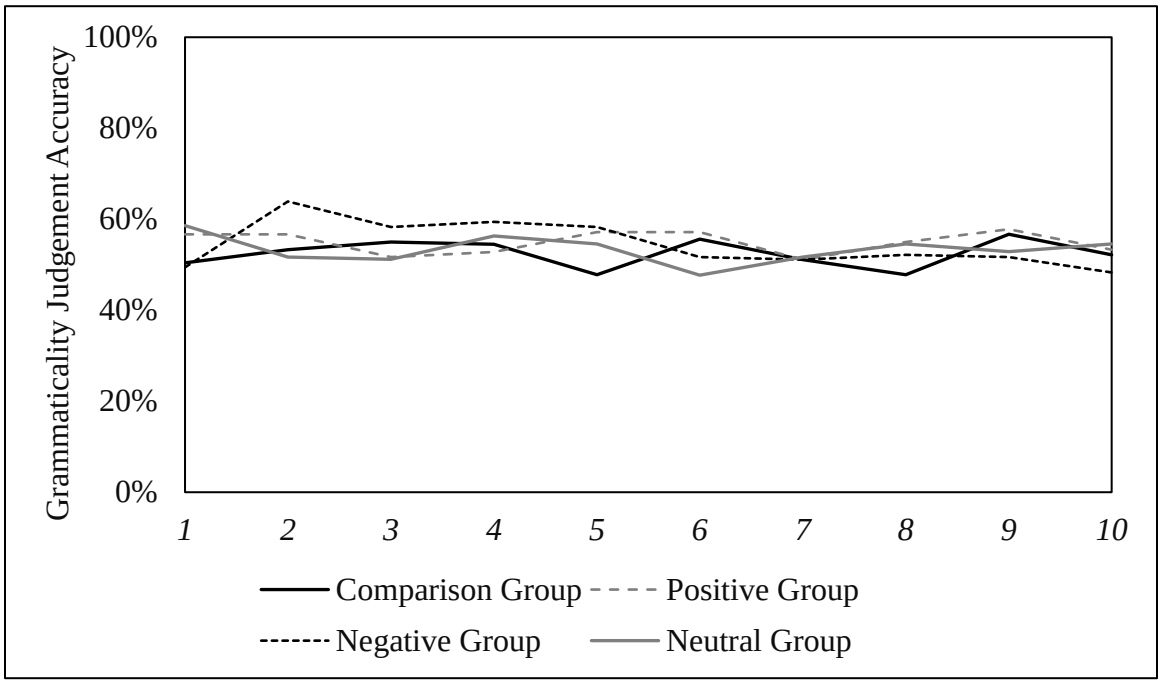

Figure 10. Grammaticality judgement accuracy for all 60 testing sentences across 10 chronological stages. Each stage represents the mean accuracy of six scores.

Thirdly, I converted the accuracy scores into *d* prime scores for each group to measure how well participants discriminated the grammatically correct sentences from the ungrammatical ones (see Figure 11). Table 14 shows that all groups achieved positive *d* prime scores. There were no significant differences between groups, Welch's $F(3, 62.15) = 1.27$, $p = .294$, $\omega^2 = 0.01$, although the three treatment groups recorded the highest performances. The four mean scores were also significantly above chance (zero). These results, especially in concert with the accuracy scores from Table 13, confirm that incidental exposure facilitated the learning of the L2 syntax, regardless of mood state.

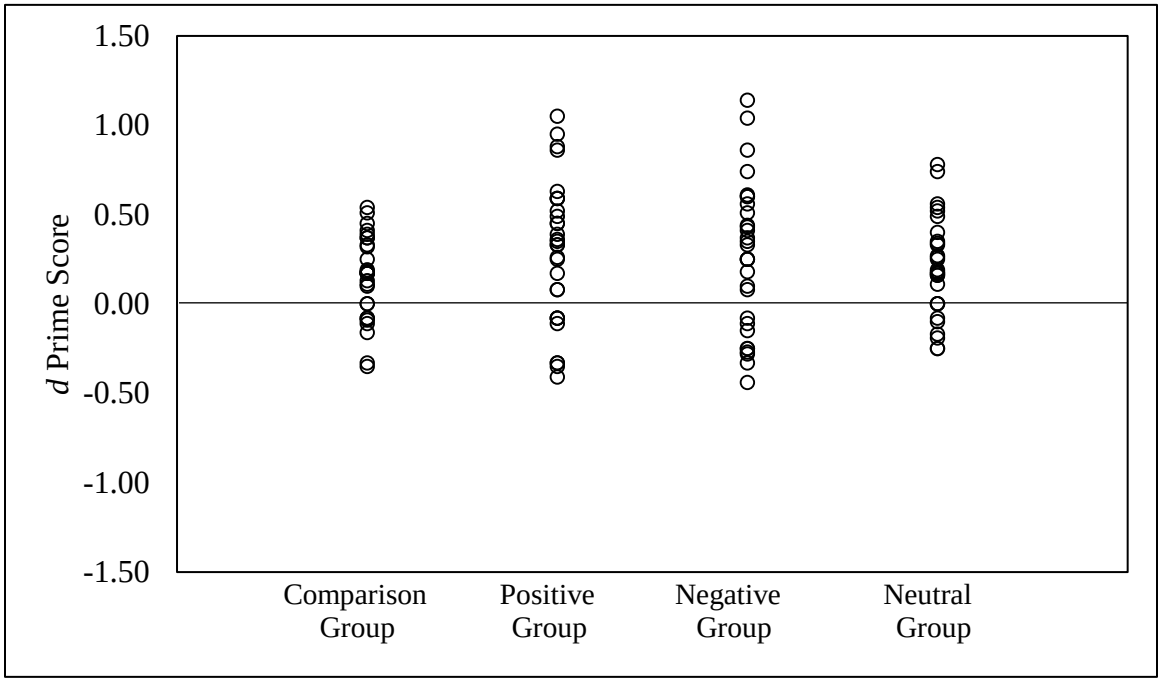

Figure 11. The d prime scores from the immediate grammaticality judgement posttest, with zero representing chance discrimination. Scores ±3 standard deviations were removed. One dot equals one participant.

Table 14
D Prime Scores for Grammaticality Judgement Task, Immediate Posttest

				Mean Difference from Zero		
Group	***N***	***M* (*SD*)**	**95% CI**	***t***	***p***	***r***
Comparison	29	0.15 (0.23)	(0.06, 0.24)	3.43	.002	.54
Positive	30	0.30 (0.40)	(0.15, 0.44)	4.08	<.001	.60
Negative	30	0.26 (0.42)	(0.11, 0.42)	3.50	.002	.54
Neutral	29	0.20 (0.28)	(0.10, 0.31)	3.96	<.001	.60

Note. Scores ±3 standard deviations were removed prior to analysis.

Lastly, I examined the endorsement ratings for each verb pattern presented in the GJT. For the three grammatical patterns, results from one-sample Wilcoxon signed rank testing indicated that all groups endorsed the V2-VF and VF-V1 grammatical verb patterns at rates significantly above chance, with all *p*s <.050. This was not the case for the grammatical V2 verb pattern, however, which was only endorsed at chance levels (all *p*s >.096). The finding is quite odd, considering that all groups achieved highly accurate elicited imitation rates of this structure

during the exposure phase. To further inspect this phenomenon, I equally divided the ten V2 sentences by their specific structure (i.e., those with a pre-verbal subject (SV) and those with a post-verbal subject (VS); see Tables 3 and 4 in Section 2.3 for examples). For balance, I also separated the V2-VF sentences in a similar manner (i.e., V2(SV)-VF and V2(VS)-VF). I then graphed the endorsement ratings for each of the eleven verb patterns, which are found in Figure 12. Descriptive statistics from Table 15 reveal that the four groups endorsed each verb pattern similarly. Kruskal-Wallis testing confirmed this assessment, finding no significant differences between groups for any syntactic structure, with all *p*s >.122, except for the trend in *V3, $H(3) = 6.95$, $p = .074$.

With respect to the grammatical structures, Wilcoxon signed rank testing indicated that the Comparison, Negative, and Neutral groups endorsed the V2(VS) verb pattern and all groups endorsed the V2(VS)-VF and VF-V1 verb patterns at rates significantly above chance. This was not the case for the grammatical V2(SV) and V2(SV)-VF verb patterns, though, which were only endorsed at chance levels or outright rejected as part of the new syntax. The findings point to a near-universal perception of post-verbal subject (VS) and VF structures as essential characteristics of the L2 grammatical system. This may also explain the high endorsement rates for the ungrammatical verb patterns of *V1 (apart from the Positive group), *VF, and *V1-VF, which all possess VS and VF components. However, as *V4 sentences were also highly endorsed, it appears that participants have not yet developed a complete knowledge of the role of verb placement within the L2 syntax.

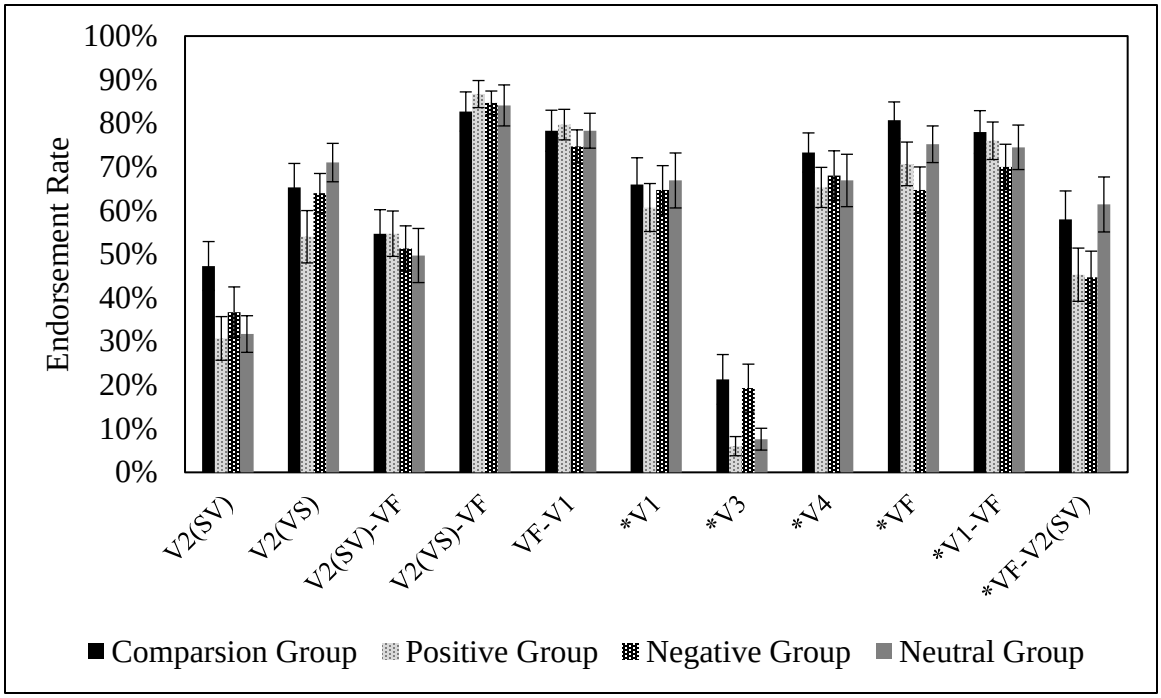

Figure 12. *Endorsement ratings for each verb pattern from the immediate GJT*. Ungrammatical verb patterns are marked with an asterisk. For the Comparison, Positive, and Negative groups, *n* = 30; for the Neutral group, *n* = 29. Error bars represent ±1 SEM.

Table 15
Descriptive Statistics and Accuracy of Verb Pattern Endorsement Ratings, Immediate Posttest

	Comparison Group (*n* = 30)	**Positive Group (*n* = 30)**	**Negative Group (*n* = 30)**	**Neutral Group (*n* = 29)**
	M (SD)	***M (SD)***	***M (SD)***	***M (SD)***
Verb Pattern	**95% CI**	**95% CI**	**95% CI**	**95% CI**
V2(SV)	47.33 (30.39)	30.67** (27.16)	36.67* (31.55)	31.74*** (22.37)
	(35.98, 58.68)	(20.53, 40.81)	(24.89, 48.45)	(23.21, 40.23)
V2(VS)	65.33* (30.14)	54.00 (32.86)	64.00** (24.86)	71.03*** (23.66)
	(54.08, 76.59)	(41.73, 66.27)	(54.72, 73.28)	(62.04, 80.03)
V2(SV)-VF	54.67 (30.14)	54.67 (28.25)	51.33 (28.62)	49.66 (33.22)
	(43.41, 65.92)	(44.12, 65.22)	(40.65, 62.02)	(37.02, 62.29)
V2(VS)-VF	82.67*** (24.49)	86.67*** (16.88)	84.67*** (14.56)	84.14*** (25.29)
	(73.52, 91.81)	(80.36, 92.97)	(79.23, 90.10)	(74.52, 93.76)
VF-V1	78.33*** (25.47)	79.67*** (19.21)	74.67*** (20.63)	78.28*** (21.72)
	(68.82, 87.85)	(72.50, 86.84)	(66.96, 82.37)	(70.01, 86.54)
*V1	66.00* (33.28)	60.67 (29.93)	64.67* (30.48)	66.90* (33.92)
	(53.57, 78.43)	(49.49, 71.85)	(53.28, 76.05)	(53.99, 79.80)
*V3	21.33*** (31.04)	6.00*** (11.92)	19.33*** (30.39)	7.59*** (13.54)
	(9.74, 32.93)	(1.55, 10.45)	(7.99, 30.68)	(2.44, 12.74)

Table 15 (cont'd)

Verb Pattern	Comparison Group (*n* = 30) *M (SD)* 95% CI	Positive Group (*n* = 30) *M (SD)* 95% CI	Negative Group (*n* = 30) *M (SD)* 95% CI	Neutral Group (*n* = 29) *M (SD)* 95% CI
*V4	73.33*** (24.82) (64.07, 82.60)	65.33** (25.15) (55.94, 74.73)	68.00** (31.34) (56.30, 79.70)	66.90* (32.19) (54.65, 79.14)
*VF	80.67*** (23.18) (72.01, 89.32)	70.67** (27.16) (60.53, 80.81)	64.67* (29.09) (53.80, 75.53)	75.17*** (22.46) (66.63, 83.72)
*V1-VF	78.00*** (26.96) (67.93, 88.07)	76.00*** (23.72) (67.14, 84.86)	70.00** (28.65) (59.30, 80.70)	74.48*** (27.72) (63.94, 85.03)
*VF-V2(SV)	58.00 (35.76) (44.65, 71.35)	45.33 (33.19) (32.94, 57.73)	44.67 (32.67) (32.47, 56.87)	61.38 (33.78) (48.53, 74.23)

Note. The scores, rated on a scale of 0-100%, indicate the endorsement ratings for each verb pattern from the immediate GJT. Ungrammatical verb patterns are marked with an asterisk. SV = subject-verb; VS = verb-subject. Significance from chance (50%) is *p <.05, **p <.01, ***p <.001.

3.2.2.2 Overall Performance, Delayed Grammaticality Judgments

In this section, I report on whether participants from the four groups successfully retained their knowledge from incidental exposure of the L2 syntax. After two weeks (with no additional exposure to the grammatical verb patterns), I administered a delayed GJT to measure group performance. All participants, except for two from the Negative group, returned for this assessment.[5] Table 16 displays the mean accuracy results from this posttest, with the highest scores registered by the Positive group, followed by the Comparison and Neutral groups, and finally the Negative group. Higher standard deviations within the three treatment groups may be the result of residual affective impacts on learning (either positive or negative) encountered during the initial exposure phase. While I found no differences in scoring between the groups, $F(3, 114) = 0.35$, $p = .787$, $\omega^2 = -0.02$, only the Comparison, Positive, and Neutral groups

[5] Two participants from the Negative group (one male and one female) did not return for the delayed portion of the experiment due to scheduling conflicts. Both achieved a 60% accuracy rating on the immediate GJT.

performed significantly above chance. This suggests that participants from these three groups maintained their knowledge of the L2 syntax over time (as measured by total accuracy). Individuals from the Negative group, however, failed in this endeavor, scoring at the chance level. I also examined if any learning occurred over the course of the delayed posttest by dividing group performance into ten chronological stages. Results from one-factor, repeated measures ANOVAs (with sphericity assumed), found that all groups performed consistently throughout the test, with all *p*s >.183.

Table 16
Grammaticality Judgement Accuracies, Delayed Posttest

				Mean Difference from Chance (50%)		
Group	***N***	***M* (*SD*)**	**95% CI**	***t***	***p***	***r***
Comparison	30	53.84 (5.96)	(51.61, 56.06)	3.53	.001	.55
Positive	30	54.72 (7.49)	(51.93, 57.52)	3.45	.002	.54
Negative	28	52.63 (8.45)	(49.35, 55.91)	1.65	.111	.30
Neutral	30	53.50 (9.17)	(50.08, 56.92)	2.09	.045	.36

Note. The scores, rated on a scale of 0-100%, indicate the accuracy of correctly identifying sentences in the testing set as either grammatical or ungrammatical. Scores ±3 standard deviations were removed.

Analysis of group *d* prime scores revealed similarities to the total accuracy performances found in Table 16. Data depicted in Figure 13 and Table 17 show participants within the Positive group as the best discriminators of grammatical and ungrammatical sentences, followed by the Comparison and Neutral groups, and then the Negative group. Although significant group differences did not emerge, $F(3, 114) = 0.37$, $p = .777$, $\omega^2 = -0.02$, those in the Comparison, Positive, and Neutral groups performed significantly above chance, suggesting knowledge of the L2 grammatical structures was retained. The Negative group, however, failed to discriminate between grammatical and ungrammatical sentences (at chance levels), signifying a diminished

learning effect over time. The relationship between immediate and delayed posttest performances are discussed in Section 3.2.2.3.

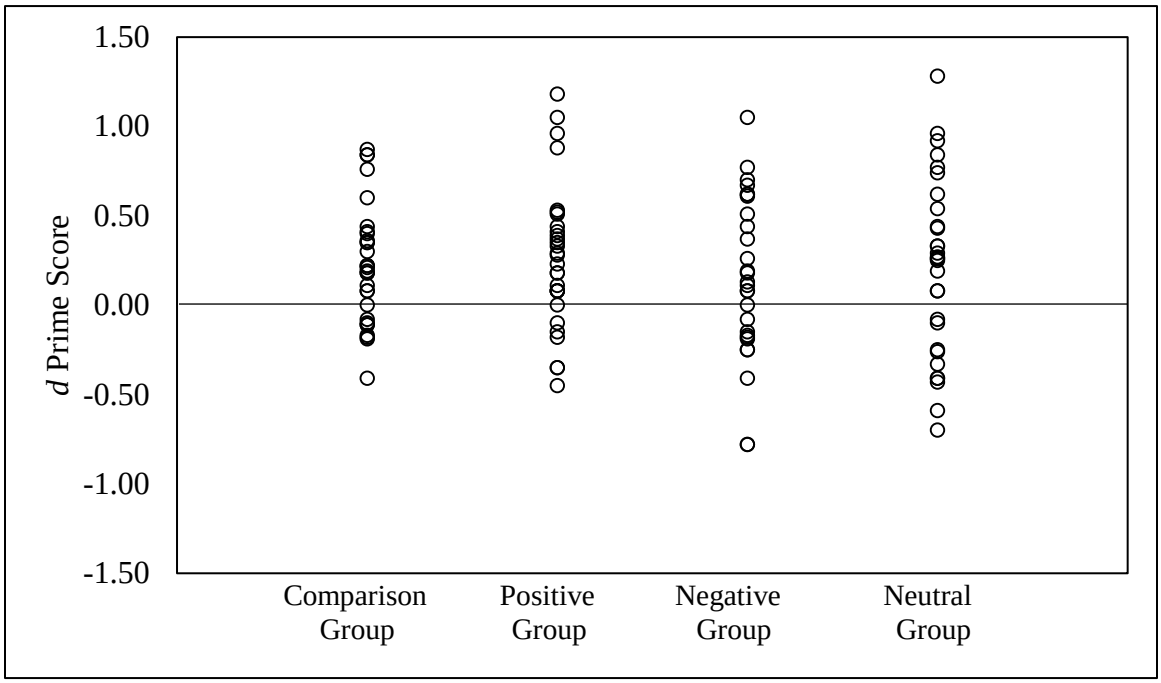

Figure 13. The d prime scores from the delayed grammaticality judgement posttest, with zero representing chance discrimination. For the Comparison, Positive, and Neutral groups, $n = 30$; for the Negative group, $n = 28$. Scores ±3 standard deviations were removed. One dot equals one participant.

Table 17
D Prime Scores for Grammaticality Judgement Task, Delayed Posttest

				Mean Difference from Zero		
Group	***N***	***M* (*SD*)**	**95% CI**	***t***	***p***	***r***
Comparison	30	0.22 (0.33)	(0.10, 0.35)	3.65	.001	.56
Positive	30	0.26 (0.40)	(0.12, 0.41)	3.63	.001	.56
Negative	28	0.15 (0.45)	(-0.03, 0.32)	1.73	.095	.32
Neutral	30	0.21 (0.50)	(0.02, 0.40)	2.31	.028	.39

Note. Scores ±3 standard deviations were removed.

Next, I examined the endorsement ratings of all eleven verb patterns (graphed in Figure 14) from the delayed GJT. The descriptive statistics, found in Table 18, summarize the different performances per group. For the grammatical verb patterns, all endorsed the V2(VS)-VF and

VF-V1 patterns at similarly high rates and significantly above chance, showing positive retention of the target structures. This was not the case for the V2(VS) pattern, which was endorsed significantly above chance by the Comparison group, but only at chance levels by the Positive, Negative, and Neutral groups. Here, participants in the Negative and Neutral groups displayed a reduction in knowledge of this structure from the immediate to delayed GJT. I also measured a significant difference between-groups for the V2(VS) pattern, $H(3) = 11.02$, $p = .012$. Post-hoc analysis, with Bonferroni correction ($\alpha = .008$), found a significant separation between the Comparison and Negative groups, $z = -3.21$, $p = .001$, and near-significant difference between the Comparison and Positive groups, $z = -2.62$, $p = .009$. Finally, all groups remained skeptical of the grammatical patterns which contained pre-verbal subject components, and endorsed them at levels significantly below chance (V2(SV)) or at chance (V2(SV)-VF).

Regarding the ungrammatical verb forms, the four groups showed similar endorsement ratings for the *V1, *V3, *V4, and *VF-V2 patterns, with all *p*s >.104. More specifically, endorsements dropped to at-chance levels for both the *V1 (minus the Comparison group) and *V4 (except the Comparison and Positive groups) forms. This means that non-target-like knowledge was not consolidated for these specific ungrammatical items by the treatment groups. Endorsement rates of the *V3 (categorical rejection) and *VF-V2 verb patterns (at-chance levels) remained steady compared to the immediate posttest results. Lastly, all groups continued to highly endorse the *VF and *V1-VF patterns, indicating an incomplete understanding of how verb-final clauses functioned in the L2 syntax and an acceptance of the VS component as an indicator of grammaticality in complex sentences. Interestingly, significant differences between-groups emerged with the two patterns during this posttest. For the *VF sentences, $H(3) = 7.85$, $p = .045$, I found a near-significant separation (with α adjusted to .008) between the Comparison

and Positive groups, z = -2.54, p = .011. Analysis of the *V1-VF form, $H(3)$ = 13.97, p = .003, revealed that the Positive group endorsed this pattern the most and at a near-categorical level of 91%. This rating was significantly higher than the Negative, z = -3.43, p = .001, and Neutral groups, z = -3.24, p = .001, and at a near-significant level to the Comparison group, z = -2.23, p = .026.

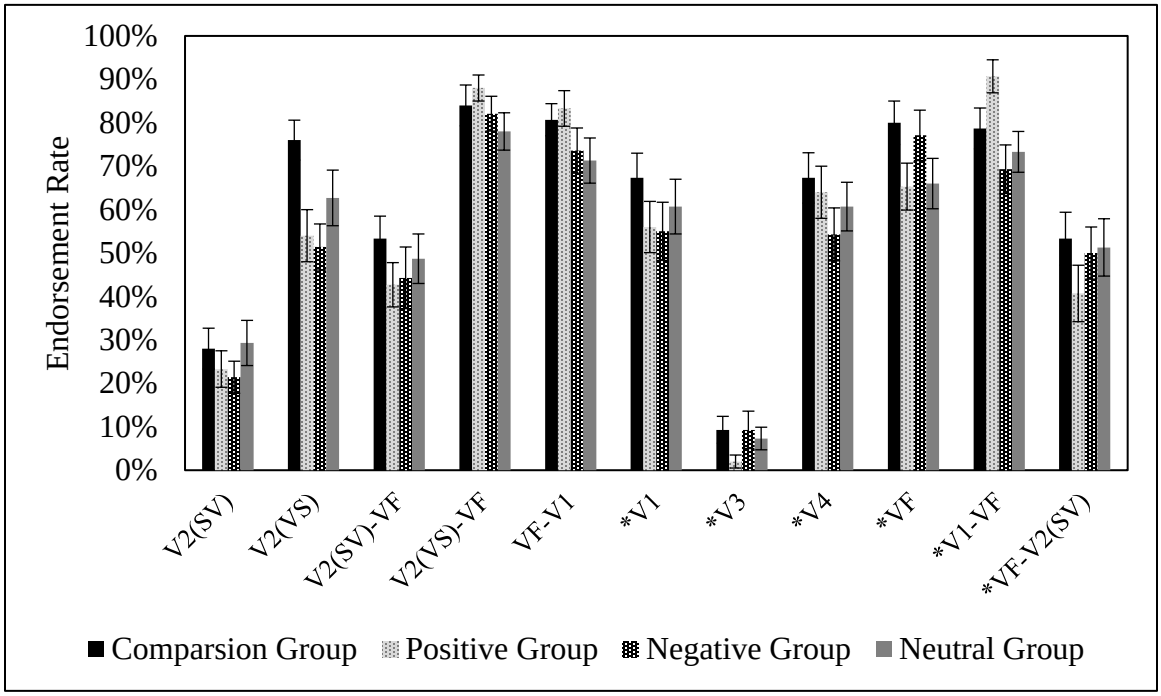

Figure 14. Endorsement ratings for each verb pattern from the delayed GJT. Ungrammatical verb patterns are marked with an asterisk. For the Comparison, Positive, and Neutral groups, n = 30; for the Negative group, n = 28. Error bars represent ±1 SEM.

Table 18
Descriptive Statistics and Accuracy of Verb Pattern Endorsement Ratings, Delayed Posttest

	Comparison Group (n = 30)	**Positive Group (n = 30)**	**Negative Group (n = 28)**	**Neutral Group (n = 30)**
Verb Pattern	***M (SD)*** **95% CI**	***M (SD)*** **95% CI**	***M (SD)*** **95% CI**	***M (SD)*** **95% CI**
V2(SV)	28.00*** (25.52) (18.47, 37.53)	23.33*** (22.94) (14.77, 31.90)	21.43*** (19.57) (13.84, 29.02)	29.33** (28.64) (18.64, 40.03)
V2(VS)	76.00*** (25.41) (66.51, 85.49)	54.00 (32.86) (41.73, 66.27)	51.43 (27.98) (40.58, 62.28)	62.67 (35.13) (49.55, 75.78)
V2(SV)-VF	53.33 (28.45) (42.71, 6.96)	42.67 (27.66) (32.34, 53.00)	44.29 (37.46) (29.76, 58.81)	48.67 (30.93) (37.12, 60.22)

Table 18 (cont'd)

Verb Pattern	Comparison Group (*n* = 30) *M (SD)* 95% CI	Positive Group (*n* = 30) *M (SD)* 95% CI	Negative Group (*n* = 28) *M (SD)* 95% CI	Neutral Group (*n* = 30) *M (SD)* 95% CI
V2(VS)-VF	84.00*** (25.94) (74.31, 93.69)	88.00*** (16.27) (81.92, 94.08)	82.14*** (21.32) (73.88, 90.41)	78.00*** (23.69) (69.15, 86.85)
VF-V1	80.67*** (20.50) (73.01, 88.32)	83.33*** (22.34) (74.99, 91.67)	73.57** (27.38) (62.96, 84.19)	71.33** (28.62) (60.65, 82.02)
*V1	67.33** (31.29) (55.65, 79.02)	56.00 (32.12) (44.01, 67.99)	55.00 (35.54) (41.22, 68.78)	60.67 (34.23) (47.88, 73.45)
*V3	9.33*** (17.21) (2.91, 15.76)	2.00*** (8.05) (-1.01, 5.01)	9.29*** (22.76) (0.46, 18.11)	7.33*** (14.37) (1.97, 12.70)
*V4	67.33** (31.72) (55.49, 79.18)	64.00* (32.97) (51.69, 76.31)	54.29 (32.14) (41.82, 66.75)	60.67 (30.84) (49.15, 72.18)
*VF	80.00*** (27.29) (69.81, 90.19)	65.33* (29.68) (54.25, 76.42)	77.14*** (30.65) (65.26, 89.03)	66.00* (31.58) (54.21, 77.79)
*V1-VF	78.67*** (25.69) (69.07, 88.26)	90.67*** (20.83) (82.89, 98.45)	69.29** (29.56) (57.83, 80.75)	73.33*** (25.91) (63.66, 83.01)
*VF-V2(SV)	53.33 (33.36) (40.88, 65.79)	40.67 (35.81) (27.30, 54.04)	50.00 (31.51) (37.78, 62.22)	51.33 (35.89) (37.93, 64.73)

Note. The scores, rated on a scale of 0-100%, indicate the endorsement ratings for each verb pattern from the delayed GJT. Ungrammatical verb patterns are marked with an asterisk. SV = subject-verb; VS = verb-subject. Significance from chance (50%) is *p <.05, **p <.01, ***p <.001.

3.2.2.3 Relationship between the Immediate and Delayed GJT Performances

To analyze the association between immediate and delayed GJT performances, I conducted two measures: (a) a correlation between the two posttest scores for each group and (b) mixed-design ANOVAs for both the accuracy rates and *d* prime scores. Results from the correlations, shown in Figure 15, reveal that individuals from the Positive, r = .451, p = .012, and Negative, r = .536, p = .003, groups (and to a lesser extent, the Neutral group, r = .321, p = .089) were more likely to replicate their immediate GJT performance on the delayed posttest. Alternatively, participants from the Comparison group, r = .069, p = .716, were more inclined to score closer to the group mean of 53.84% on the delayed posttest, regardless of their immediate

GJT performance.

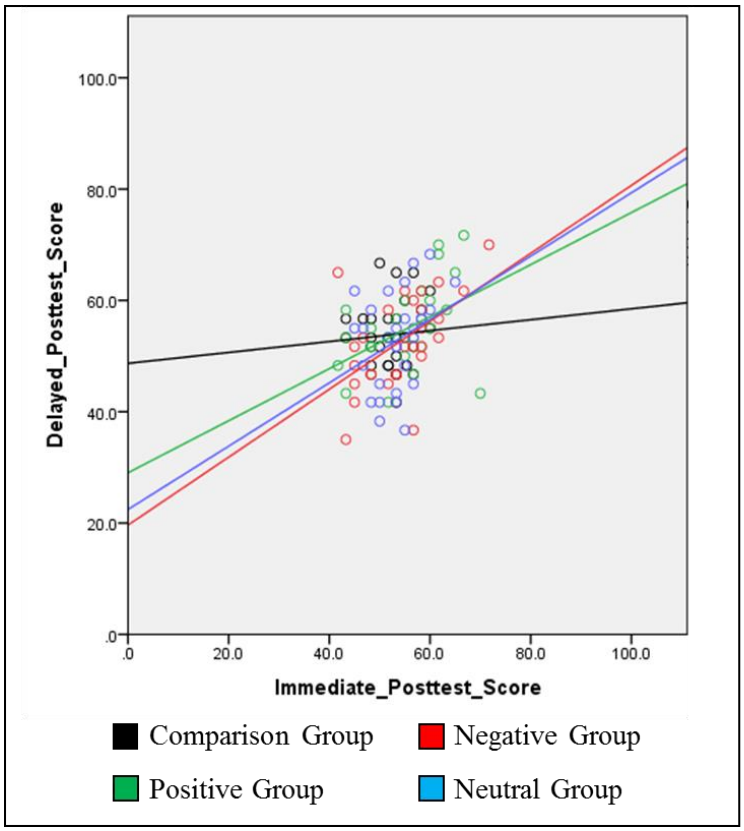

Figure 15. Scatterplot of correlations between immediate and delayed GJT performance by group.

From a more general perspective, mixed-design ANOVAs indicated no within-group differences in scoring between accuracy rates, $F(1, 113) = .08$, $p = .772$, $\eta_p^2 = .00$, and *d* prime scores, $F(1, 112) = .31$, $p = .577$, $\eta_p^2 = .00$, over the two-week time span. These findings are promising and confirm the effectiveness and durability of incidental exposure, particularly in the face of different emotional distractors.

3.2.3 Summary of RQ1

In sum, participants subjected to positive, negative, and neutral emotional induction displayed aspects of learning a novel L2 syntax to which they were exposed incidentally in a meaning-focused task. After two weeks, and with no additional exposure to the L2, only

individuals from the Positive and Neutral group successfully retained their knowledge of the grammatical structure. Table 19 provides a synopsis of the results.

Table 19
Summary of Findings for RQ1

	Comparison Group	**Positive Group**	**Negative Group**	**Neutral Group**
Exposure				
Total elicited imitation accuracy	91.35%	88.11%	88.67%	87.78%
Total plausibility judgment accuracy	90.78%	91.08%	88.92%	87.08%
Immediate GJT				
Accuracy/significance above chance (50%)	52.45% $p = .003$	54.94% $p = .001$	54.45% $p = .002$	53.39% $p = .001$
D prime/significance above chance (0)	0.15 $p = .002$	0.30 $p < .001$	0.26 $p = .002$	0.20 $p < .001$
Grammatical verb patterns endorsed significantly above chance (50%)	V2(VS), (V2)VS-VF, VF-V1	(V2)VS-VF, VF-V1	V2(VS), (V2)VS-VF, VF-V1	V2(VS), (V2)VS-VF, VF-V1
Ungrammatical verb patterns endorsed significantly above chance (50%)	*V1, *V4, *VF, *V1-VF	*V4, *VF, *V1-VF	*V1, *V4, *VF, *V1-VF	*V1, *V4, *VF, *V1-VF
Delayed GJT				
Accuracy/significance above chance (50%)	53.84% $p = .001$	54.72% $p = .002$	52.63% $p = .111$	53.50% $p = .045$
D prime/significance above chance (0)	0.22 $p = .001$	0.26 $p = .003$	0.15 $p = .095$	0.21 $p = .028$
Grammatical verb patterns endorsed significantly above chance (50%)	V2(VS), (V2)VS-VF, VF-V1	(V2)VS-VF, VF-V1	(V2)VS-VF, VF-V1	(V2)VS-VF, VF-V1
Ungrammatical verb patterns endorsed significantly above chance (50%)	*V1, *V4, *VF, *V1-VF	*V4, *VF, *V1-VF	*VF, *V1-VF	*VF, *V1-VF

Although the Negative group did not perform above chance on the delayed posttest in terms of total accuracy and grammatical/ungrammatical discrimination, there are two caveats to this finding that must be addressed. First, two participants from the Negative group, both of whom achieved a 60% accuracy rate on the immediate GJT, did not return for the delayed posttest. While I can only speculate as to whether their delayed GJT performances would have raised the Negative group's scores significantly, correlation results from Figure 15 make the scenario more probable than not. Secondly, mixed-design ANOVAs revealed no within-group differences in scoring between the two measures over the two-week time span. Thus, this analysis did not support the view that participants from the Negative group, or indeed any treatment group, forgot significant amounts of their initial knowledge of the L2 syntax over time. Therefore, the within-group ANOVAs, combined with attrition in the Negative group, cast some doubt on whether retention in the Negative group was truly impaired. The results are best characterized as tenuous and deserving of further inspection. That said, future discussion of this topic (see Section 4.2) will focus on the possible reasons for the decline in performance, which is still the empirical finding from the study.

3.3 Emotions and the Implicit Acquisition of an L2 Syntax

RQ2 inquired if participants in positive, negative, or neutral emotional states could acquire the grammar system of a novel L2 implicitly. The following analyses were based primarily on source attribution data (i.e., *guess*, *intuition*, *recollection*, and *rule knowledge*) from both the immediate and delayed GJTs, as well as post-experiment verbal reports.

3.3.1 Proportions and Accuracies of Source Attributions, Immediate Posttest

Source attribution proportions from the immediate posttest, displayed in Figure 16, show how each group classified their grammaticality judgments. In order to further examine these

relationships, I developed an explicit-to-implicit knowledge ratio for each participant based on the proportion data. The calculated means (*SD*) of the four experimental groups were: (a) Comparison group, $M = 5.19$ (10.84); (b) Positive group, $M = 1.76$ (1.74); (c) Negative group, $M = 3.19$ (6.19); and (d) Neutral group, $M = 3.87$ (6.13). Using a Kruskal-Wallis test, I discovered no between-group difference among the ratios, $H(3) = 3.72$, $p = .294$. However, one-sample Wilcoxon signed rank tests (with a test value of 1), indicated nuances in how each group relied on the two source attribution types. Here, the ratios of the Comparison group ($p = .001$) and Neutral group ($p = .003$) were significantly higher than the test value. These participants, then, relied more on their perceived, explicit structural knowledge of the L2 syntax to navigate the immediate posttest. The Positive group ($p = .074$) and the Negative group ($p = .082$) ratios, however, were not significantly different from the test value, suggesting an almost equal use of explicit and implicit attributions when determining grammaticality responses.

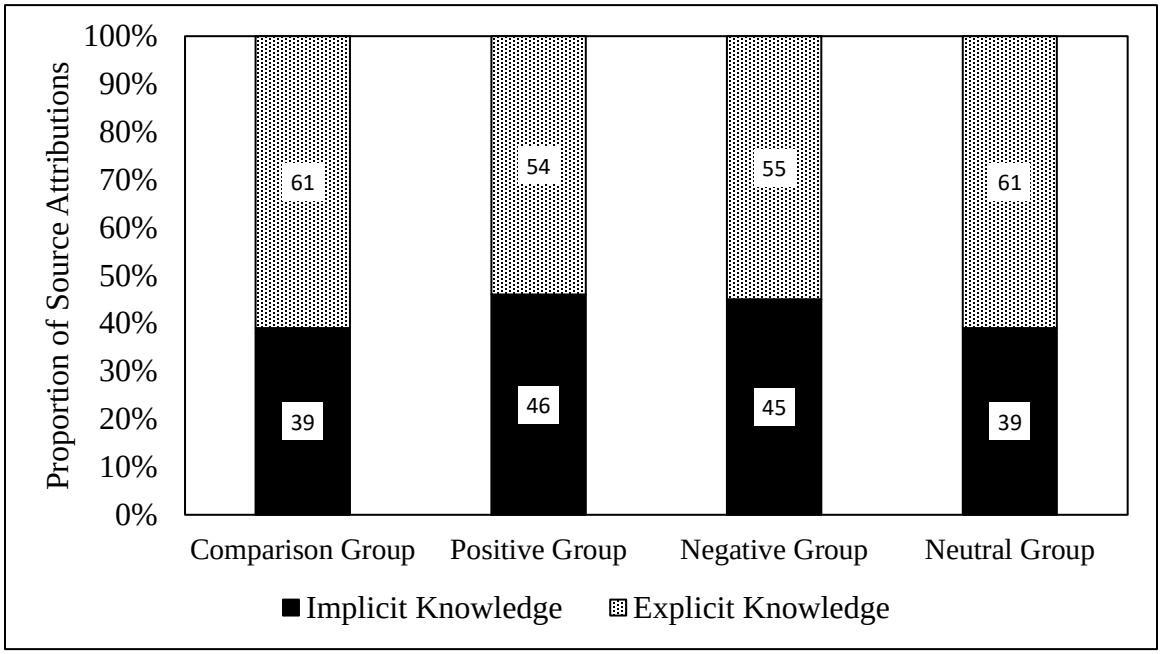

Figure 16. Proportion of selected source attributions from the immediate GJT. Implicit knowledge underlies the subjective attributions of *guess* and *intuition*, whereas explicit knowledge is derived from *recollection* and *rule knowledge*. For the Comparison, Positive, and Negative groups, $n = 30$; for the Neutral group, $n = 29$.

Table 20 provides group accuracy ratings for the two categories of source attributions during the immediate posttest. According to one-sample Wilcoxon signed rank tests, all groups performed significantly above chance when utilizing explicit source attributions, meaning that all groups acquired explicit structural knowledge of the L2 grammar system. Apart from a near-significant performance by the Positive group, no group was accurate above chance when basing their decisions on implicit structural knowledge. These findings suggest that participants from all groups, regardless of mood state, did not acquire implicit structural knowledge of the L2 syntax.

Table 20
Grammaticality Judgment Accuracies per Source Attribution, Immediate Posttest

	Implicit Knowledge	**Mean Difference from Chance (50%)**	**Explicit Knowledge**	**Mean Difference from Chance (50%)**
Group	***M (SD)***	***z, p***	***M (SD)***	***z, p***
Comparison	48.97 (18.25)	-.55, .581	55.22 (8.87)	3.34, .001
Positive	53.54 (9.86)	1.82, .069	57.15 (9.87)	3.24, .001
Negative	54.68 (15.06)	1.61, .108	58.92 (12.78)	3.44, .001
Neutral	49.05 (14.08)	.05, .959	57.83 (9.83)	4.33, <.001

Note. The scores, rated on a scale of 0-100%, indicate the accuracy ratings for each source attribution from the immediate GJT. *Guess* and *intuition* are implicit attributions, whereas *recollection* and *rule knowledge* are explicit attributions. For the Comparison, Positive, and Negative groups, $n = 30$; for the Neutral group, $n = 29$.

While not reaching the level of significance, proportion data (Figure 16) and accuracy data (Table 20) suggested that participants from the Positive and Negative groups utilized more implicit source attributions than those from the Comparison and Neutral groups. To explore this finding further, I examined group proportion data for each verb pattern to identify whether any individual structures were chiefly guided by implicit knowledge. Table 21 shows the results from binomial logistic regression using GEE, which modeled the odds of an explicit response over an implicit response. Here, the verb patterns of V2(VS), V2(VS)-VF, VFV1, *V3, *VF,

and *V1VF were driven primarily by explicit knowledge, whereas the remaining structures were equally divided between implicit and explicit knowledge use. While all treatment group Wald chi-square values were similar to their respective intercept values, I did record a few near-significant differences. These included three verb patterns from the Positive group, V2(SV), p = .069; *V1, p = .065; and *VF, p = .063, and one from the Negative group, *VF, p = .068. Proportion data for these specific structures indicated a preference for guessing and intuition only by the Positive group when determining GJT responses for the V2(SV) form (56% of the time) and *V1 form (63% of the time).

Table 21
Explicit Source Attribution Use by Verb Pattern, Immediate Posttest

	Intercept	**Positive Group**	**Negative Group**	**Neutral Group**
Verb Pattern	**Wald χ^2** *Exp*(*B*) **(95% CI)**			
V2(SV)	1.80 1.34 (0.87, 2.07)	3.30 0.59 (0.33, 1.04)	0.49 0.81 (0.44, 1.48)	0.03 1.06 (0.53, 2.09)
V2(VS)	4.89* 1.78 (1.07, 2.96)	1.86 0.63 (0.32, 1.23)	1.08 0.70 (0.35, 1.38)	0.16 0.87 (0.43, 1.73)
V2(SV)-VF	1.35 1.31 (0.83, 2.06)	0.07 1.09 (0.58, 2.02)	0.03 0.95 (0.49, 1.84)	0.03 1.06 (0.54, 2.06)
V2(VS)-VF	6.57** 1.83 (1.15, 2.91)	0.07 0.92 (0.49, 1.73)	0.14 0.89 (0.49, 1.63)	0.26 1.20 (0.60, 2.40)
VF-V1	4.79* 1.68 (1.06, 2.67)	0.38 0.83 (0.47, 1.49)	0.24 0.86 (0.46, 1.59)	0.50 1.27 (0.66, 2.44)
***V1**	0.21 1.11 (0.71, 1.75)	3.40 0.54 (0.28, 1.04)	0.16 0.88 (0.46, 1.67)	1.06 1.43 (0.73, 2.80)
***V3**	7.35** 2.00 (1.21, 3.30)	0.01 0.97 (0.50, 1.88)	0.43 1.29 (0.61, 2.72)	0.03 0.94 (0.45, 1.96)
***V4**	0.10 1.08 (0.65, 1.80)	0.60 0.77 (0.39, 1.50)	2.18 0.58 (0.28, 1.19)	0.10 1.11 (0.57, 2.20)
***VF**	8.77** 2.06 (1.28, 3.33)	3.47 0.55 (0.30, 1.03)	3.32 0.55 (0.29, 1.05)	1.41 0.67 (0.35, 1.30)
***V1-VF**	4.06* 1.68 (1.01, 2.78)	0.81 0.74 (0.38, 1.43)	1.70 0.65 (0.33, 1.25)	0.79 0.74 (0.38, 1.44)
***VF-V2(SV)**	1.53 1.38 (0.83, 2.30)	0.17 0.87 (0.45, 1.68)	1.12 0.69 (0.34, 1.38)	0.06 1.09 (0.54, 2.17)

Note. Ungrammatical verb patterns are marked with an asterisk. *p <.05, **p <.01, ***p <.001.

3.3.2 Proportions and Accuracies of Source Attributions, Delayed Posttest

Figure 17 summarizes the source attribution proportions measured at the delayed posttest. Again, I analyzed the explicit-to-implicit knowledge ratios for each group and arrived at the following mean (*SD*) values: (a) Comparison group, $M = 2.90$ (5.67); (b) Positive group, $M = 4.22$ (8.73); (c) Negative group, $M = 1.86$ (3.60); and (d) Neutral group, $M = 4.24$ (8.75). Kruskal-Wallis testing indicated no differences in values between the four groups, $H(3) = 1.34$, $p = .720$. One-sample Wilcoxon signed rank tests revealed that no group ratios were significantly different from the mean value, with all *p*s >.072. This means that all groups were evenly split between the use of implicit and explicit source attributions on the delayed posttest. Further analysis of the immediate and delayed explicit-to-implicit knowledge ratios revealed significant changes in preference for source attributions within the Comparison group, $z = -2.37$, $p = .018$, $r = -.31$, and Neutral group, $z = -2.16$, $p = .031$, $r = -.29$. Over the two-week period, these participants placed a greater emphasis on implicit attributions while reducing their utilization of explicit structural knowledge. Individuals within the Positive and Negative groups, however, did not measure any changes during the same timeframe, with all *p*s >.112. The findings show that at the delayed GJT, all groups selected the two categories equally, marking a failure by participants to discriminate between the different source attribution types.

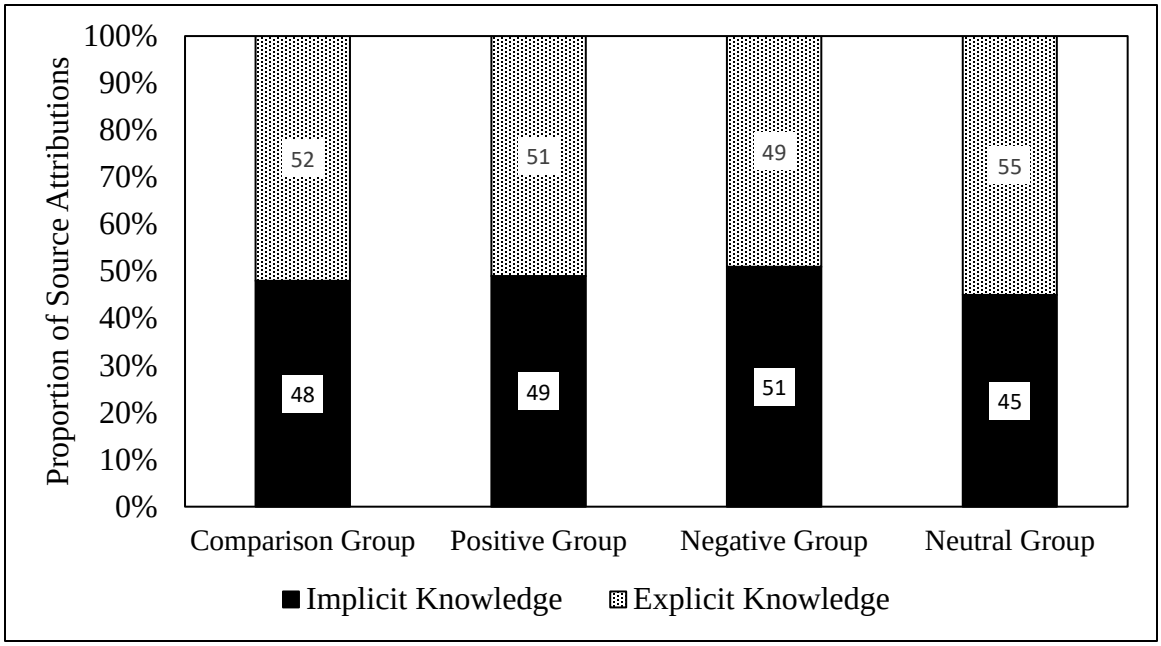

Figure 17. Proportion of selected source attributions from the delayed GJT. Implicit knowledge underlies the subjective attributions of *guess* and *intuition*, whereas explicit knowledge is derived from *recollection* and *rule knowledge*. For the Comparison and Positive groups, $n = 30$; for the Negative group, $n = 27$; for the Neutral group, $n = 29$.

Analysis of the individual verb patterns, using binomial logistic regression (GEE) with explicit response modeling (see Table 22), confirmed that participants were largely indiscriminate in their use of implicit and explicit source attributions on the delayed posttest. The *V3 structure marked the only exception, which was predominantly driven by explicit knowledge for all groups.

Table 22
Explicit Source Attribution Use by Verb Pattern, Delayed Posttest

	Intercept	**Positive Group**	**Negative Group**	**Neutral Group**
	Wald χ^2			
Verb Pattern	***Exp*(*B*) (95% CI)**			
V2(SV)	0.54 1.21 (0.73, 1.99)	0.05 0.92 (0.47, 1.83)	0.13 0.88 (0.43, 1.78)	0.66 1.35 (0.65, 2.81)
V2(VS)	0.01 0.97 (0.56, 1.68)	0.73 0.72 (0.35, 1.52)	0.29 0.82 (0.39, 1.70)	0.18 1.17 (0.56, 2.45)
V2(SV)-VF	0.76 1.24 (0.76, 2.01)	0.29 0.83 (0.42, 1.65)	0.15 0.88 (0.46, 1.70)	0.01 1.03 (0.52, 2.02)

Table 22 (cont'd)

Verb Pattern	Intercept	Positive Group	Negative Group	Neutral Group
	Wald χ^2			
	Exp(*B*) (95% CI)			
V2(VS)-VF	2.03	0.23	1.46	0.03
	1.42 (0.88, 2.30)	0.85 (0.44, 1.66)	0.67 (0.34, 1.29)	0.95 (0.48, 1.86)
VF-V1	0.01	0.16	0.01	0.31
	1.03 (0.66, 1.56)	1.13 (0.62, 2.05)	0.97 (0.51, 1.86)	1.19 (0.64, 2.21)
***V1**	0.04	1.71	1.28	0.19
	0.95 (0.58, 1.56)	0.61 (0.29, 1.28)	0.68 (0.35, 1.32)	1.17 (0.57, 2.41)
***V3**	7.21**	1.51	0.65	2.60
	2.06 (1.22, 3.50)	1.72 (0.73, 4.08)	1.40 (0.62, 3.19)	2.02 (0.86, 4.77)
***V4**	2.83	0.02	0.00	0.02
	0.65 (0.39, 1.07)	0.95 (0.47, 1.91)	1.00 (0.49, 2.04)	1.06 (0.52, 2.15)
***VF**	0.29	0.21	0.29	0.13
	1.14 (0.71, 1.85)	0.85 (0.43, 1.69)	0.83 (0.41, 1.66)	0.88 (0.43, 1.79)
***V1-VF**	0.00	0.06	0.10	0.03
	1.00 (0.65, 1.54)	0.92 (0.49, 1.73)	0.89 (0.44, 1.79)	0.95 (0.50, 1.79)
***VF-V2(SV)**	0.01	0.02	0.41	0.09
	1.03 (0.62, 1.70)	0.95 (0.48, 1.87)	0.80 (0.40, 1.60)	1.11 (0.56, 2.22)

Note. Ungrammatical verb patterns are marked with an asterisk. *p <.05, **p <.01, ***p <.001.

Source attribution accuracy data from Table 23 revealed that no group performed significantly above chance while using implicit source attributions. The Comparison, Positive, and Neutral groups remained accurate at levels significantly above chance when accessing their explicit structural knowledge of the target syntax. These findings confirm a consolidation of conscious, structural knowledge between post-exposure and (two-week) delayed testing. Interestingly, I recorded no such consolidation with the Negative group, suggesting a lack of durability in structural knowledge retention.

Table 23
Grammaticality Judgment Accuracies per Source Attribution, Delayed Posttest

Group	Implicit Knowledge *M (SD)*	Mean Difference from Chance (50%) *z, p*	Explicit Knowledge *M (SD)*	Mean Difference from Chance (50%) *z, p*
Comparison	53.22 (10.12)	1.60, .109	56.89 (15.73)	3.10, .002
Positive	49.85 (13.90)	.74, .461	58.18 (17.13)	3.28, .001
Negative	53.10 (11.07)	1.63, .102	54.26 (12.59)	1.47, .141
Neutral	48.33 (13.92)	-.87, .383	56.18 (12.78)	2.64, .008

Note. The scores, rated on a scale of 0-100%, indicate the accuracy ratings for each source attribution from the delayed GJT. *Guess* and *intuition* are implicit attributions, whereas *recollection* and *rule knowledge* are explicit attributions. For the Comparison and Positive groups, $n = 30$; for the Negative group, $n = 27$ (implicit) and $n = 26$ (explicit); for the Neutral group, $n = 29$.

3.3.3 Verbal Reports

At the retrospective interviews, I asked participants if they noticed any types of grammatical patterns or regularities during their initial exposure to the L2 sentences. The transcripts of these verbal reports are located in Appendix I. To begin, no one could state the three specific verb placement rules of the L2 grammar (see Table 2 in Section 2.3.1). Rather, analysis indicated that participants from each group fell into one of four categories as shown in Figure 18: (a) no awareness of verb placement, (b) some awareness of verb placement, (c), awareness of a V2-type rule, and (d) awareness of a VF-type rule. Individuals within the "no awareness" group failed to notice anything unusual about verb placement in sentences from the exposure set. The Positive group had the lowest percentage of unaware participants, whereas the Negative group contained the highest. Individuals who were "somewhat aware" offered general or simple descriptions of the verb patterns, but lacked an overall specificity of how verbs functioned within the sentence clauses. Example response from this group included, "the sentences were mixed up" (417) or "it was pretty clear to me that if it sounded like normal English, it was almost certainly incorrect" (316). Again, more individuals from the Negative

group fell into this category. Those within the "V2-type awareness" group reported some type of grammar rule that placed the verb before the subject of the sentence. An example rule from this group included, "I noticed that a lot of the times it would be that the subject came after the verb, which I know is different from English. It would be like, 'yesterday cooked Jim the meal'" (108). More participants from the Positive group mentioned this type of rule than from any other group. Individuals within the "VF-type awareness" group indicated that verbs could often be found at the final position of a sentence (although they failed to mention the importance of clause type), as in, "I think the action was generally last" (322). Those from the Negative group recognized this rule the most. Overall, these findings suggest that participants from the Positive group (64%) were better able to verbalize some type of verb pattern rule associated with the L2 grammar. Those from the Negative group were least able to verbalize a pattern, with many participants (59%) not able to discern any meaningful grammatical regularities from their exposure to the L2 system.

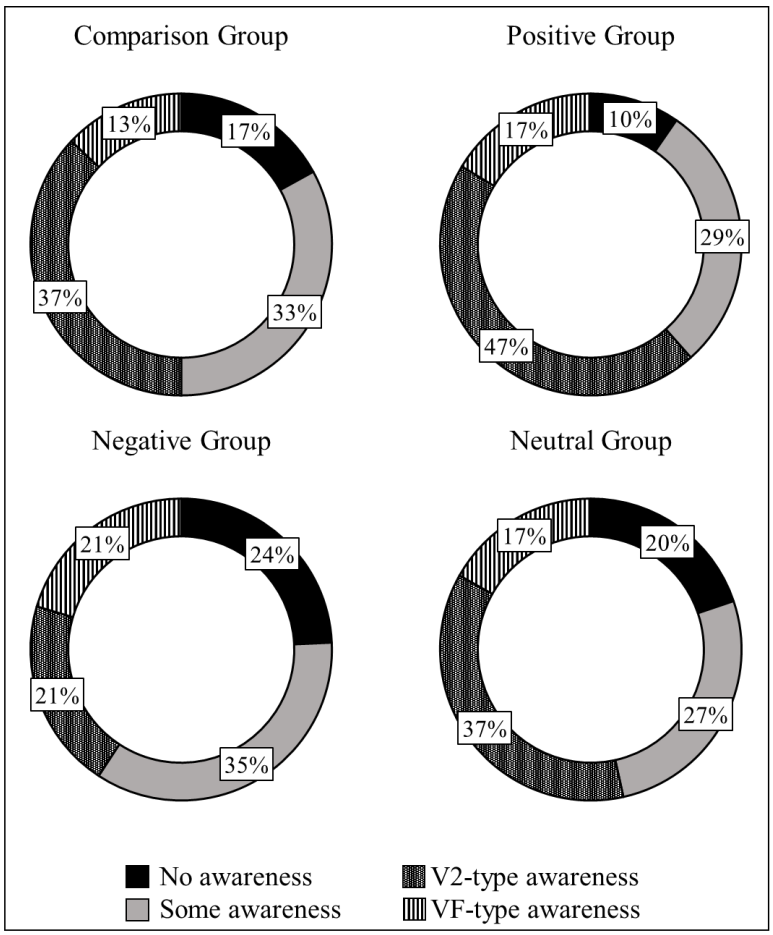

Figure 18. The four categories of verbal reports as described in the retrospective verbal reports. Percentages in the Positive, Negative, and Neutral groups do not add up to 100. This is because one participant from each group described both a V2-type and VF-type rule, and is counted within both subgroups.

3.4 Emotions and the Relationship between Individual Differences and L2 Learning

3.4.1 Exploratory Factor Analysis

RQ3 examined the links between certain individual differences (i.e., openness, intuition, EL, FLA, and impulsivity) and L2 performance under an affective status. As a first step, I conducted exploratory factor analysis on each of the five personality questionnaires (i.e., BFAS, REI, TEIQue-SF, FLCAS, and UPPS) supplied to the participants at the start of the experiment and before emotional induction. Prior to analysis, I reversed all negatively-worded items to maintain a uniformity of positive responses throughout. An initial attempt at consolidating all

items from the five questionnaires into a single factor analysis failed, resulting in a non-positive definite matrix. As such, I decided to perform a separate analysis for each individual survey and examined the scores by principal axis factor analysis with an oblique rotation (direct oblimin). All Kaiser-Meyer-Olkin measures were above .7 and considered acceptable for the participant population (Field, 2013). According to corresponding structure matrices, 14 factors in total emerged from the findings. Secondary analysis revealed high internal reliabilities for each scale (all Cronbach's alpha above .74, apart from *emotionality towards others* at .69). Table 24 provides the results.

Table 24
Summary of Exploratory Factor Analysis

Survey	KMO	Sphericity *p*	Factors (*no. items)*	Eigenvalues	% of Variance	α
BFAS	.765	$\chi^2(171) = 761.183$ <.001	Openness (9)	5.02	26.39	.81
			Intellect (7)	2.54	13.37	.79
			Escapism (2)	1.54	8.11	.75
REI	.849	$\chi^2(120) = 742.19$ <.001	Intuitive ability (10)	5.92	37.00	.87
			General intuition (6)	1.89	11.83	.74
TEIQue-SF	.792	$\chi^2(276) = 1,240.15$ <.001	Emotional self-regulation (11)	6.80	28.33	.86
			Emotionality towards others (5)	2.22	9.26	.69
			Stress management (7)	2.16	9.01	.78
FLCAS	.912	$\chi^2(210) = 1,131.35$ <.001	Foreign language anxiety (12)	8.47	40.31	.89
			General (academic) anxiety (9)	1.62	7.73	.84
UPPS	.792	$\chi^2(703) = 2,678.67$ <.001	Premeditation (10)	9.35	24.60	.88
			Sensation seeking (10)	5.25	13.80	.87
			Urgency (11)	3.22	8.47	.87
			(Lack of) Perseverance (6)	2.03	5.33	.83

Note. Only factor loadings over .40 were retained. $N = 120$.

Appendix K presents the structure matrices for all five exploratory factor analyses. Within the BFAS, I discovered three factors that accounted for nearly 48% of the variance:

openness, *intellect*, and *escapism*. *Openness* and *intellect* were the previously defined categories from the BFAS (DeYoung et al., 2007). Scree plot analysis indicated the presence of a third factor, *escapism*, which focused on themes of daydreaming. For the REI, two factors emerged that accounted for over 48% of the variance: *intuitive ability* and *general intuition*. Items within *intuitive ability* dealt with one's own perceived intuitive capabilities (e.g., I believe in trusting my hunches), whereas *general intuition* centered on one's overall impressions and value of intuition (e.g., intuition can be a very useful way to solve problems). Both *intuitive ability* and *general intuition* paralleled the two experiential subscales, ability and engagement, from the REI (Pacini & Epstein, 1999). The TEIQue-SF yielded three factors that made up over 46% of the variance: *emotional self-regulation*, *emotionality towards others*, and *stress management*. These factors corresponded with three of the 15 TEIQue facets (emotional regulation, emotional perception, and stress management) identified in the long form of the questionnaire (Petrides, 2009). For the FLCAS, two factors emerged that accounted for 48% of the variance: *foreign language anxiety* and *general* (*academic) anxiety*. These subscales aligned with findings from MacIntyre and Gardener (1989), but not with MacIntyre and Gardener (1991) or Fox, Miller, Godfroid, and Moser (in preparation). Finally, I found four factors within the UPPS that represented over 52% of the variance: *premeditation*, *sensation seeking*, *urgency*, and *(lack of) perseverance*. These results mirrored the four defined subscales into which the UPPS is organized (Whiteside & Lynam, 2001).

3.4.2 Multiple Linear Regression and Moderation Analysis

For the multiple linear regression and moderation analyses, I used the immediate grammaticality judgment scores as the dependent variable to examine whether individual differences interacted with mood in shaping performance. There were three different types of

predictor variables: (a) emotional treatment (i.e., Positive, Negative, and Neutral dummy variables, with Comparison as the baseline), (b) the mean values of the 14 factor scores, and (c) the interactions between factor scores and emotional treatment. The factor scores, generated from the previous exploratory factor analysis, were derivatives of the Anderson-Rubin method. I removed all outliers (i.e., ± 3 standard deviations from the mean values) prior to regression analysis.

Because the number of predictors (14 main effects and 42 interaction terms) exceeded the capacity of my sample size (N = 120), I ran a series of preliminary analyses to identify the most relevant predictors for a final regression model. To begin, I created a correlation matrix using the 14 factors from Table 24 to examine if any of the items were related. A moderate to high correlation between two factors could indicate that the items are tapping into similar constructs (or opposite constructs if r is negative). The following factors exhibited moderate correlations (above .300) with one another: (a) *openness* and *general intuition*: r = .354, p <.001; (b) *openness* and *emotionality towards others*: r = .440, p <.001; (c) *openness* and *sensation seeking*: r = .403, p <.001; (d) *general intuition* and *emotionality towards others*, r = .354, p <.001; (e) *stress management* and *intuitive ability*, r = .308, p = .001; (f) *stress management* and *sensation seeking*, r = .484, p <.001; and (g) *emotional self-regulation* and *urgency*, r = -.451, p <.001.

Next, I correlated the immediate GJT accuracy rates with the 14 factor scores for each experimental group separately. Large differences in correlation values between the Comparison group and any of the treatment groups were flagged as likely candidates for further regression. Table 25 shows the results from this analysis.

Table 25
Correlations between Factors and Immediate GJT Accuracy for Each Group

Group		Intellect	Stress Management	Premeditation	(Lack of) Perseverance
	r	-.149	-.253	.273	.033
Comparison	*p*	.432	.186	.144	.966
	n	30	29	30	30
	r	**.391**	-.026	.181	.229
Positive	*p*	.033	.890	.339	.232
	n	30	30	30	29
	r	.170	.336	.327	**-.388**
Negative	*p*	.370	.070	.083	.034
	n	30	30	29	30
	r	.154	-.092	**-.391**	-.128
Neutral	*p*	.426	.635	.036	.509
	n	29	29	29	29

Note. Significant correlations ($p < .05$) are in bold.

Third, I created scatterplots of all factor scores with fit lines at subgroups to visually identify interactions among the variables. For potential moderation analysis, I noted any large deviations in slope of the Positive, Negative, and Neutral groups' fit lines from the Comparison group's fit line. These included: (a) *intellect*: Positive group; (b) *stress management*: Negative group; (c) *premeditation*: Neutral group; and (e) *(lack of) perseverance*: Negative group. Figure 19 displays the outcome from this endeavor.

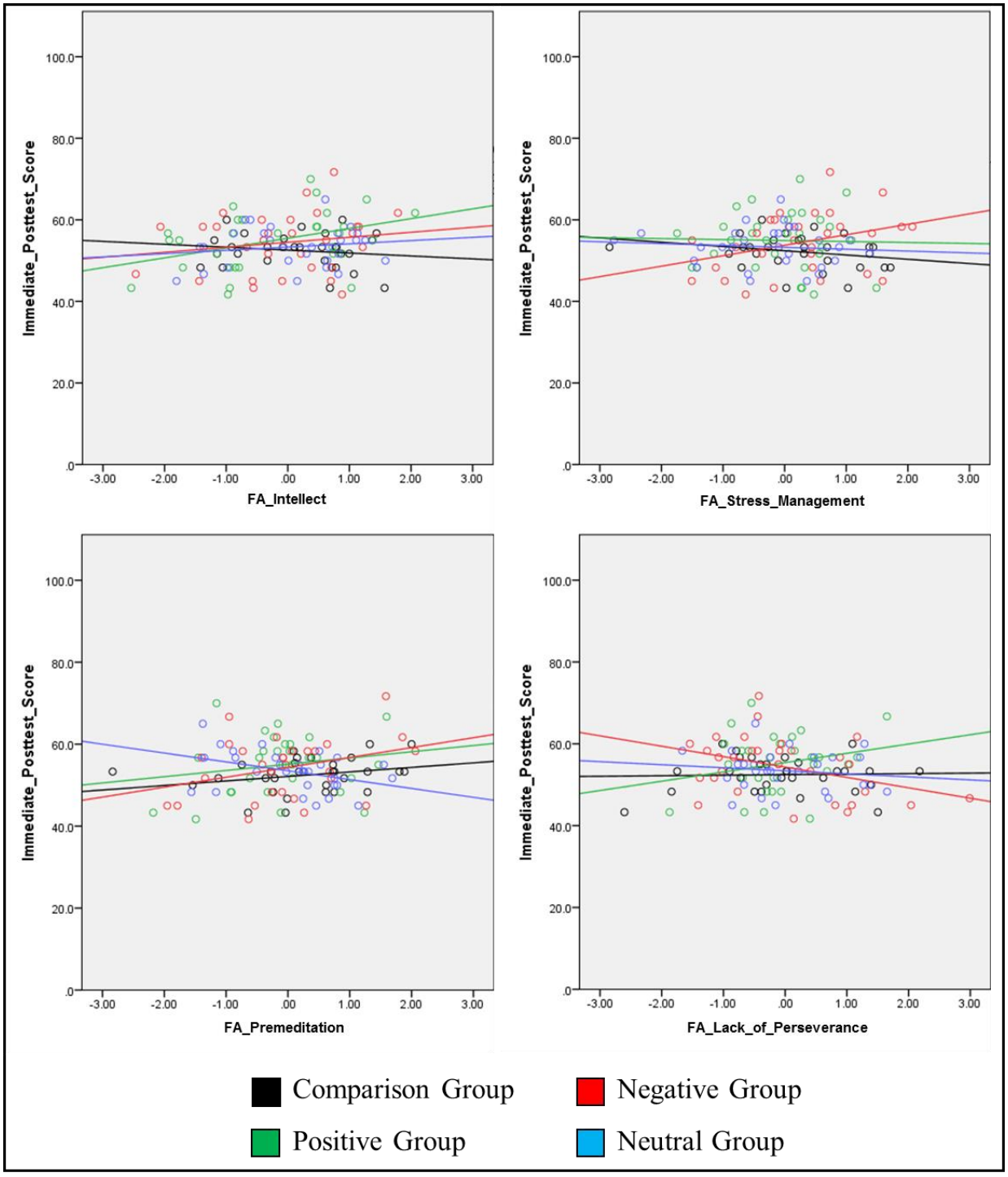

Figure 19. Scatter plots, by factor, with the largest interactions between a treatment group and the Comparison group.

Lastly, I performed forced entry, multiple linear regressions for each factor separately. For all regressions, I entered the three dummy variables in Step 1, the factor score in Step 2, and the three interaction variables (i.e., dummy variable x factor score) in Step 3. I noted all near significant and significant predictors, which included: (a) *intellect* x Positive, b = 3.12 (.00, 6.24), p = .050, (b) *stress management* x Negative, b = 3.62 (.35, 6.88), p = .030, (c) *premeditation* x Neutral, b = -3.26 (-6.55, .02), p = .052, and (d) *(lack of) perseverance* x Negative, b = -2.67 (-5.49, .15), p = .064.

Based upon findings from the correlation analysis (Table 25), scatterplots (Figure 19), and individual linear regressions, I selected the following four factors (with their corresponding interaction variables) for final multiple linear regression and moderation analysis: *intellect*, *stress management*, *premeditation*, and *(lack of) perseverance*. Including the dummy variables, I arrived at 19 total predictors. This amount moderately exceeded the general rule of one variable per ten observations for a reliable regression (Field, 2013; Larson-Hall, 2010). Due to the exploratory nature of the analysis, however, I accepted the associated risks and proceeded with the examination. Using the forced entry method (i.e., dummy variables in Step 1, factor scores in Step 2, and interaction variables in Step 3), I arrived at a final model that accounted for 29% of the variance in immediate posttest performance. With all predictors, the regression equation was statistical, $F_{19, 96}$ = 2.02, p = .014. Table 26 provides these findings.

Table 26
Linear Model of Predictors of Immediate Grammaticality Judgment Accuracy

	R^2	ΔR^2	*b (95% CI)*	*SE B*	*Beta*
Model 1					
Constant			52.19* (49.97, 54.41)	1.12	
Positive group	.03	.03	2.98 (-.16, 6.12)	1.58	.21
Negative group			2.01 (-1.13, 5.15)	1.58	.14
Neutral group			1.20 (-1.94, 4.34)	1.58	.09
Model 2					
Constant			51.83* (49.61, 54.06)	1.12	
Positive group			3.55* (.39, 6.71)	1.60	.26
Negative group			2.44 (-.69, 5.57)	1.58	.18
Neutral group	.09	.06	1.40 (-1.77, 4.56)	1.60	.10
Intellect			1.16* (.00, 2.32)	.58	.19
Stress management			-.15 (-1.41, 1.11)	.64	-.02
Premeditation			.45 (-.81, 1.71)	.64	.07
(Lack) Perseverance			-.52 (-1.73, .69)	.61	-.08
Model 3					
Constant			52.37* (50.14, 54.59)	1.12	
Positive group			3.60* (.52, 6.68)	1.55	.26
Negative group			1.46 (-1.65, 4.58)	1.57	.11
Neutral group			.82 (-2.32, 3.97)	1.58	.06
Intellect			-.71 (-3.21, 1.79)	1.26	-.12
Stress management			-1.99 (-4.49, .51)	1.26	-.31
Premeditation			1.66 (-.72, 4.04)	1.20	.26
(Lack) Perseverance			-.64 (-2.69, 1.41)	1.03	-.10
Intellect x Positive			4.16* (.82, 7.50)	1.68	.41
Intellect x Negative	.29*	.20*	1.50 (-1.84, 4.84)	1.68	.12
Intellect x Neutral			2.18 (-.36, 5.72)	1.78	.17
Stress management x Positive			.27 (-3.52, 4.05)	1.91	.02
Stress management x Negative			3.67* (.21, 7.13)	1.74	.30
Stress management x Neutral			1.12 (-2.32, 4.55)	1.73	.09
Premeditation x Positive			-2.80 (-6.57, .96)	1.90	-.20
Premeditation x Negative			-.03 (-3.31, 3.25)	1.65	.00
Premeditation x Neutral			-4.26* (-7.72, -.81)	1.74	-.30
(Lack) Perseverance x Positive			3.60 (-.06, 7.25)	1.84	.22
(Lack) Perseverance x Negative			-.93 (-3.84, 1.98)	1.47	-.09
(Lack) Perseverance x Neutral			-.55 (-3.87, 2.78)	1.68	-.04

*p <.05.

Findings from Model 3 indicated that exposure to positive film clips and images was a significant predictor of a positive L2 learning performance, $t(96) = 2.32$, $p = .022$. While the individual factors alone were not significant predictors of GJT performance, some were important via their interactions with certain mood states. Moderation analysis indicated that the following interactions were near-significant or significant: (a) *intellect* x Positive, $t(96) = 2.47$, $p = .015$; (b) *stress management* x Negative, $t(96) = 2.11$, $p = .038$; (c) *premeditation* x Neutral, $t(96) = -2.45$, $p = .016$; and (d) *(lack of) perseverance* x Positive, $t(96) = 1.95$, $p = .054$.

3.4.3 Analyses of Significant Interactions

Figure 20 shows the results for *intellect*, which was derived from BFAS items such as, "I am quick to understand things," "I formulate ideas clearly," and "I like to solve complex problems." Based on the moderation analysis, participants in the Positive group with higher reported *intellect* levels experienced a benefit to learning, performing better than the average *intellect* group by 6% and the below-average *intellect* group by 9%. Such discrepancies were also noted within the Negative and Neutral groups. This means that individuals with higher *intellect* levels were more likely to outperform in L2 learning tasks while experiencing some form of emotional induction. Those with lower *intellect* levels, however, were disadvantaged by their mood state.

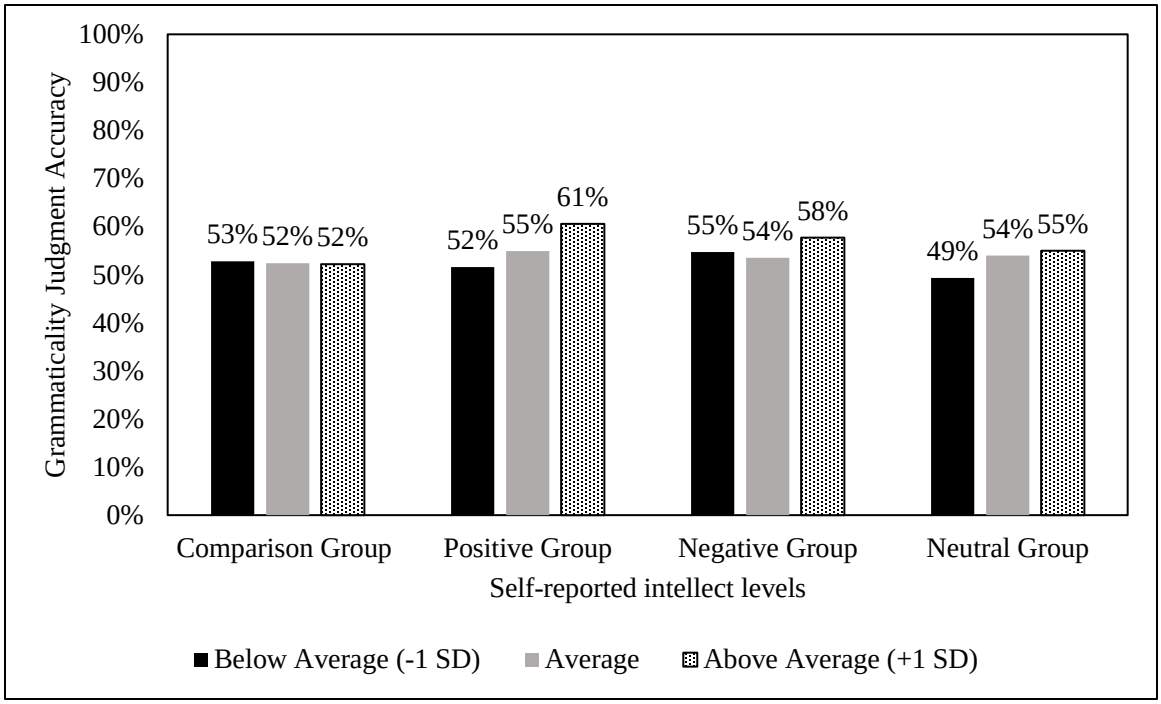

Figure 20. Immediate posttest performance by group based upon intellect levels. For the Comparison, Positive, and Negative groups, $n = 30$; for the Neutral group, $n = 29$.

In past research, *intellect* has been associated with a proclivity for explicit learning (Gebauer & Mackintosh, 2007; Kaufman et al., 2010; Toplak et al., 2010; Xie et al., 2013). As a secondary analysis, I correlated this trait with both the proportion and accuracy rates of participants from each group when basing their judgments on explicit source attributions (i.e., *recollection* or *rule knowledge*). The findings, presented in Table 27, show that individuals from the Positive group (and to a lesser extent, Comparison and Neutral groups) with higher reported levels of *intellect* were more likely to utilize explicit source attributions during the immediate GJT. Participants from both the Positive and Negative groups were more accurate when basing their responses on explicit measures.

Table 27

Correlations of Intellect with Explicit Source Attribution Proportion and Accuracy by Group

Factor	Group		Proportion	Accuracy
Intellect	**Comparison**	*r*	.241	-.205
		p	.199	.277
		n	30	30
	Positive	*r*	**.535**	**.393**
		p	.002	.031
		n	30	30
	Negative	*r*	-.206	.193
		p	.274	.308
		n	30	30
	Neutral	*r*	.230	-.288
		p	.230	.130
		n	29	29

Note. Significant correlations ($p < .05$) are in bold.

Next, I generated a graph of the *stress management* interactions, which is found in Figure 21. This factor was composed of TEIQue-SF items such as, "on the whole, I'm able to deal with stress," "I generally believe that things will work out fine in my life," and "generally, I'm able to adapt to new environments." Within the Negative group, participants who rated themselves with average or higher levels of this trait performed the best overall, whereas those with lower levels performed 7% worse. This trend was not found within the other three groups. The finding suggests that *stress management* was only beneficial to L2 learning when activated by a negative mood state.

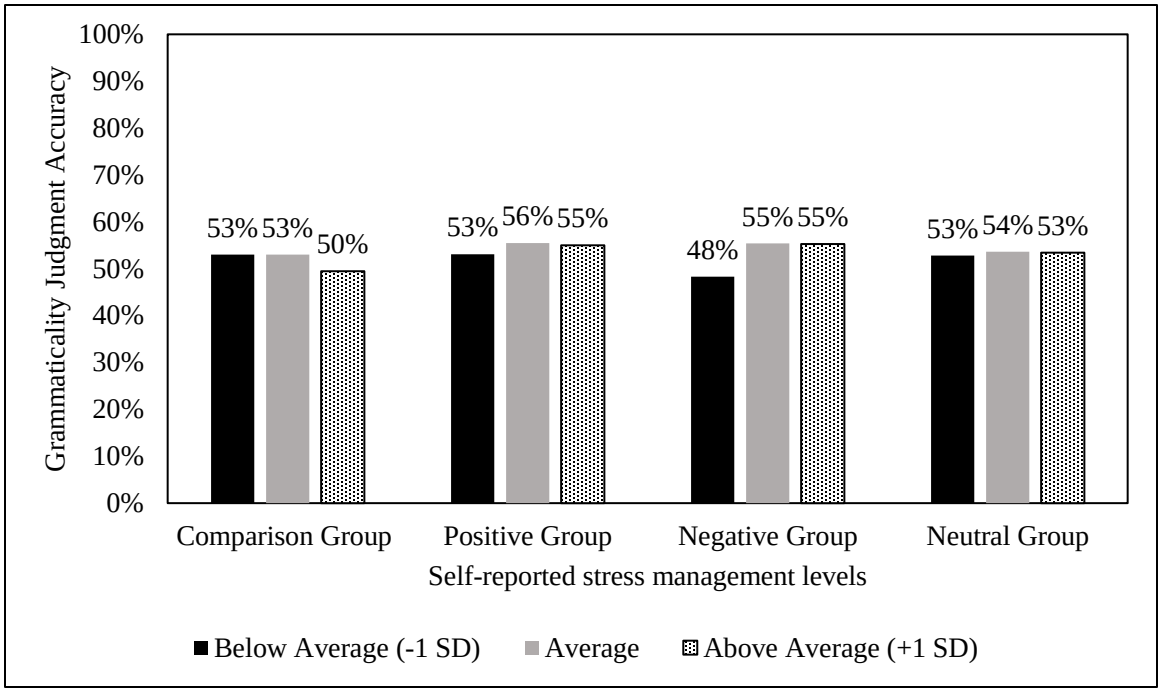

Figure 21. *Immediate posttest performance by group based upon stress management levels*. For the Positive and Negative groups, $n = 30$; for the Comparison and Neutral groups, $n = 29$.

Stress management, which is a component of EI (see Section 1.8) and showed a strong association with *intuitive ability* and *sensation seeking* (see Section 3.4.2), may exhibit properties related to implicit learning (Fiori, 2009; Zeidner et al., 2009). To test this hypothesis, I correlated the trait with both the proportion and accuracy rates of participants from each group when basing their judgments on implicit source attributions (i.e., *guess* or *intuition*). The findings, presented in Table 28, indicate that individuals with higher levels of stress management were less inclined to select implicit source attributions overall. This was especially evident for those in the treatment groups, showing that in an emotional state, implicit knowledge was driven by one's inability to regulate stress. Interestingly, participants from the Negative group with above-average levels of stress management were the most accurate when using implicit measures.

Table 28
Correlations of Stress Management with Implicit Source Attribution Proportion and Accuracy by Group

Factor	Group		Proportion	Accuracy
Stress Management	**Comparison**	*r*	-.027	-.072
		p	.889	.711
		n	30	30
	Positive	*r*	**-.548**	.176
		p	.002	.353
		n	30	30
	Negative	*r*	-.235	**.591**
		p	.211	.001
		n	30	30
	Neutral	*r*	-.333	-.226
		p	.077	.239
		n	29	29

Note. Significant correlations ($p < .05$) are in bold.

Results from the *premeditation* interactions are graphed in Figure 22. Example UPPS items for this factor included, "my thinking is usually careful and purposeful," "I am a cautious person," and "before making up my mind, I consider all of the advantages and disadvantages." Here, participants from the Neutral group that reported lower levels of premeditation performed 5% better than those with higher rates. The same trend was not found in the other three groups, where a lack of impulsivity signaled a benefit to L2 learning. This was especially true in the Negative group, where participants with above-average levels of the trait scored 9% higher than those with below-average levels.

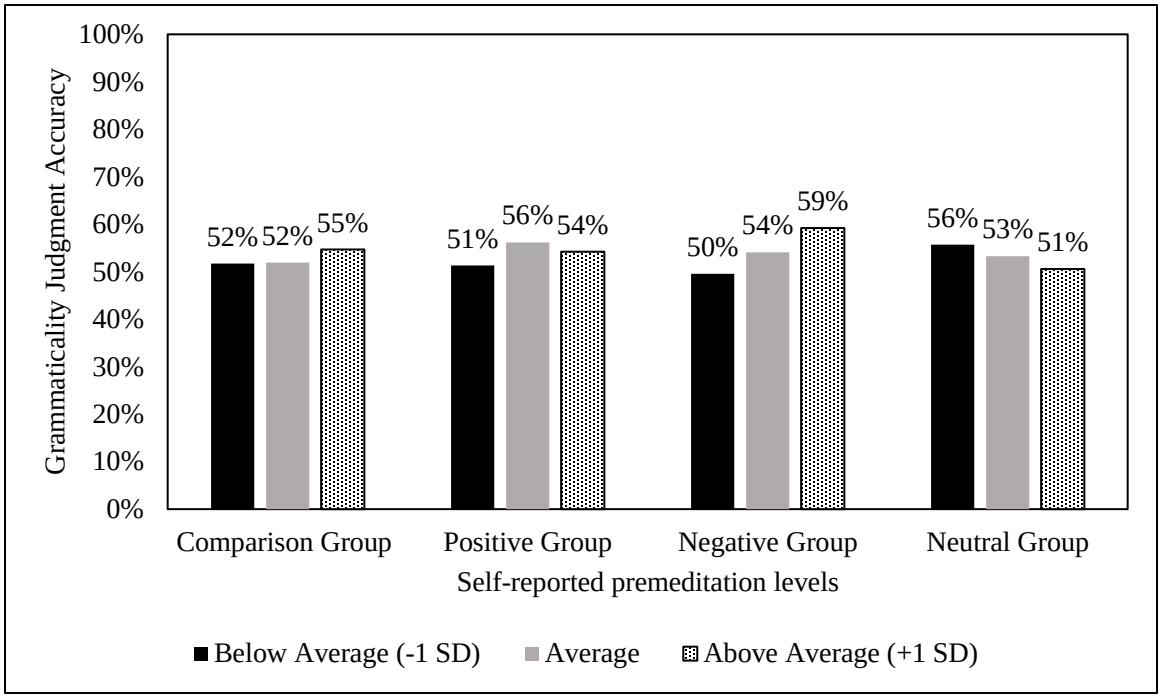

Figure 22. *Immediate posttest performance by group based upon premeditation levels*. For the Comparison and Positive groups, *n* = 30; for the Negative and Neutral groups, *n* = 29.

Figure 23 contains the interaction results based upon *(lack of) perseverance*. UPPS items related to this factor were, "I generally [do not] like to see things through to the end," "I [cannot] concentrate easily," and "I tend to give up easily." From these findings, participants in the Positive group with higher levels of *(lack of) perseverance* performed 4.5% better than those with average or lower levels. Interestingly, the Negative group displayed a reverse pattern, with higher levels of *(lack of) perseverance* marking a disadvantage to L2 learning. Immediate GJT performance within the Comparison and Neutral groups was not impacted by this trait.

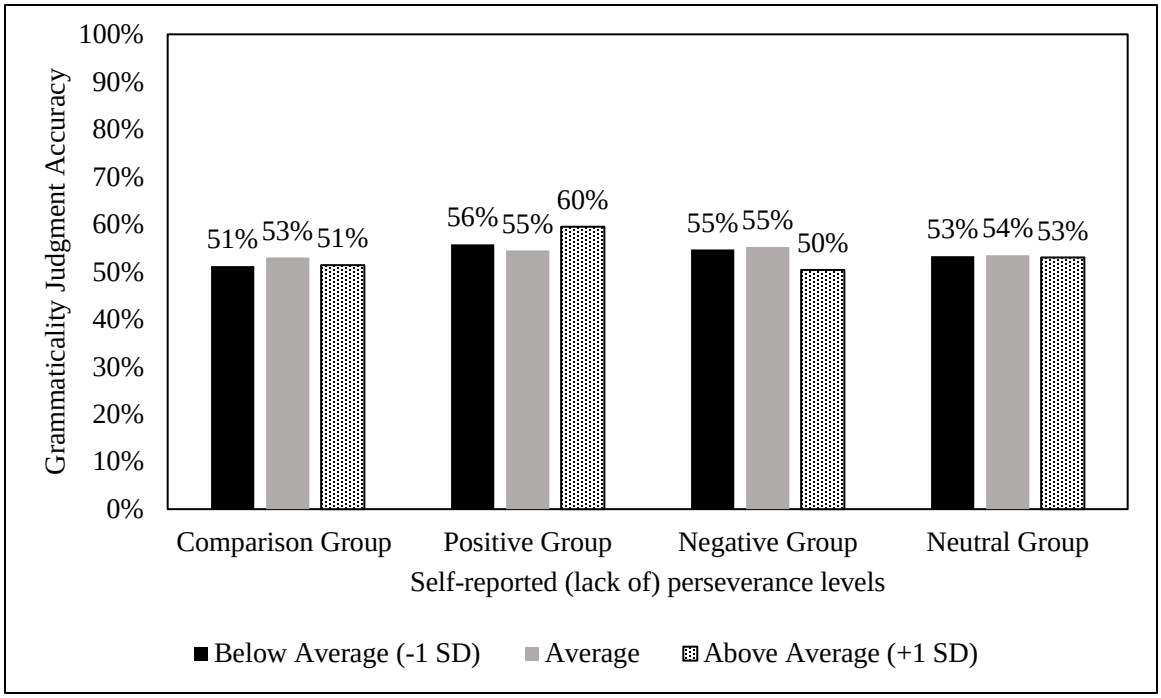

Figure 23. *Immediate posttest performance by group based upon (lack of) perseverance levels*. For the Comparison and Negative groups, $n = 30$; for the Positive and Neutral groups, $n = 29$.

As proxies for impulsivity, a *(lack of) premeditation* and a *(lack of) perseverance* have also been linked to implicit learning (Kaufman et al., 2010; Strack & Deutsch, 2004). To follow up on these potential relationships, I correlated the traits with both the proportion and accuracy rates of participants from each group when basing their judgments on implicit source attributions. Table 29 presents the findings. In agreement with the abovementioned literature, those with lower reported levels of *premeditation* tended to select implicit source attributions more often than their counterparts, regardless of group. Only participants from the Neutral group with a *(lack of) premeditation*, however, were more accurate when basing their responses on *guess* or *intuition*. For *(lack of) perseverance*, the results were mixed. Participants that reported a *(lack of) perseverance* utilized implicit source attributions more in the Positive and Neutral groups. I found the opposite pattern, however, within the Comparison and Negative groups. Finally, accuracy rates with implicit source attributions were highest for the Positive group

participants, followed by the Neutral and Comparison group participants, with lower levels of *perseverance*.

Table 29
Correlations of Premeditation and (Lack of) Perseverance with Implicit Source Attribution Proportion and Accuracy by Group

Factor	Group		Proportion	Accuracy
Premeditation	**Comparison**	*r*	-.099	.258
		p	.603	.168
		n	30	30
	Positive	*r*	**-.380**	.080
		p	.039	.674
		n	30	30
	Negative	*r*	-.073	.347
		p	.708	.065
		n	29	29
	Neutral	*r*	-.103	**-.462**
		p	.596	.012
		n	29	29
(Lack of) Perseverance	**Comparison**	*r*	-.161	.044
		p	.397	.816
		n	30	30
	Positive	*r*	.124	.203
		p	.520	.290
		n	29	29
	Negative	*r*	-.049	-.217
		p	.799	.250
		n	30	30
	Neutral	*r*	.293	.058
		p	.124	.765
		n	29	29

Note. Significant correlations ($p < .05$) are in bold.

3.5 General Summary of the Results

In this study, participants attempted to learn and retain the syntax of a semiartificial L2 presented in a meaning-focused task. Learners in three of the four groups were emotionally induced (either positively, negatively, or neutrally) throughout the exposure phase to examine the

effects of mood states on L2 acquisition. Results indicated that all groups learned aspects of the target L2 verb patterns as measured by immediate GJT accuracy rates and *d* prime scores. After a two-week period of no exposure, delayed GJT posttest results showed that participants from the Comparison, Positive, and Neutral groups successfully retained their acquired knowledge of the L2 syntax. Individuals within the Negative group, however, failed to perform at levels significantly above chance, perhaps signaling that their knowledge was not durable. In terms of the overall learning effect, participants from all experimental groups perceived that post-verbal subject (VS) and VF structures were essential components of the L2 syntax, while generally dismissing sentences with pre-verbal subjects as ungrammatical.

Next, analysis of source attribution ratings revealed that participants from all groups performed significantly above chance only when using the explicit measures of *recollection* and *rule knowledge*. This phenomenon occurred at both the immediate GJT (although there was evidence that positively and negatively induced participants relied more heavily on guessing and intuition) and delayed GJT (apart from the Negative group, who performed at chance levels with explicit attributions on the delayed posttest). The findings suggest that under incidental exposure, learners did not develop implicit knowledge of the L2 syntax, regardless of mood state. Analysis of retrospective verbal reports indicated that although the majority of learners in the Comparison, Positive, and Neutral groups (and less than half from the Negative group) could verbalize some aspects of the L2 grammar structure (i.e., V2-like and VF-like rules), no one was able to correctly articulate how verbs functioned within main and subordinate clauses of the target syntax. This development of conscious, albeit incomplete, knowledge reinforced that learning gains from incidental exposure overwhelmingly derived from explicit means.

Lastly, the examination of individual differences measures, mood state, and L2 incidental exposure indicated a variety of predictors that contributed to overall learning performance. I found that positive emotionality facilitated higher accuracy rates overall on the immediate GJT. Moderation analysis also yielded four meaningful interactions. First, a positive mood state moderated the relationship between *intellect* and *(lack of) perseverance* and learning performance. Those with higher levels of both traits scored better on the immediate posttest than their counterparts with average to below average levels. Next, negative emotionality moderated the relationship between *stress management* and learning performance. Here, the ability to regulate stress ensured higher GJT scores. Third, a neutral mood state functioned as a moderating variable between *(lack of) premeditation* and learning performance, where higher levels of impulsivity aided higher GJT scoring. Finally, correlation analysis between these four traits and group source attribution proportion data indicated the following: (a) a positive correlation between *intellect* and the use of explicit source attributions (except for the Negative group); (b) a negative correlation between both *stress management* and *premeditation* and the use of implicit source attributions; and (c) a positive correlation between *(lack of) perseverance* and the use of implicit source attributions (except for the Comparison and Negative groups).

CHAPTER 4

DISCUSSION

In this study, four groups of participants (three emotionally induced and one comparison) were exposed to a variety of verb placement rules from a V2-structured, semi-artificial language under incidental conditions. I examined whether participants learned and retained the target grammar structures of the L2 (via immediate and delayed GJTs) and how this knowledge was best characterized (via explicit and implicit source attributions and retrospective verbal reports). Finally, I measured the effects of emotionality on the relationship between a variety of individual differences and L2 learning performance. My data analysis yielded the following key findings: (a) according to subjective reports, the EMDB film clips and IAPS images were effective in generating negative and neutral mood states, but only slightly effectual in producing positive emotionality; (b) positive, negative, and neutral emotional induction did not interfere with the immediate learning of an L2 syntax; (c) only participants exposed to negative stimuli failed to retain their knowledge of the L2 grammar after a two-week period; (d) no treatment group was able to acquire the target syntax implicitly; (e) positive emotional induction was a significant predictor of L2 learning performance; (f) positive affect enhanced the relationship between the traits of *intellect* and *(lack of) perseverance* and learning performance; (g) negative affect diminished the relationship between *(lack of) stress management* and learning performance; (h) neutral affect enhanced the relationship between *(lack of) premeditation* and learning performance; (i) the use of explicit source attributions correlated positively with intelligence (minus the Negative group); and (j) the use of implicit source attributions correlated negatively with both *stress management* and *premeditation* for all groups, and positively with *(lack of) perseverance* only for the Positive and Neutral groups. Within this chapter, I examine the

findings of my study in relation to the recent discoveries made by researchers in the fields of emotional psychology, SLA, and adult education.

4.1 The Effectiveness of Emotional Induction

With respect to the emotional stimuli used in this study, the combination of EMBD film clips and IAPS pictures successfully produced the expected mood states for participants in the Negative and Neutral groups (see Tables 8 and 10). That is, the Negative group reported significant decreases in valence and significant increases in arousal that were sustained throughout the exposure phase. For the Neutral group, participants' emotional and arousal states remained at levels consistent with the Comparison group over the same time course. SAM ratings and verbal reports from the Positive group, however, indicated that the positive stimuli did not perform as anticipated. Although these film clips and images counteracted the negative effects of adaptation (i.e., growing used to the treatment) over time, they failed to significantly elevate participants' valence and arousal levels as measured by subjective self-assessments. One possible explanation for this disparity lies in how men and women generally respond to visual, erotic stimuli.

Within this study, erotica represented 100% of the EMDB film clips and 44% of the IAPS images used to induce positive emotions. Although both genders demonstrated similar decreases in valence over the induction period, the males from the Positive group exhibited an increase in arousal almost three and a half times greater than their female counterparts (see the notes sections of Tables 7 and 9).[6] These results partly aligned with previous research identifying gender differences in emotional reactions to sexually explicit material (Bradley,

[6] Differences in self-report by gender did not translate into learning differences, as measured by immediate GJT performance. Here, the mean accuracy rates of males, $M = 55.37$, and females, $M = 54.76$, were not significantly different, $U = 86.00$, $z = -.38$, $p = .722$.

Codispoti, Sabatinelli, & Lang, 2001; Jacob, Arntz, Domes, Reiss, & Siep, 2011; Rupp & Wallen, 2008). For instance, Bradley et al. (2001) found that men rated erotic pictures from the IAPS as significantly more pleasant and arousing than did the female participants. In a separate study from the same article, the researchers also reported that after viewing images of the opposite sex, the males often self-described as "sexy" and "excited," whereas the females felt "amused" or "embarrassed." These findings mirrored the gender differences from self-assessment arousal data and retrospective reports (see Appendix J) within the Positive group. Here, female participants were either genuinely less affected by the (mostly) erotic material or succumbed to a gender bias often present in emotional reporting. Examples of sociocultural influences that might lead females to understate their affective status include perceived social expectations and cultural attitudes toward sexual expression (Rupp & Williams, 2008). According to Jacob et al. (2011), the inclusion of less sexually-explicit material and more romantically-themed stimuli (e.g., romantic couples) would perhaps facilitate greater increases in, and more accurate self-assessments of, positive emotionality and arousal for female participants. For the purposes of this study, however, I still categorized participants from this group as "positive" since their valence and arousal ratings were overall consistent with positive induction, albeit at reduced levels.

4.2 Emotional Induction on Learning and Retaining L2 Syntax

My initial research question focused on the role of positive, negative, and neutral mood states in the learning and retention of an L2 syntax. I discovered that, on par with the Comparison group, participants in all three treatment groups successfully acquired aspects of the key verb placement structures (i.e., V2(VS), V2(VS)-VF, VF-V1) as per their above-chance accuracy rates and *d* prime scores from the immediate GJT (see Tables 13 and 14). Here,

emotional induction did not appear to restrict L2 grammar learning under incidental conditions. With respect to retention, only participants from the Comparison, Positive, and Neutral groups consistently maintained above-chance GJT performance and *d* prime scores over a two-week period. Individuals from the Negative group, however, failed to sustain their initial knowledge gains on the latter posttest, perhaps suggesting that negative mood states may hinder aspects of long-term, L2 retention (see Tables 16 and 17). While my findings in this regard are somewhat tenuous, the outcome aligns with previous researchers that have also identified negative affect as detrimental to learning (Elnicki, 2010; MacIntyre & Gregersen, 2012; Miller et al., under review; Pekrun et al., 2011; Shang et al., 2013).

One possible explanation for these findings is how the negative stimuli may have impacted participants' focus during incidental exposure. I arranged the treatment groups' film clips and images throughout the exposure phase in accordance with Tobias' (1986) model, which highlighted three points where anxiety most prominently interfered with learning: pre-processing, during processing, and after processing (before output) (see Figure 3). Participants primarily in the Negative group, and to a lesser extent the Positive group, showed evidence of processing interference during the exposure phase (Phase 3) of this experiment. For example, both groups exhibited uneven performances while attempting to repeat the 120 sentences from the exposure set. Within-group testing showed near-significant differences in accuracy over the course of exposure. Participants from the Comparison and Neutral groups, however, were more stable, maintaining more consistently accurate repetitions throughout the same period (see Figure 6). Also, the Negative group displayed significant inconsistencies in reproducing the VF-V1 verb pattern (Figure 8) as compared to the other three groups.

During these instances, participants exposed to negative and positive mood states may have been colored by affective attention that diverted processing resources toward the source of emotionality rather than the incidental learning task. Subsequently, the prioritization of emotional information over the target input, especially at the pre-processing stage prior to sentence repetition, possibly influenced (either positively or negatively) how the material was encoded and later processed by the learner (Pessoa, 2010; Pessoa et al., 2012; Tobias, 1986). Interestingly, this phenomenon did not manifest itself in immediate GJT scoring, where both groups demonstrated a learning effect of the L2 syntax on par with the Comparison and Neutral groups. Delayed posttest results, however, confirmed that participants in the Negative group may have failed to fully encode, and thus successfully retain knowledge of, aspects of the L2 syntax that they initially learned. This contrasts with the Positive group, whose delayed GJT scores remained high after the two-week period.

One reason as to why affective attention was a greater detriment for participants in the Negative group than those from the Positive group lies with the dual competition framework (Pessoa, 2009). This model posits that task-irrelevant stimuli (e.g., the film clips and images used in this study) can impact cognitive control by competing for processing resources needed to accomplish a primary function (e.g., an L2 learning task). Whether the stimuli interfere with or facilitate task performance is dependent upon their level of intensity. For some participants in the Negative group, resources were likely diverted away from the L2 learning task in order to process the highly arousing (i.e., high threat) film clips and images. While participants in the Positive group may have also experienced affective impacts, subjective measures (Table 9 in Section 3.1.2) and verbal reports (Section 3.1.3.1) indicated that the stimuli were less intensive (i.e., low threat) and unlikely to receive processing prioritization over the requirements set forth

in the L2 exposure phase. It is possible, then, that the Positive film clips and images functioned not to disrupt cognitive control, but instead to keep participants more alert and interested in the experimental tasks. This broad assessment, of course, does not address the specific individual differences that may also have played a role in regulating affective attention for participants in both groups. More discussion on this topic can be found in Section 4.4.

Another interesting finding from this study is how emotions affected the relationship between immediate and delayed posttest performances by group. As detailed in Section 3.2.2.3, I discovered significant and near-significant correlations among the two GJT scores for participants within the three treatment groups. This means that, at the individual level, positive and negative (and to a lesser extent, neutral) mood states functioned to anchor knowledge retention relative to the initial amount of knowledge learned. The phenomenon offers a more complex view of how emotions might influence L2 retention, challenging the general supposition that positive emotions engender learning, while negative emotions have the opposite effect (see MacIntyre & Gregersen, 2012). In this study, if mood states (either positive *or* negative) were helpful to the individual during learning, long-term retention was likely. Conversely, if affect interfered with the initial learning process, long-term retention also suffered. The results offer a stark contrast to the relationship found within the Comparison group, where delayed posttest scores were at a similar level for all participants and independent of immediate GJT performance. As I am (I believe) the first to compare short-term and long-term L2 assessments for participants trained under a variety of emotional stressors, these findings are preliminary and in need of confirmation through future research.

A final area of discussion, not related to emotions, involves the actual learning effect from this study. Consistent with research using the same semiartificial language and exposure

set items (Godfroid et al., in preparation; Rebuschat & Williams, 2012), no one from the treatment groups ascertained the three formal rules of the L2 grammatical system (as outlined in Table 3). Rather, participants acquired only partial aspects of the L2 syntax. Utilizing the endorsement rates across sentence types (see Tables 15 and 18), these features can be largely reduced into three rudimentary "perceived rules."[7] The first is that verbs can appear in the final position of any clause, which supports the high endorsement rates for the V2(VS)-VF, VF-V1, *VF, and *V1-VF structures. The second rule is that verbs must precede the subject, which explains the high endorsements of the V2(VS), V2(VS)-VF, VF-V1, *V1, and *V1-VF forms. The third rule is that pre-verbal subjects are not a part of the grammar, which resulted in low endorsement rates for the V2(SV), V2(SV)-VF, *V3, and *VF-V2(SV) structures. Here, participants did not seem to favor sentences with English-like structures, which included any use of the SV form. The incongruity between these "perceived rules" and the "formal rules" is not uncommon, given the complex nature of the L2 syntax and the limited exposure to grammatical items in the exposure phase (see also Godfroid et al., in preparation). In my view, the participants' basic realizations represent an initial, yet positive step in the L2 learning process. I would offer that additional contact with the semiartificial language, even under incidental conditions, might allow learners to develop more target-like grammatical knowledge of the L2 over time (see Perruchet & Pacteau, 1990).

[7] There are two qualifications to these rules that should be noted. The first pertains to the *V4 structure, which does not align with any of the "perceived rules." Although participants overwhelmingly endorsed this form on the immediate posttest, the structure fell out of favor on the delayed posttest. Next, the V2(VS) form, which is included in the second "perceived rule" and was highly endorsed on the immediate posttest, dropped to at chance endorsement levels on the delayed posttest. In my opinion, these aberrations do not necessarily invalidate what participants seemingly acquired about the L2.

4.3 Emotional Induction and Implicit Knowledge Acquisition

The second research question asked if individuals exposed to positive, negative, or neutral mood states could acquire an L2 syntax implicitly. The triangulation of source attribution and accuracy data from the immediate and delayed posttests (Tables 20 and 23) provided no definitive evidence that experimental participants developed unconscious structural knowledge of the L2 grammar system. Individuals exposed to emotional stimuli were overwhelmingly more accurate on the immediate and delayed (minus the Negative group) GJTs when attributing their responses to *recollection* or *rule knowledge*. That said, participants from the Positive and Negative groups exhibited a greater *predisposition* to implicit knowledge acquisition directly after emotional induction. Indicators from the immediate posttest included higher (although not significantly higher than chance) accuracy rates when basing GJT responses on *intuition* or *guess* as compared to the Comparison and Neutral groups (Table 20) and a greater preference for implicit source attributions in general (Figure 16). Analysis of the individual verb patterns (Table 21) also hinted that unconscious knowledge drove judgments of the V2(SV) and *V1 structures within the Positive group.[8] While these findings are interesting and likely influenced by processing interferences from the positive and negative film clips and images, they do not provide sufficient evidence for implicit knowledge acquisition. This conclusion runs counter to previous L2 research which used semiartificial languages and similar incidental learning conditions and found evidence of implicit knowledge formation (Grey et al., 2014; Rebuschat & Williams, 2012). In both studies, the researchers measured participants' GJT accuracy rates at levels significantly above chance when paired with the implicit source

[8] Given the large amount of verb pattern comparisons in the GEE model, these effects may also be interpreted as spurious.

attribution of *intuition*. This outcome, however, was not replicated by Godfroid et al. (in preparation). As in this study, Godfroid and colleagues found no meaningful indications that participants developed unconscious knowledge of the target L2 syntax after incidental exposure.[9]

With respect to retrospective verbal reporting, no participant could identify the three specific verb placement rules of the L2 syntax. Based upon responses, individuals fell into one of four categories: (a) no awareness of verb placement, (b) some awareness of verb placement, (c) awareness of a V2-type rule, and (d) awareness of a VF-type rule. These findings highlight the value of multiple awareness measures when assessing what type of knowledge is acquired from learning under incidental conditions (see also Godfroid et al., in preparation; Rebuschat & Williams, 2012). Alone, retrospective verbal reporting (Section 3.3.3) would have shown implicit knowledge to be a significant driver of learning, as many participants displayed above-chance performance on the GJT, but were unable to articulate any rule, regulation, or verb pattern associated with the L2 syntax. This assumption, of course, is faulty when paired with analysis from immediate and delayed source attribution data and underscores the issues of insensitivity and incompleteness with verbal reports (Rebuschat, 2013). Another point to consider is how the amount of time between the initial L2 exposure and the retrospective interviews (two weeks) might have affected the quality of the verbal reports. Although speculative, it is reasonable to assume that the delayed reporting may have generated more comments signaling "no awareness of verb placement" and "some awareness of verb placement" due to memory degradation. Nonetheless, a larger percentage of Negative group participants (54%) failed to recall either a V2-type or VF-type rule as compared to those within the Positive

[9] Godfroid and colleagues found evidence of unconscious structural knowledge for only one verb pattern out of seven (VF-V1) in one subgroup of learners (V2-aware).

(39%) or Neutral (47%) groups. This phenomenon provides some evidence of negative mood state interference in long-term, conscious knowledge formation.

One explanation for why participants did not acquire implicit knowledge of the L2 syntax may lie with how adults learn, and ultimately acquire, second languages. The Fundamental Difference Hypothesis (Bley-Vroman, 1988; DeKeyser, 2003) states that adults primarily favor problem-solving strategies and analytical processing when learning new languages. Such techniques allow adults to make sense of new vocabulary and complex grammars quickly and with minimal input. This contrasts with the language learning mechanisms of children, which are assumed to be largely implicit and occur without awareness. Over the past few decades, researchers have noted the importance of explicit cognitive processing in terms of both adult L2 acquisition (DeKeyser, 2000) and its pedagogical value in the classroom (Leow, 2015). In accordance with the abovementioned literature, I also discovered that my participants, all of whom were over the age of 18, relied more on their conscious knowledge of the novel language to navigate the two performance assessments. This phenomenon likely occurred because participants either developed an awareness of certain syntactic features of the L2 or employed explicit processing strategies while exposed to the incidental learning task (see DeKeyser, 2003). Even when proportion data skewed in favor of implicit source attributions, as I found in the Positive and Negative groups, participants were still not accurate in their grammatical judgments. Therefore, I believe that any evidence of implicit knowledge found within the treatment groups should be solely attributed to mood state distractions. For adult learners to legitimately manifest unconscious knowledge, they would have likely needed much more L2 input over an extensive period of time (e.g., akin to a long-

term study abroad or immersion program), rather than the 120 sentences from the exposure set provided in this experiment (DeKeyser, 2000; Loewen, 2015).

Methodological differences, especially with the Rebuschat and Williams (2012) study, may also account for why I did not find evidence of implicit knowledge (acquisition) among the treatment groups. The first issue is that of sample size. The experimental group from the Rebuschat and Williams study included only 15 participants, which is a small number and arguably not well representative of the target population. Smaller *N* sizes are also more prone to sampling errors (see Field, 2013), where certain effects (e.g., high GJT accuracy rates when basing one's decision on *intuition*) may disappear with the inclusion of additional participants. I believe this to be the case in my study, where the likelihood of unconscious knowledge acquisition faded over the larger group sample sizes (30 participants each). Secondly, the testing instructions provided by Rebuschat and Williams may have biased participants towards the source attribution of *intuition*. As detailed in the GJT testing guidelines from Experiment 3 of Rebuschat (2008), from which the Rebuschat and Williams study was derived, the researcher directed participants to "rely on your intuition when judging the well-formedness of the sentences" (p. 189). Such a statement may have influenced individuals to inadvertently select *intuition* over other source attributions throughout the posttest, thus skewing the overall accuracy rates. In my experiment, participants were not asked to favor a specific source attribution on the GJTs, which likely generated a more honest assessment of what knowledge was acquired during incidental learning.

Finally, I discovered that while source attributions were a helpful tool for gauging awareness, the measurement's effectiveness extended only to the immediate posttest. Here, good discrimination between the two source attribution types emerged within two of the four

experimental groups (Comparison and Neutral groups). After a two-week period, however, the use of source attributions became less reliable as all groups selected the two categories at equal rates. This finding contrasts with Grey et al. (2014), who still recorded good discrimination between implicit and explicit source attributions (62% and 38% proportion rates, respectively) among participants on a delayed acceptability judgment task. Similar to my study, the time separation between immediate and delayed posttest was two weeks. As very few researchers have utilized source attributions over extended periods, further applications of delayed posttest designs are needed to the confirm the validity of the measure.

4.4 Mood States and the Interconnection of Individual Differences and L2 Learning

The final research question centered on whether positive, negative, and neutral mood states impacted the relationship between openness, intuition, EI, FLA, and impulsivity and L2 learning performance. Using the BFAS, REI, TEIQue-SF, FLCAS, and UPPS questionnaires to measure participants' trait levels, I extracted 14 factors for further analysis (see Table 24). Linear regression revealed that no single factor significantly contributed to learning. Rather, four specific traits (i.e., *intellect*, *stress management*, *premeditation*, and *(lack of) perseverance*) were influential through their interaction with certain mood states (as detailed in Table 26 and Section 3.4.3). For example, positive affect (and to a lesser extent, negative and neutral affect) enhanced immediate GJT performance for participants with average to above average levels of self-reported *intellect*. This trait, which has been linked to fluid intelligence and working memory (DeYoung, Peterson, & Higgins, 2005), not only shielded against the negative impacts of emotional distractors, it also aided in learning. The finding is similar to previous research by Reeve, Bonaccio, and Winford (2014), who noted that high academic ability functioned to buffer mood state interferences. As such, the positive film clips and images in this study likely kept

individuals with higher levels of *intellect* more alert and engaged during the exposure phase, rather than hinder L2 learning. Conversely, those with lower trait *intellect* levels may have lacked the processing resources required to sufficiently counteract these same emotional distractors, thus negatively affecting their overall performance (see Pessoa, 2009).

Next, I found that *stress management* was a contributing factor to learning performance for participants within the Negative group. In the context of the current study (unfamiliar syntax exposure combined with high arousal and negative emotional distractors), this outcome makes sense. As a component of EI, *stress management* is linked with how one reacts to and regulates emotional stressors (Petrides, 2009). Here, participants with average or greater than average levels of this trait were more likely to suppress any debilitating effects from the negative film clips and images, freeing up additional processing resources for L2 learning (see Fiori, 2009). Similar to the discussion on *intellect*, processing competition between the negative stimuli and the incidental exposure requirements may have contributed to GJT underperformance for those with lower *stress management* levels.

The effects of *premeditation* and *(lack of) perseverance* on learning performance were mixed and dependent upon a variety of mood state interactions. On the surface, it would seem that participants with higher levels of trait impulsivity (i.e., a lack of *premeditation* or *perseverance*) might uniformly underperform complex learning assessments (like the GJTs from this study) due to a reliance on gut responses over thoughtful contemplation. Grey et al. (2015) found this to be the case in their study of individual differences and L2 learning, where performance on Japlish acceptability judgment tasks negatively correlated with impulsivity. It is worth noting, however, that these results were achieved using cold cognition. With the introduction of affective interference, trait impulsivity appears much more reactive. For

example, while I too discovered that impulsivity, as conveyed through a (*lack of*) *premeditation*, was disadvantageous to immediate GJT performance, the findings were only true for participants exposed to high arousal stimuli (both from the Positive and Negative groups). Unlike the Grey et al. study, participants with higher levels of impulsivity within the Neutral group outperformed those with lower levels and impulsivity was a significant predictor of L2 learning. This suggests that highly impulsive learners may in fact benefit from contact with low-arousal, emotional stimuli. However, impulsivity, as expressed through a (*lack of*) *perseverance*, was found beneficial to learning performance for those within the high-arousal, Positive group. Although this outcome was reversed for Negative group participants, it was not significant (see Figure 23) and may represent an anomaly in the data. The Neutral group remained unaffected by this trait. The disparity in findings among the factors of *premeditation* and *(lack of) perseverance*, as related to high versus low arousal contexts, highlights the unpredictable nature of impulsivity within emotional settings and underscores the need for more research on this specific trait.

Since *intellect*, *stress management*, *premeditation*, and *(lack of) perseverance* were the most influential individual differences in this study, I also examined their relationships with explicit and implicit source attribution proportion data for each treatment group. In accordance with findings from previous literature (Gebauer & Mackintosh, 2007; Kaufman et al., 2010; Toplak et al., 2010; Xie et al., 2013), *intellect* positively correlated with the use of explicit knowledge source attributions in the Positive and Neutral groups (see Table 27). Here, participants with mid to high trait *intellect* levels displayed a greater awareness of how they arrived at their grammaticality judgments, portending an effortful and analytical approach to L2 learning. Interestingly, individuals experiencing negative mood induction did not conform to this relationship. As explicit knowledge is declarative (Ellis, 2004), an inability to produce rule-

based expressions may explain the disparity. This finding was confirmed by the post-experiment verbal reports (see Figure 18), where subjects in the Negative group verbalized fewer rules than any of the other groups.

In terms of implicit knowledge and the traits of *stress management*, *premeditation*, and *(lack of) perseverance*, results were mixed. As an element of EI, which itself has loose ties to implicit learning (Fiori, 2009; Zeidner et al., 2009), *stress management* correlated negatively with the use of implicit source attributions by all treatment groups (see Table 28). The relationship may be related to how participants with lower *stress management* abilities coped with the emotional distractions found throughout this study's exposure phase. As previously discussed, processing competition from the film clips and images likely restricted these individuals' ability to consciously search for grammatical patterns or regularities among the sentences from the exposure set, leading to an overreliance on guessing and intuition to navigate the immediate GJT. For impulsivity (Table 29), I discovered a negative relationship between trait *premeditation* and the use of implicit source attributions by all treatment groups. This finding aligns with previous research (Kaufman et al., 2010; Strack & Deutsch, 2004) linking impulsivity with implicit learning. Here, less deliberate individuals, regardless of mood state influence, likely made their grammaticality assessments quickly and at the unconscious level. Those with higher levels of *premeditation* were more thoughtful in their decisions, relying instead on their explicit knowledge of the L2 syntax throughout the posttest. Trait *(lack of) perseverance* levels exhibited a positive relationship with implicit source attribution use for those within the Positive and Neutral groups. For this measure of impulsivity, my findings diverged from Kaufman et al. (2010) and Strack and Deutsch (2004) only for the Negative group, as participants with lower levels of persistence relied slightly more on their explicit knowledge

while completing the immediate GJT. Although it is possible that this trait comes with a sensitivity to explicit processes through negative mood states, the result is counterintuitive. Further research is needed to understand this finding.

Finally, it is important to address why openness, intuition, and FLA did not significantly influence learning performance for any of the treatment groups from my study. As previously discussed in Sections 3.3.1 and 4.3, accuracy on the immediate GJT was primarily driven by participants' explicit knowledge of the L2 syntax. Since openness and intuition are strongly associated with implicit learning processes (Kaufman et al., 2010; Woolhouse & Bayne, 2000), it is understandable that the two traits offered no tangible benefits to performance in this study. L2 learning performance also suffered no meaningful impacts from FLA, which runs counter to previous research on the subject (Horwitz et al., 1986; Horwitz, 2001; MacIntyre & Gardner, 1989, 1994). The design of this experiment, which included a semiartificial language with English vocabulary, may offer a plausible explanation. Here, participants were not informed of their engagement with a novel language until after the incidental learning task (see Section 2.4.1.4). Any anxiety experienced during the exposure phase (i.e., accurately repeating aloud the scrambled English sentences) was likely regulated by the *stress management* trait rather than an ability to combat FLA.

CHAPTER 5

CONCLUSION

In this final chapter, I present the following three sections to conclude my dissertation: (a) a summarized account of my findings and their contributions to the fields of SLA and cognitive psychology; (b) the pedagogical, theoretical, and methodological implications related to my results; and (c) the limitations of this study and possible directions for future SLA research in the context of hot cognition.

5.1 Summary of the Findings

The present study added to the fields of psycholinguistics and cognitive psychology by investigating the impacts to L2 learning from positive, negative, and neutral mood induction. First, I examined the role of emotionality on the learning and retention of a semiartificial language as presented in a meaning-focused task. As measured by immediate GJT accuracy rates and *d* prime scores, participants from all three treatment groups were able to learn certain features of the L2 syntax. This finding is important and demonstrates the effectiveness of incidental learning conditions in the face of emotional distractors. Regarding retention, only participants from the Positive and Neutral groups successfully sustained their knowledge gains over a two-week period. Those from the Negative group, however, failed in this respect. The findings signal that high arousal, negative stimuli may interfere with aspects of long-term encoding if the mood occurs at the point of initial L2 exposure. However, as effects for this result were small, additional research is warranted to verify the conclusion. In terms of what was actually learned, individuals from all groups seemed to develop similar perceptions about the L2 grammar structure as revealed by their verb pattern endorsement rates. Although not exact, participants formulated workable ideas of what did or did not belong to the German syntax.

These "perceived rules" were target-like and proved sufficient for successfully navigating the learning assessments despite limited access to input.

Next, participants exposed to emotional stimuli in this study did not develop implicit knowledge of the target L2 syntax. Rather, immediate and delayed GJT performance was solely predicated on conscious knowledge sources. While individuals that experienced positive and negative mood state induction did show a greater proclivity for acquiring unconscious knowledge, the phenomenon was likely related to affective interferences during the incidental learning period. The results highlight that adults are analytical in their approach to language learning and, when left to their own devices, are more dependent on explicit means (i.e., *recollection* and *rule knowledge*) to process and interpret unfamiliar L2 material. The combination of source attributions and retrospective verbal reports helped to shape this conclusion, revealing that many treatment group participants developed conscious (yet incomplete) knowledge of the target structures (i.e., V2-like and VF-like rules).

Lastly, this study showcased the various moderating roles of affective stimuli on the relationship between L2 learning performance and four specific personality characteristics. These included *intellect* and *(lack of) perseverance* (as moderated by positive emotionality), *stress management* (as moderated by negative emotionality), and *premeditation* (as moderated by neutral emotionality). The factors of openness, intuition, and FLA, however, were not influential to learning performance in this study. Additionally, I found that *intellect* demonstrated a greater alignment with explicit source attributions, whereas *stress management* negatively correlated with implicit source attributions. *(Lack of) perseverance* and *(lack of) premeditation*, which are closely related to impulsivity, exhibited stronger relationships with implicit knowledge overall.

Only the Negative group, as measured through *(lack of) perseverance*, did not conform to this finding.

5.2 Implications of the Findings

From a pedagogical standpoint, this study verified the efficacy of L2 learning under incidental conditions. Here, all treatment groups successfully learned aspects of a novel grammar system despite the complexity and limited input of the target structures. While the participants' working knowledge of the L2 syntax lacked nuance (e.g., how verbs specifically functioned within main and subordinate clauses), endorsement rates and GJT performance signaled a positive first step towards grammatical sensitivity. That this occurred in the presence of a variety of emotional distractors highlights the hardiness of the learning process. Delayed GJT accuracy rates among the Positive and Neutral groups also demonstrated that learning under incidental conditions is durable, even without additional exposure to reinforce the target material. As evidence exists that semiartificial language learning compares well with natural language acquisition (see Ettlinger, Morgan-Short, Faretta-Stutenberg, & Wong, 2016), L2 instructors would be remiss not to include incidental learning tasks (e.g., communicative activities or reading for content, where the L2 grammar is not the focus; see Loewen, 2015) within their curriculum.

Next, this study confirmed how certain emotions impact language learning. While the affective stimuli appeared to either facilitate or hinder L2 acquisition on an individual level, I found that a positive mood state was the most conducive to learning and a significant predictor of L2 performance. Conversely, negative emotionality generally impaired L2 retention. Language instructors should understand that negative feelings have potentially adverse impacts on student performance that may not manifest themselves until later assessments. This is especially true in

the context of instructed SLA, where language learning is already a process inherently "fraught with emotions" (Swain, 2013, p. 198). Therefore, it is recommended that educators promote a more positive and encouraging learning environment to potentially enhance L2 acquisition. Such efforts would likely mitigate the stress normally associated with language learning and help focus students on the target material.

Theoretically speaking, my findings indicated that adult language learners were unable to acquire implicit knowledge under incidental learning conditions. Even with the presence of emotional distractors, awareness measures confirmed that knowledge was principally formed through conscious means. This outcome runs counter to previous research that found evidence of implicit knowledge acquisition using source attributions and similar learning techniques (Grey et al., 2014; Rebuschat & Williams, 2012). One possible explanation for the discrepancy is related to how adults learn novel languages, which has been hypothesized as uniquely explicit (Bley-Vroman, 1988, DeKeyser, 2000; Leow, 2015). If this is indeed true, a proportion of adult L2 language instruction should leverage activities that tap into explicit learning skills to maximize intrinsic cognitive behavior (see DeKeyser, 2003). My experiment also demonstrated that mood states play an important and complex role in L2 acquisition. To be sure, adult language learning does not normally occur within the sterile confines of cold cognition. How affective attention impacts cognitive control during L2 learning tasks, for example, is an area of psycholinguistics language learning research worthy of further examination. The inclusion of emotional stressors within SLA research may offer a more accurate perspective of how individuals acquire novel languages in the face of mood state influencers.

This study also generated several methodological implications for future research on incidental language learning. The use of multiple awareness measures (i.e., source attributions

and retrospective verbal reports), for example, proved necessary in determining what types of knowledge were acquired by participants. As noted by Godfroid et al. (in preparation), source attributions help make sense of the data (e.g., the verb pattern endorsement rates), while verbal reports identify the contributing factors to overall performance (e.g., GJT scores) (see also Dienes & Scott, 2005; Rebuschat, 2013). Researchers should continue assessing participants in this manner, particularly when GJTs are utilized, to better understand the effects of incidental exposure on knowledge acquisition. Next, the inclusion of a delayed GJT in this experiment's design offered insight into aspects of L2 retention. Future utilization of post-assessments can inform researchers on both the durability of learning under incidental conditions (see Grey et al., 2014), as well as the role of emotions on long-term L2 acquisition. Finally, this study highlighted the importance of including individual differences data within the framework of SLA research. The examination of personality characteristics and how they may predict L2 learning performance, particularly in the context of emotional settings, is vital for advancing the fields of psycholinguistics and instructed SLA.

5.3 Limitations and Future Research

The current study is not without its limitations. One issue resides with the film clips and images used to emotionally induce participants throughout the incidental learning task. To start, the affective stimuli only represented discrete subcategories of positive and negative mood states, namely either low valence, high arousal (e.g., fright, annoyance, and anger) or high valence, high arousal (e.g., elation, lust, and exhilaration). A concern with such stimuli is that negative items are generally rated higher in arousal than positive items. This effect does not allow for a symmetrical comparison of the affective impacts experienced by the Positive and Negative groups (see Carvalho et al., 2012; Lang et al., 2008). To avoid these issues, future

research should incorporate a variety of stimuli that evoke different facets of emotionality, such as feelings of low valence, low arousal (e.g., sadness and depression) or high valence, low arousal (e.g., contentment and amusement). Besides eliminating incongruities in arousal levels, this approach would allow researchers to investigate how other emotional states impact aspects of L2 learning.

Other noted limitations were more specific to either the EMDB or IAPS databases. For example, EMDB film clips were soundless. The inclusion of television or movie segments with sound may help to amplify emotional impacts by stimulating the visual and auditory senses of participants. Also, the neutral films clips (i.e., nature scenes) from this database skewed slightly pleasant, which may have influenced SAM valence ratings among Neutral group participants. Within the IAPS, many photos depicted outdated scenes (e.g., older fashions, hairstyles, etc.; see Jacob et al., 2011) and lacked racial diversity which may have minimized relatability with the young adults that participated in this study. Members of the SLA community interested in emotional research should continue to explore a variety of affective mediums to determine which induction methodologies are best suited for our field of study.

Secondly, I recorded changes in valence and arousal ratings throughout the experiment using only one measurement tool: SAMs. While the self-assessments allowed for quick and discreet emotional checks, they were entirely subjective. As such, the SAMs may not have accurately captured the true effects of the film clips and images on the participants' psychological state (see Section 4.1). The inclusion of psychophysiological measures in future studies, such as skin conductance and heart rate data, would offer a more well-rounded estimation of how mood states affect both the mind and the body during a learning task.

Finally, this study focused exclusively on receptive tasks (i.e., GJTs) to gauge L2 learning and retention. While participants produced the semiartificial language during the elicited imitations, they were not required to generate spontaneous speech using the novel syntax. In the future, researchers that investigate L2 learning under incidental conditions need to incorporate productive tasks and assessments in order to better understand how the oral process of communication is affected. Lastly, other subdomains of language besides syntax (e.g., phonology or semantics; see Grey et al., 2014) should be evaluated to broaden our perspectives on the L2 learning process.

APPENDICES

APPENDIX A

Sentences from the Exposure Set

The following items constitute the exposure set used in Phase 3 of this study. Aside from the four practice items, there are a total of 120 different sentences, divided equally into three verb placement rules (V2, VF-V1, V2-VF). Implausible sentences are labeled with a question mark (?). All items are adapted from Rebuschat (2008).

Practice sentences:

1. Brian received today a haircut at the barber shop. (V2)

2. Yesterday alleged Sue that the convict to Utah escaped. (V2-VF)

3. ? Last week e-mailed Liz the document to a tomato. (V2)

4. ? After his cat the rats chased, assembled Brian a raisin with a fork. (VF-V1)

V2 sentences:

Average sentence length: 8.9 words (8.9 for plausible, 8.9 for implausible)

Average syllables per sentence: 13.8 syllables (14.0 for plausible, 13.5 for implausible)

1. Chris entertained today his friends with a funny story.

2. Brian played often an important part in the school plays.

3. Jack reacted last week badly against unfounded claims.

4. Mike operated last June on his patient for many hours.

5. George saved yesterday a lot of money during the trip.

6. Liz heaved today the boxes onto the table.

7. Sarah forgot often her problems during the party.

8. Rose satisfied last week all the requirements promptly.

9. Sue gambled last June with her savings at the casino.

10. Cate justified yesterday the funding during the meeting.

11. Today executed George the plan with efficiency.

12. Often drew Mike his clients in a realistic fashion.

13. Last week ranked Jack his employees according to their skills.

14. Last June rebutted Brian his employee's claim for payment.

15. Yesterday ranted Chris about the government's plans.

16. Today challenged Cate the college statutes in her speech.

17. Often sat Sue in the seminar next to the door.

18. Last week ate Rose excellent dessert at a café.

19. Last June defended Sarah many shots during her matches.

20. Yesterday competed Liz with much zest in the tennis match.

21. ? Chris gossiped today in his office with a Martian.

22. ? Brian exploded often all night to a potato.

23. ? Jack scrutinized last week the old goat on planet Mars.

24. ? Mike juggled last June to his friends the purple whale.

25. ? George swallowed yesterday the recipe cards with nails.

26. ? Liz lectured today for a long time to the unicorn.

27. ? Sarah covered often the lava with golden elbows.

28. ? Rose abandoned last week her cats on planet Venus.

29. ? Sue punished last June a bulldozer with her poodle.

30. ? Cate kissed yesterday important discussions with a fork.

31. ? Today bit George the priest in the happy lunchbox.

32. ? Often vomited Mike the lipstick for his birthday.

33. ? Last week met Jack in Seattle the Mayor of Jupiter.

34. ? Last June preached Brian with Elvis Presley in Memphis.

35. ? Yesterday graduated Chris from school on planet Saturn.

36. ? Today erupted Cate at midnight with a monkey.

37. ? Often repaired Sue the guitar with oranges and lemons.

38. ? Last week angered Rose the course assignments with her rainbow.

39. ? Last June sailed Sarah on a candy bar to Norway.

40. ? Yesterday shattered Liz the window with a leprechaun.

VF-V1 sentences:

Average sentence length: 12.8 words (12.5 for plausible, 13.0 for implausible)

Average syllables per sentence: 17.5 syllables (18.0 for plausible, 17.0 for implausible)

1. Since his teacher criticism voiced, put Chris more effort into his work.

2. After the robber a knife pulled, screamed Brian to the man for help.

3. Since his team against their rivals lost, fired Jack the coach on the spot.

4. After his father a tutor hired, studied Mike harder on his assignments.

5. Since a silver spoon after dinner vanished, accused George his guests of theft.

6. After her mother the house cleaned, admired Liz the state of the bedroom.

7. Since her car in the road stopped, began Sarah to take the bus.

8. After the police her car seized, expected Rose a fine from the officer.

9. After the ATM money withheld, complained Sue about the issue to the bank.

10. Since the famous actor her daughters interviewed, bragged Cate about her kids with pride.

11. After the company his book published, sent George many copies to his friends.

12. Since the storm many trees uprooted, planted Mike five saplings with friends.

13. After the lottery the prize announced, looked Jack for his ticket at home.

14. Since the company their offer withdrew, sought Brian employment elsewhere.

15. After his friend four goals scored, viewed Chris him with different eyes.

16. Since the factory the river polluted, avoided Cate contact with tap water.

17. After the magazine her designs published, had Sue many calls from buyers.

18. Since her parents their grandchildren visited, passed Rose her day in bed.

19. After the nurse her son vaccinated, texted Sarah her spouse a message.

20. Since many protesters the area occupied, called Liz the police for help.

21. ? Since his boss many sessions scheduled, hammered Chris his soul with a pumpkin.

22. ? After his cats the mice hunted, squandered Brian a new lump in the office.

23. ? Since his son the bread ate, invested Jack a dollar in the moth.

24. ? After his wife an egg craved, flushed Mike his shoes to Japan.

25. ? Since his boss more work promised, enjoyed George a holiday on the moon.

26. ? After her kids to the playground walked, phoned Liz their rabbit in the cave.

27. ? Since her mother the men kissed, showed Sarah her elbow to a bear.

28. ? After her aunt the lagoon purchased, painted Rose dessert at the farm.

29. ? After her son for the bus waited, boarded Sue the microwave to New York.

30. ? Since her friend a tractor owned, cycled Cate her cat on a camel.

31. ? After his wife a thief surprised, drowned George the police with a steak.

32. ? Since the women a garden planted, issued Mike a lobster warning in bed.

33. ? After his wife many chores juggled, ambushed Jack famous oysters from school.

34. ? Since his friend to Russia sailed, spoke Brian about work to sausages.

35. ? After his son from the airplane resigned, erased Chris the painting in bed.

36. ? Since her son a teacher became, swallowed Cate a doorbell at the table.

37. ? After the shop in her town closed, killed Sue a tasty cake in the bushes.

38. ? Since her friends often hunger feigned, e-mailed Rose in the canyon a soup.

39. ? After her cat the sandbox toured, devoured Sarah clouds for breakfast.

40. ? Since many birds to the ground fell, killed Liz three teeth with a sponge.

V2-VF sentences:

Average sentence length: 9.4 words (9.2 for plausible, 9.5 for implausible)

Average syllables per sentence: 13.7 syllables (13.5 for plausible, 13.9 for implausible)

1. George repeated today that the movers his table scratched.

2. Mike reckoned often that his students about their classes cared.

3. Jack mentioned last week that his father robots designed.

4. Brian contested last June that his friend weapons possessed.

5. Chris stressed yesterday that his children their teeth brushed.

6. Cate realized today that her neighbor illegal drugs dealt.

7. Sue remarked often that the judge innocent people favored.

8. Rose guessed last week that all jurors against her ruled.

9. Sarah advised last June that her students the words learned.

10. Liz recalled yesterday that her mother a cake baked.

11. Today reflected Chris that the fire department all day trained.

12. Often swore Brian that this ointment all wounds healed.

13. Last week alleged Jack that his wife their money lost.

14. Last June yelled Mike that the government welfare encouraged.

15. Yesterday opined George that the storm his boat destroyed.

16. Today figured Liz that her spouse an affair conducted.

17. Often emphasized Sarah that the college a job offered.

18. Last week explained Rose that profits below average remained.

19. Last June remarked Sue that her son in Miami lived.

20. Yesterday explained Cate that the company sales improved.

21. ? George presumed today that his car the best college swallowed.

22. ? Mike wondered often that his teacher a ghost robbed.

23. ? Jack guessed last week that his parents the unicorns burned.

24. ? Brian reported last June that his egg the ocean attacked.

25. ? Chris said yesterday that the lemon in his office fainted.

26. ? Cate confessed today that her flower the horse murdered.

27. ? Sue posited often that the sandwich her cave jumped.

28. ? Rose assumed last week that the earthworm two debates exploded.

29. ? Sarah testified last June that her moon the snow burned.

30. ? Liz guessed yesterday that the carpet a country baked.

31. ? Today beheld Chris that the earth around socks rotated.

32. ? Often reasoned Brian that the eyeball cash digested.

33. ? Last week proposed Jack that the raccoon for love vomited.

34. ? Last June cried Mike that his toenail in newspapers drowned.

35. ? Yesterday sang George that his hamburger English mumbled.

36. ? Today exclaimed Liz that her parents the hotdog watered.

37. ? Often wished Sarah that the troll in the winter melted.

38. ? Last week inferred Rose that her scissors a table caressed.

39. ? Last June thought Sue that her boss in cereal floated.

40. ? Yesterday mentioned Cate that the plumber a new frog designed.

APPENDIX B

Testing Sentences

The following items constitute the testing set used in Phase 4 of this study. Aside from the four practice items, there are a total of 60 different sentences, divided into 30 grammatical and 30 ungrammatical items. The grammatical sentences follow the three verb placement rules (V2, VF-V1, V2-VF) found in the exposure set (Appendix A). Ungrammatical items abide by different verb placement rules (VF, VF-V2, V1-VF, V1, V3, V4) and are labeled with an asterisk (*). All items are adapted from Rebuschat (2008).

Practice items:

1. Yesterday purchased Peter a new car in Chicago. (V2)

2. Because his son books needed, visited Sam the library in town. (VF-V1)

3. *When her children recently for school left, Janet watched a movie. (VF-V2)

4. *Yesterday John ate the sandwich during his break. (V3)

V2 sentences:

Average sentence length: 9.7 words

Average syllables per sentence: 15.2 syllables

1. David scribbled yesterday a long letter to his family.

2. John recognized recently the stolen paintings in a museum.

3. Jim loaded in the afternoon the wagon with hay.

4. Paul told after dinner his parents the good news.

5. Peter decided some time ago on a business proposal during a meal.

6. Yesterday enjoyed Emma the food in the dining hall.

7. Recently spent Chloe her day at the library.

8. In the afternoon drank Jennifer a glass of wine in the local bar.

9. After dinner drove Susan to her son's house in Dallas.

10. Some time ago arranged Janet a meeting with her tutor.

VF-V1 sentences:

Average sentence length: 12.1 words

Average syllables per sentence: 19.9 syllables

1. When his parents groceries needed, purchased David everything necessary.

2. Because his puppy very annoyingly acted, asked John the vet for advice.

3. When his wife the office building left, prepared Jim dinner for the entire family.

4. Because his children fairy tales loved, invented Paul many stories from them.

5. When his daughter in Detroit worked, visited Peter this city many times.

6. When the children the new flowerbed destroyed, chased Emma the culprits around the garden.

7. Because her company capital lacked, organized Chloe a fundraiser with her boss.

8. When her children from school arrived, interrupted Jennifer her work for a while.

9. Because her daughter sweets adored, brought Susan many desserts to the table.

10. When her friend in Italy dwelled, received Janet postcards from Rome.

V2-VF sentences:

Average sentence length: 10.2 words

Average syllables per sentence: 17.8 syllables

1. Paul speculated yesterday that the suspect from prison escaped.

2. Peter disclosed recently that the company sufficient funds generated.

3. Emma said in the afternoon that her parents the apartment rented.

4. Chloe argued after dinner that the chairman the wrong figures displayed.

5. Jennifer suspected some time ago that the old professor the computer broke.

6. Yesterday lamented Susan that her son the baptism missed.

7. Recently learned Janet that the university her application rejected.

8. In the afternoon acknowledged David that her children to England moved.

9. After dinner maintained John that his father in French cuisine indulged.

10. Some time ago claimed Jim that his mother Spain liked.

***VF sentences:**

Average sentence length: 9.8 words

Average syllables per sentence: 16.4 syllables

1. *Yesterday David with distinction from Harvard University graduated.

2. *Recently John the Boston Marathon in four hours ran.

3. *In the afternoon Emma a wonderful meal for her in-laws cooked.

4. *After dinner Chloe an old car with her savings bought.

5. *Some time ago Jennifer to New York with her husband travelled.

***VF-V2 sentences:**

Average sentence length: 13.2 words

Average syllables per sentence: 22.4 syllables

1. *Because his son yesterday an instrument wanted, Jim talked with the music teacher.

2. *When his parents recently to Paris retired, Paul flew a lot to France.

3. *Because his children in the afternoon a calculator required, Peter called the electronics store.

4. *When her director after dinner confidential information divulged, Susan quit the department.

5. *Because her husband some time ago in Princeton taught, Janet declined the job transfer.

***V1-VF sentences:**

Average sentence length: 14.4 words

Average syllables per sentence: 22.2 syllables

1. *Acquired David an extravagant watch when his partner yesterday a lot of money made.
2. *Went John to the cinema on his own because his favorite actress recently in a new film starred.
3. *Discussed Jim the new CD when his friend after dinner the kids took.
4. *Stayed Emma at the hotel because her husband in the afternoon a boring conference attended.
5. *Knew Chloe Sydney when her daughter some time ago in Australia lived.

***V1 sentences:**

Average sentence length: 10.6 words

Average syllables per sentence: 18.0 syllables

1. *Hired Paul yesterday two new chefs for his restaurant.
2. *Imitated Peter recently his best employee during the Christmas dinner.
3. *Transferred Jennifer in the afternoon three employees to a different office.
4. *Invited Susan after dinner some colleagues to her birthday party.
5. *Chatted Janet some time ago with her new students for a long time.

***V3 sentences:**

Average sentence length: 9.2 words

Average syllables per sentence: 16.4 syllables

1. *Recently David consulted an accountant during a five-hour meeting.
2. *Yesterday John inspected the homework with increased rigor.
3. *In the afternoon Emma returned the library books to the stacks.

4. *After dinner Chloe smashed the guitar without any warning.

5. *Some time ago Jennifer filled the bucket with apples.

***V4 sentences:**

Average sentence length: 9.8 words

Average syllables per sentence: 18.2 syllables

1. *Yesterday Jim the television show recorded with their new VCR.

2. *Recently Paul much furniture imported for her new weekend retreat.

3. *In the afternoon Peter his decision undermined with poignant arguments.

4. *After dinner Susan the envelope sealed with wax.

5. *Some time ago Janet the payments suspended for an indefinite period.

APPENDIX C

Debriefing Interview Questions

1a. During the first session of this experiment, did you notice any grammar patterns or regularities for the sentences that you heard and repeated?

1b. If yes, please indicate what you believe you have noticed.

2. Do you think that the film clips or images affected your performance in any of the experimental tasks? How so?

3. How did the content of the film clips and images make you feel during the experiment? Please explain.

APPENDIX D

Film Clips and Images, Initial Emotional Induction

The following tables present information on the name and description of the film clips (Carvalho et al., 2012) and images (Lang et al., 2008) shown to each treatment group during Phase 2 (initial emotional induction) of the experiment. Subjective measurements, as reported from the EMDB* and IAPS**, are also included.

Table D1
Practice Film Clip for Each Group, Initial Induction

Clip No.	Name	Content	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
6000	Homemade footage 1	Objects	Moving objects on a table	4.90 (1.82)	2.44 (2.23)

Table D2
Practice Images for Each Group, Initial Induction

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
7003	Disk	5.00 (1.22)	3.07 (1.98)
7004	Spoon	5.04 (0.60)	2.00 (1.66)

Table D3
Positive Group Film Clips, Initial Induction

Clip No.	Name	Content	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
2000	Underworld: Evolution		Sex scene between a man and a woman	6.70 (1.55)	5.82 (1.87)
2002	9 Songs		Couple having sex in the living room; she is sitting on the sofa while he is standing	7.15 (1.50)	5.99 (1.84)
2003	Killing Me Softly	Erotica	Couple having bondage sex near the fireplace	6.11 (2.10)	5.63 (2.22)
2004	Kama Sutra: The Sensual Art of Love Making		Couple having sex in the arch position	6.48 (1.70)	6.00 (1.78)
2009	Diary of a Nymphomaniac		Couple having sex on a small sofa	6.54 (1.74)	6.11 (1.85)

Table D4

Positive Group Images, Initial Induction

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
4220	Erotic female	8.02 (1.93)	7.17 (2.69)
4225	Erotic female	6.09 (1.82)	5.39 (2.38)
4490	Erotic male	6.27 (1.95)	6.06 (2.42)
4597	Romantic	6.95 (1.65)	5.91 (1.86)
4604	Erotic couple	5.98 (1.76)	6.09 (1.87)
4607	Erotic couple	7.03 (1.84)	6.34 (2.16)
4608	Erotic couple	7.07 (1.66)	6.47 (1.96)
4609	Couple	6.71 (1.67)	5.54 (2.05)
4611	Erotic couple	6.62 (1.82)	6.04 (2.11)
4640	Romance	7.18 (1.97)	5.52 (2.28)
4664	Erotic couple	6.61 (2.23)	6.72 (2.08)
4670	Erotic couple	6.99 (1.73)	6.74 (2.03)
5623	Windsurfers	7.19 (1.44)	5.67 (2.32)
5910	Fireworks	7.80 (1.23)	5.59 (2.55)
7270	Ice cream	7.53 (1.73)	5.76 (2.21)
7279	Alcohol	6.22 (1.92)	5.19 (2.09)
7450	Cheeseburger	6.40 (2.01)	5.05 (2.22)
8021	Skier	6.79 (1.44)	5.67 (2.37)
8161	Hang glider	6.71 (1.64)	6.09 (2.24)
8501	Money	7.91 (1.66)	6.44 (2.29)

Table D5

Negative Group Film Clips, Initial Induction

Clip No.	Name	Content	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
1000	The Ruins		Amputation scene on top of the ruins	2.04 (1.98)	7.11 (1.77)
1001	Texas Chainsaw Massacre: The Beginning		Leatherface removing the face of a victim	1.68 (1.45)	7.45 (1.77)
1002	Midnight Meat Train	Horror	Murderer removing the eyes and teeth of a victim	1.67 (1.36)	7.72 (1.67)
1004	Hostel 2		Cannibalism scene	2.07 (1.91)	6.88 (1.95)
1008	The Rest Stop		Young woman shooting a policeman in the head	1.94 (1.41)	6.53 (2.05)

Table D6

Negative Group Images, Initial Induction

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
2811	Gun	2.17 (1.38)	6.90 (2.22)
3000	Mutilation	1.45 (1.20)	7.26 (2.10)
3001	Headless body	1.62 (1.14)	6.64 (2.54)
3010	Mutilation	1.79 (1.28)	7.26 (1.86)
3016	Mutilation	1.90 (1.31)	5.82 (2.44)
3017	Mutilation	2.45 (1.35)	5.34 (2.39)
3030	Mutilation	1.91 (1.56)	6.76 (2.10)
3102	Burn victim	1.40 (1.14)	6.58 (2.69)
3120	Dead body	1.56 (1.09)	6.84 (2.36)
3130	Mutilation	1.58 (1.24)	6.97 (2.07)
3195	Stitches	2.06 (1.23)	6.36 (2.25)
3350	Infant	1.88 (1.67)	5.72 (2.23)
3500	Attack	2.21 (1.34)	6.99 (2.19)
6022	Assault	2.14 (1.55)	6.09 (2.47)
6560	Attack	2.16 (1.41)	6.53 (2.42)
9040	Starving child	1.67 (1.07)	5.82 (2.15)
9252	Dead body	1.98 (1.59)	6.64 (2.33)
9325	Vomit	1.89 (1.23)	6.01 (2.54)
9420	Soldier	2.31 (1.59)	5.69 (2.28)
9904	Car accident	2.39 (1.36)	6.08 (2.06)

Table D7

Neutral Group Film Clips, Initial Induction

Clip No.	Name	Content	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
5000			Desert and polar scenes	5.88 (1.99)	2.99 (2.25)
5001			Mountains with ice	5.83 (1.67)	2.72 (2.03)
5002	Disney's Earth	Scenery	Polar scenes; ice moving	5.68 (1.70)	2.51 (1.86)
5003			Waterfalls	6.53 (1.73)	3.52 (2.12)
5004			Flowers and trees	6.57 (1.56)	2.99 (1.82)

Table D8

Neutral Group Images, Initial Induction

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
7006	Bowl	4.88 (0.99)	2.33 (1.67)
7009	Mug	4.93 (1.00)	3.01 (1.97)
7010	Basket	4.94 (1.07)	1.76 (1.48)
7011	Gas can	4.52 (1.16)	3.81 (1.67)
7012	Rubber bands	4.98 (1.05)	3.00 (1.94)
7013	Lightbulb	4.20 (1.35)	4.11 (2.02)
7014	Scissors	5.15 (0.97)	3.25 (2.03)
7016	Razor	4.76 (1.08)	3.40 (1.71)
7017	Video	5.18 (1.07)	3.12 (1.97)
7018	Screw	4.81 (0.88)	3.91 (1.97)
7019	Tools	5.20 (1.17)	3.36 (1.87)
7020	Fan	4.97 (1.04)	2.17 (1.71)
7021	Whistle	5.21 (1.22)	4.17 (2.22)
7025	Stool	4.63 (1.17)	2.71 (2.20)
7026	Picnic table	5.38 (1.26)	2.63 (1.93)
7030	Iron	4.69 (1.04)	2.99 (2.09)
7031	Shoes	4.52 (1.11)	2.03 (1.51)
7036	Shipyard	4.88 (1.08)	3.32 (2.04)
7184	Abstract art	4.84 (1.02)	3.66 (1.89)
7185	Abstract art	4.97 (0.87)	2.64 (2.04)

*For the EMDB, both valence and arousal were measured on a 9-point Likert scale. Ratings were from the overall sample size, N = 113 (75 females).

**For the IAPS, both valence and arousal were measured on a 9-point Likert scale. Ratings were from the overall sample size, N = 100 (50 females).

APPENDIX E

Images, Exposure Phase

The following tables present information on the name and description of the images (Lang et al., 2008) shown to each treatment group during Phase 3 (embedded stimuli within the incidental learning task) of the experiment. Subjective measurements, as reported from the IAPS**, are also included.

Table E1
Positive Group Images, Exposure Phase

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
1650	Jaguar	6.65 (2.25)	6.23 (1.99)
4250	Attractive female	6.79 (2.05)	5.16 (2.76)
4311	Erotic female	6.66 (1.76)	6.67 (2.19)
4626	Wedding	7.60 (1.66)	5.78 (2.42)
4676	Erotic couple	6.81 (1.67)	6.07 (2.22)
4681	Erotic couple	6.69 (1.82)	6.68 (1.70)
4689	Erotic couple	6.90 (1.55)	6.21 (1.74)
4694	Erotic couple	6.69 (1.70)	6.42 (2.08)
4695	Erotic couple	6.84 (1.53)	6.61 (1.88)
4697	Erotic couple	6.22 (1.76)	6.62 (1.69)
4698	Erotic couple	6.50 (1.67)	6.72 (1.72)
4800	Erotic couple	6.44 (2.22)	7.07 (1.78)
4810	Erotic couple	6.56 (2.09)	6.66 (2.14)
5626	Hang glider	6.71 (2.06)	6.10 (2.19)
5629	Hiker	7.03 (1.55)	6.55 (2.11)
7280	Wines	7.20 (1.80)	4.46 (2.38)
7400	Candy	7.00 (1.64)	5.06 (2.23)
7402	Pastry	5.98 (2.04)	5.05 (2.12)
7405	Cupcakes	7.38 (1.73)	6.28 (2.16)
7451	Hamburger	6.68 (2.11)	5.84 (2.03)
7499	Concert	6.47 (1.57)	5.58 (2.16)
7508	Ferris wheel	7.02 (1.46)	5.09 (2.11)
8185	Skydivers	7.57 (1.52)	7.27 (2.08)
8186	Sky surfer	7.01 (1.57)	6.84 (2.01)
8300	Pilot	7.02 (1.60)	6.14 (2.21)
8341	Wing walker	6.25 (1.86)	6.40 (2.27)
8370	Rafting	7.77 (1.29)	6.73 (2.24)
8490	Rollercoaster	7.20 (2.35)	6.68 (1.97)
8496	Waterslide	7.58 (1.63)	5.79 (2.26)
8531	Sports car	7.03 (1.50)	5.41 (2.15)

Table E2

Negative Group Images, Exposure Phase

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
2717	Drug addict	2.58 (1.32)	5.70 (2.16)
2800	Sad child	1.78 (1.14)	5.49 (2.11)
2981	Deer head	2.76 (1.94)	5.97 (2.12)
3015	Accident	1.52 (0.95)	5.90 (2.82)
3062	Mutilation	1.87 (1.31)	5.78 (2.57)
3064	Mutilation	1.45 (0.97)	6.41 (2.62)
3068	Mutilation	1.80 (1.56)	6.77 (2.49)
3071	Mutilation	1.88 (1.39)	6.86 (2.05)
3080	Mutilation	1.48 (0.95)	7.22 (1.97)
3110	Burn victim	1.79 (1.30)	6.70 (2.16)
3168	Mutilation	1.56 (1.06)	6.00 (2.46)
3191	Battered female	1.95 (1.22)	5.95 (2.17)
3261	Tumor	1.82 (1.34)	5.75 (2.64)
3266	Injury	1.56 (0.98)	6.79 (2.09)
3400	Severed hand	2.35 (1.90)	6.91 (2.22)
6021	Assault	2.21 (1.51)	6.06 (2.38)
6230	Aimed gun	2.37 (1.57)	7.35 (2.01)
6231	Aimed gun	2.49 (1.54)	6.82 (2.11)
6250	Aimed gun	2.83 (1.79)	6.54 (2.61)
6312	Abduction	2.48 (1.52)	6.37 (2.30)
6370	Attack	2.70 (1.52)	6.44 (2.19)
6550	Attack	2.73 (2.38)	7.09 (1.98)
6563	Attack	1.77 (1.23)	6.85 (2.18)
9183	Hurt dog	1.69 (1.10)	6.58 (2.12)
9302	Toilet	2.32 (1.41)	5.58 (2.43)
9326	Vomit	2.21 (1.30)	5.89 (2.35)
9410	Soldier	1.51 (1.15)	7.07 (2.06)
9635.1	Man on fire	1.90 (1.31)	6.54 (2.27)
9810	KKK rally	2.09 (1.78)	6.62 (2.26)
9921	Fire	2.04 (1.47)	6.52 (1.94)

Table E3

Neutral Group Images, Exposure Phase

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
7038	Shoes	4.82 (1.20)	3.01 (1.96)
7043	Drill	5.17 (1.26)	3.68 (2.09)
7061	Puzzle	5.40 (1.40)	3.66 (1.92)
7062	Sewing	5.27 (1.06)	3.40 (1.94)
7077	Stove	5.12 (1.46)	4.61 (2.06)
7080	Fork	5.27 (1.09)	2.32 (1.84)
7081	Luggage	5.36 (1.30)	3.96 (2.24)
7090	Book	5.19 (1.46)	2.61 (2.03)
7092	Scale	4.05 (1.46)	4.38 (2.05)
7100	Fire hydrant	5.24 (1.20)	2.89 (1.70)
7110	Hammer	4.55 (0.93)	2.27 (1.70)
7130	Truck	4.77 (1.03)	3.35 (1.90)
7140	Bus	5.50 (1.42)	2.92 (2.38)
7150	Umbrella	4.72 (1.00)	2.61 (1.76)
7160	Fabric	5.02 (1.10)	3.07 (2.07)
7161	Pole	4.98 (1.02)	2.98 (1.99)
7170	Lightbulb	5.14 (1.28)	3.21 (2.05)
7175	Lamp	4.87 (1.00)	1.72 (1.26)
7179	Rug	5.06 (1.05)	2.88 (1.97)
7180	Neon building	4.73 (1.31)	3.43 (1.95)
7183	Checkerboard	5.58 (1.39)	3.78 (2.19)
7186	Abstract art	4.63 (1.60)	3.60 (2.36)
7190	Clock	5.55 (1.34)	3.84 (2.06)
7205	Scarves	5.56 (1.39)	2.93 (2.16)
7207	Beads	5.15 (1.46)	3.57 (2.25)
7217	Clothes rack	4.82 (0.99)	2.43 (1.64)
7224	File cabinets	4.45 (1.36)	2.81 (1.94)
7233	Plate	5.09 (1.46)	2.77 (1.92)
7234	Ironing board	4.23 (1.58)	2.96 (1.90)
7235	Chair	4.96 (1.18)	2.83 (2.00)

**For the IAPS, both valence and arousal were measured on a 9-point Likert scale. Ratings were from the overall sample size, $N = 100$ (50 females).

APPENDIX F

Film Clips and Images, Secondary Emotional Induction

The following tables present information on the name and description of the film clips (Carvalho et al., 2012) and images (Lang et al., 2008) shown to each treatment group during Phase 3 (secondary emotional induction) of the experiment. Subjective measurements, as reported from the EMDB* and IAPS**, are also included.

Table F1
Positive Group Film Clips, Secondary Induction

Clip No.	Name	Content	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
2001	Playboy's Clip	Erotica	Couple having sex; woman in astride position while man is standing	6.32 (1.71)	6.06 (1.83)
2005	Kama Sutra: The Sensual Art of Love Making		Couple having sex in the variant yawning and fixing nail positions	6.51 (1.90)	5.83 (1.83)
2006	9 Songs		Couple engaging in oral sex	6.40 (1.61)	5.89 (1.81)
2007	Monamour		Couple having oral sex and intercourse	6.58 (1.79)	6.10 (1.67)
2008	Diary of a Nymphomaniac		Couple having sex in the missionary position	6.46 (1.88)	5.51 (2.09)

Table F2

Positive Group Images, Secondary Induction

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
4232	Erotic female	5.95 (2.53)	6.28 (2.31)
4290	Erotic female	7.61 (2.56)	7.20 (2.63)
4520	Erotic male	6.16 (1.54)	4.80 (2.25)
4643	Erotic couple	6.84 (1.54)	6.01 (2.00)
4650	Erotic couple	6.96 (1.54)	5.67 (2.14)
4656	Erotic couple	6.73 (1.94)	6.41 (2.19)
4658	Erotic couple	6.62 (1.89)	6.47 (2.14)
4659	Erotic couple	6.87 (1.99)	6.93 (2.07)
4660	Erotic couple	7.40 (1.36)	6.58 (1.88)
4672	Erotic couple	6.00 (2.04)	6.29 (2.37)
4680	Erotic couple	7.25 (1.83)	6.02 (2.27)
4687	Erotic couple	6.87 (1.51)	6.51 (2.10)
5950	Lightning	5.99 (2.07)	6.79 (1.98)
7282	Cake	6.72 (1.48)	4.77 (2.08)
7289	Food	6.32 (2.00)	5.14 (2.51)
7460	French fries	6.81 (2.08)	5.12 (2.49)
8030	Skier	7.33 (1.76)	7.35 (2.02)
8170	Sailboat	7.63 (1.34)	6.12 (2.30)
8178	Cliff diver	6.50 (2.00)	6.82 (2.33)
8502	Money	7.51 (1.72)	5.78 (2.49)

Table F3

Negative Group Film Clips, Secondary Induction

Clip No.	Name	Content	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
1003	Hostel	Horror	Victim being tortured on a chair; fingers from his hand are amputated	2.99 (2.00)	6.19 (2.20)
1005	Midnight Meat Train		Woman inside a subway car with bodies hanging from the ceiling	2.06 (1.48)	6.92 (1.74)
1006	Cannibal Holocaust		Savage cannibal attack on man with dismemberment	1.98 (1.50)	7.37 (1.88)
1007	Texas Chainsaw Massacre: The Beginning		Scared woman, hidden, watching Leatherface mutilate her boyfriend	1.81 (1.43)	7.33 (1.91)
1009	Midnight Meat Train		Woman is attacked and decapitated	1.83 (1.24)	6.88 (1.70)

Table F4

Negative Group Images, Secondary Induction

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
3005.1	Open grave	1.63 (1.19)	6.20 (2.54)
3053	Burn victim	1.31 (0.97)	6.91 (2.57)
3059	Mutilation	1.81 (1.24)	6.48 (2.32)
3060	Mutilation	1.79 (1.56)	7.12 (2.09)
3063	Mutilation	1.49 (0.96)	6.35 (2.60)
3069	Mutilation	1.70 (1.41)	7.03 (2.41)
3131	Mutilation	1.51 (0.97)	6.61 (2.34)
3170	Baby tumor	1.46 (1.01)	7.21 (1.99)
3225	Mutilation	1.82 (1.22)	5.95 (2.46)
3530	Attack	1.80 (1.32)	6.82 (2.09)
6212	Soldier	2.19 (1.49)	6.01 (2.44)
6243	Aimed gun	2.33 (1.49)	5.99 (2.23)
6313	Attack	1.98 (1.38)	6.94 (2.23)
6520	Attack	1.94 (1.27)	6.59 (2.08)
6570	Suicide	2.19 (1.72)	6.24 (2.16)
9075	Starving child	1.66 (1.10)	6.04 (2.40)
9185	Dead dog	1.97 (1.16)	5.65 (2.35)
9405	Sliced hand	1.83 (1.17)	6.08 (2.40)
9413	Hanging	1.76 (1.08)	6.81 (2.09)
9940	Explosion	1.62 (1.20)	7.15 (2.24)

Table F5

Neutral Group Film Clips, Secondary Induction

Clip No.	Name	Content	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
5005	Disney's Earth	Scenery	Sandstorm and desert	5.32 (1.06)	2.86 (1.97)
5006			Several takes of trees	6.23 (1.63)	2.86 (2.17)
5007			Scenes of trees, waterfalls, and sand	6.28 (1.57)	3.20 (2.36)
5008			Scenes from a jungle; mushrooms growing	5.73 (1.54)	2.54 (1.95)
5009			Clouds swirling	6.17 (1.44)	2.79 (1.80)

Table F6

Neutral Group Images, Secondary Induction

Slide No.	Description	Valence *M* (*SD*)	Arousal *M* (*SD*)
7032	Shoes	4.82 (1.46)	3.18 (1.88)
7034	Hammer	4.95 (0.87)	3.06 (1.95)
7035	Mug	4.98 (0.96)	2.66 (1.82)
7037	Trains	4.81 (1.12)	3.71 (2.08)
7040	Dust pan	4.69 (1.09)	2.69 (1.93)
7041	Baskets	4.99 (1.12)	2.60 (1.78)
7044	Scale	4.69 (1.40)	3.94 (2.17)
7045	Zipper	4.97 (0.76)	3.32 (1.96)
7046	Pill	4.18 (1.38)	4.14 (2.04)
7050	Hair dryer	4.93 (0.81)	2.75 (1.80)
7052	Clothespins	5.33 (1.32)	3.01 (2.02)
7053	Candlestick	5.22 (0.75)	2.95 (1.91)
7055	Lightbulb	4.90 (0.64)	3.02 (1.83)
7056	Tool	5.07 (1.02)	3.07 (1.92)
7057	Coffee cup	5.35 (1.37)	3.39 (2.01)
7058	Dice	5.29 (1.38)	3.98 (2.17)
7059	Keyring	4.93 (0.81)	2.73 (1.88)
7060	Trash can	4.43 (1.16)	2.55 (1.77)
7187	Abstract art	5.07 (1.02)	2.30 (1.75)
7188	Abstract art	5.50 (1.12)	4.28 (2.16)

*For the EMDB, both valence and arousal were measured on a 9-point Likert scale. Ratings were from the overall sample size, N = 113 (75 females).

**For the IAPS, both valence and arousal were measured on a 9-point Likert scale. Ratings were from the overall sample size, N = 100 (50 females).

APPENDIX G

Self-Assessment Manikins

The emotional self-assessment using the SAMs on a 9-point Likert scale (adapted from Bradley and Lang (1994)). Note that the first row represents valence and the second row arousal.

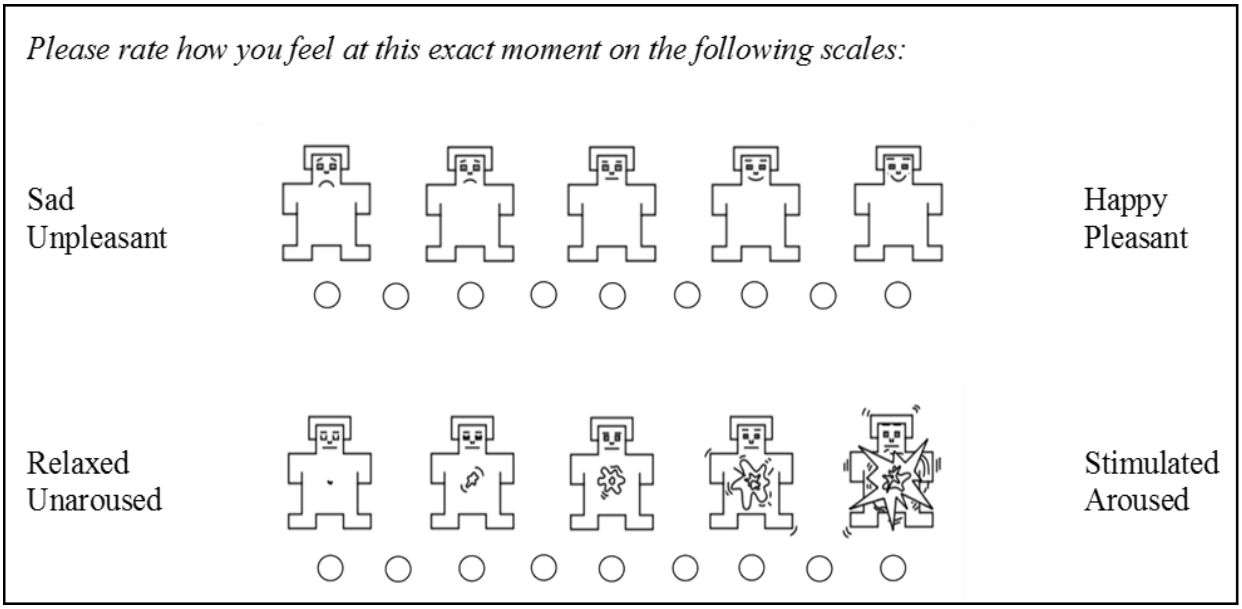

Figure G1. SAM ratings for valence and arousal.

APPENDIX H

Written Background Questionnaire

Please answer the following background questions:

1. What is your sex (male/female)? _____

2. What is your age? _____

3. What is your native language? _____

4. Please list all of the foreign languages that you speak and the number of years of study:

    a. _____; years studied _____

    b. _____; years studied _____

    c. _____; years studied _____

    d. _____; years studied _____

5. What types of movies do you normally watch?

_____

Thank you for your time!

APPENDIX I

Verbal Reports

Table I1
Noticed Verb Patters or Grammatical Regularities, Comparison Group

Subject	Report
401	I noticed that they were complete sentences, they had a subject and subject-predicate. It was kind of mixed up but it kind of reminded me of Spanish, how sometimes you have to change the order of things…but I couldn't really figure out what the order was. Maybe the time was first, then the person, then action. Sometimes action, then the person…it was weird.
402	I tried to [formulate a rule]. I was looking at a lot of past-tense stuff…other than that, I really wasn't getting much.
403	I don't know if I can put it into words. Just the verbs and all the placement of them…I understood it as the opposite of regular English grammatical rules. For example, we would say, "he left in the afternoon." And here I found, "in the afternoon left…" Something like that, the placement of the verbs and sometimes the pronouns as well.
404	Some of them, the tenses, I would try to listen to. And the placement of the verb in relation to the noun. But, I never really had anything super solid…I was finding some patterns, but I wouldn't say that I had a rule.
405	I was trying to figure out some sort of pattern and I felt like there were stints where I would get three in a row. And I'm like, "maybe there's an adjective that follows a noun half-way through the sentence." But then something would break it, so anytime I tried to figure out something, there would be a sentence that would completely throw it off.
406	Yeah, I noticed that sentences we would speak in English, just the structure was a little backwards. So, just the way you would formulate a sentence would have other words, like descriptor words, for words we would normally say after that…so it would have verbs at the end instead of where we would normally put them. So, just the same sentences we would speak, just in a different order.
407	Yes, there's two rules that I kind of distilled out. The one that I'm fairly confident with was that if it sounds like proper syntax in English, then it's probably wrong. The other one, and I'm not certain about this one, was this format that was, "time-verb-person-everything else." So like, "yesterday went David to the store." There were a few other ones, but I can't crystalize them right now in my head.

Table I1 (cont'd)

Subject	Report
408	I felt like the action would come before the name or before the subject of the sentence. So it would be, "received Carly," or something like that. I thought that might be one of the syntax rules for this new language. It [also] seemed like an inverted English sentence.
409	Not really. Maybe subconsciously, but I wasn't really trying to come up with a rule.
410	I felt like they were switched…so the verb was changed to go behind a word, or before. I feel like it was before. So, "the market she went." That's what I always noticed. So it was after, I guess. I noticed that most of the sentences didn't start with a name. If they did, it was second or at the end. If it didn't start with a name, it was in the second, like run-on sentence, or later in the sentence.
411	I noticed they would switch verbs and nouns around. Like, they would first say…instead of saying, "Janet ran," they would say, "ran Janet," or something like that…that was my basis for determining if something was grammatical, was if it didn't make sense in English.
412	It appeared that the subject of the sentence was flipped…when you have a conversation about something, you address what the subject is and then say what you are doing to it. The new sentences, it seemed like it was flipped, where it had the action, then told you what happened or what the subject was after the action.
413	Yeah, it seemed like the sentences were flipped backwards. It would be one part of the sentence like, "Janet went to the store, comma, to get a bottle of water." It would switch it around, "To get a bottle of water, Janet went to the store," or something like that.
414	I thought I noticed that maybe the verb was coming before the noun, but I really don't know.
415	No, I did not, which is why I think my percentages were low for both the times [posttests].
416	I started to notice that the time went first…that was the main one I noticed.
417	It seemed like the noun came before the verb…so the sentences were mixed up.
418	No.
419	Yeah, it was just a little goofy…one rule was, something that should have been at the middle or the end of the sentence was at the beginning of it.
420	I wasn't really focusing on the grammatical setting of it…I honestly couldn't pick out any rule.

Table I1 (cont'd)

Subject	Report
421	It seemed that the verb came before the subject, unless it had an object. So, like, "ran Jim" or "Jim to the store ran." The object came between the subject and verb, if there was an object.
422	Yes…the time, or the setting, or the underlying where, what or when, and then the verb, and then the subject, and then the object. That's the structure I was looking for.
423	I noticed that the ends of the sentences were all past tense, a lot. Or, if the sentence was broken up in half by a comma, then the part before the comma would end in a past tense.
424	The verbs and the nouns were flipped around. Sometimes the verbs came before and sometimes the nouns came before, but it was a noun from the end of the sentence. Sometimes the noun that would have been at the end of the sentence was at the beginning of the sentence.
425	It was kind of like Yoda talk and everything was backwards.
426	I couldn't identify a specific set of rules.
427	I kind of started basing it off of where the verb was, but that might just be something that I made up. If it was in the middle of the sentence, I counted it as grammatically correct if it had already been acted and told what the subject was being acted on.
428	The verb was in front of the name, maybe. I don't know.
429	Yes. You switch the verb and the subject in the sentence from how you do in proper English.
430	It had something to do about time phrases…where you place them in the sentence. That was the only rule that seemed to exist…[but] I wasn't sure.

Table I2

Noticed Verb Patterns or Grammatical Regularities, Positive Group

Subject	Report
101	I tried to, and I think it was the verb went towards the beginning, I think…I was trying to find a rule, but I don't think that I got one.
102	I know there was like, the noun and the verb and that stuff was switched up a little bit. So, those were some of the cues that I could figure out.
103	Yeah, I think I found at least one. Like, putting a verb before someone's name, like, "delivered Karen the envelope." That's the big one that I noticed.
104	Yes, it was like the subject and verb were messed up (flipped). The verb came first, before the subject, instead of the other way around like it normally is [in English].
105	It kind of reminded me of how Yoda speaks, from Star Wars. If there was ever a time or a place, the place would be stated first…uh, no, it would be time and then place. So, "recently, something, something, John did eat" or "John ate something." And the last part would be preposition-subject. Like, time-subject-preposition, I think. I don't know, it was a weird way.
106	Yes. I thought that the sentences should say the verb that they were doing first, then their name. If it was talking about someone else they knew, then it would say their name, or who they were, then it would describe something and then say the verb. Also, I wasn't sure if this part of the rule was right, but in the beginning it would say, "after dinner washed Jane the dishes," or something like that. I wasn't sure if the "after dinner" had to come first, so I assumed that it did have to come first. Also, the whole "after dinner" thing, or "sometimes," or whatever timing…if they were talking about someone else, too, then it would say, "her children after dinner the games played." So, it would put their name, then the time, then describing the thing, and then the action.
107	Yeah…you could tell where the verbs and the…you can tell that it's not regular English. So the person does the action in the second part of the sentence and then the first part of the sentence you're describing…I really don't know.
108	I noticed that a lot of the times it would be that the subject came after the verb, which I know is different from English. It would be like, "yesterday cooked Jim the meal." I kept noticing that as a repeating pattern.
109	Yes. So, I feel like what the grammar rule was…is that in the sentence, you would say the noun before the verb…like, "Joe to the park walked."
110	I definitely noticed that if it was a two-part sentence, both parts of the sentence were scrambled up…not in the correct grammatical order [according to] regular English.

Table I2 (cont'd)

Subject	Report
111	Yeah…normally, we would say, "Kevin jumped," but in the [new] language it would be, "jumped Kevin." And I think there was something with the accuracy of the time because sometimes it would be like "yesterday" and sometimes it was "a long time ago." It was more vague.
112	I thought I did. I felt like there could be a comma in everything, the way that the sentence started. It starts with the end and the beginning is after that, separated by a comma. I could recognize a pattern. It's hard to articulate what it actually is.
113	There definitely was some word order. It would be like some point in time. Maybe a subject…ends with a verb. Sometimes there were two verbs. A first phrase and a second phrase…but it was quite different from English.
114	Kind of. None that I could pinpoint exactly, but I could definitely tell it was following some sort of rule.
115	I was trying to figure out the verb stuff. The verb thing, I think I was picking out…they verbs were coming before in the sentences, like, "because Janet talked, a new paper she wrote." It was almost like things were reversed.
116	Yeah. They would switch the nouns and the verbs, it looked like…just the word grammar pattern.
117	I didn't notice an explicit rule. I did notice a pattern…with the noun and verb order…but nothing that I could express.
118	I noticed…it wouldn't say "to the," "in," all those words that you use to complete a sentence…it would skip those and be like, "Sally door to calf." It would skip, "Sally walked to the door." That's what I was looking for.
119	Yeah, it was just a matter of switching the verb and the noun, as compared to our language.
120	I noticed that most of the time, they were two-claused. There was a first part and a second part of the sentence. The first part introduced the subject of the sentence and the second part almost qualified what was happening in the second part.
121	I would look for mixed-up, or words that didn't necessarily go in order. I guess the key of the sentence structure would be towards the end. Like, the main subject of the sentence.
122	No.

Table I2 (cont'd)

Subject	Report
123	I don't really know how to explain it, but when I would hear the sentences…sometimes I would re-arrange them to how I thought they should be. The last two parts of the sentences seemed to be switched. If the sentence was in English, like, "Sarah went to the store," then it [this new language] would be like, "Sarah to the store went." If there were two parts to the sentence…I felt like they were [also] in that form…both parts.
124	The only rule that I could decipher was that the normal way sentences would go [in English], that that wasn't the [new] language. That's the only rule I picked up on.
125	Not specifically, no.
126	The verb was switched. That's what I thought it was. They switched the verb with the person.
127	If there are two verbs, they have to be reversed…with the noun they're acting on.
128	It seems like sometimes the verb has to come before the subject…sometimes it would be the opposite.
129	I didn't at first, but then I noticed that the verb was coming before the noun in the first part of the sentence. [The noun was] a person's name.
130	I kind of noticed a pattern between the verb and subject of the sentence. [Also], if there were two clauses, there was one rule for the first part and one rule for the second. In the first part, it seemed that the verb always came before the subject. In the second part, it was how we would normally say the sentence [in English] or it was the same as the first part. But, I couldn't figure it out.

Table I3

Noticed Verb Patterns or Grammatical Regularities, Negative Group

Subject	Report
201	I didn't notice it as much the first time, but listening to it again now I did notice some rules. Like verbs coming before nouns as opposed to vice versa with English. One thing I did notice both times was weird placement of prepositional phrases…it was jarring hearing prepositional phrases thrown into different places.
202	I didn't really pick up on any rules…nothing that I could put into words.
203	Yes, it seemed like the verbs went before a noun. So, instead of the "subject performs this verb," the verb comes before the subject.
204	Sometimes it was the way the words were said…sometimes the beginning of the sentence would be switched up and the end would be OK. Sometimes the beginning would be OK and the end would be switched up.
205	In certain situations, the verb would come before the noun or at the beginning of the sentence, and then in other cases it came at the end of the sentence…that's the main thing that I noticed, the order of the subject-verb.
206	I don't think I really paid attention that much when I first did it…I don't think I was looking for anything. At the time I knew I was listening to weird sentences. But I did hear a lot of the sentences where the action words were at the end…but I don't know. Today I was thinking that maybe it could have been actions words in the middle of the sentence or at the beginning. Or when there are two parts to a sentence, the rule could have been different, but I don't know.
207	No. For me, at least, it took me a lot of focus to not rearrange them [the sentences]…sometimes I wanted to put the words in what I think of as grammatical [English] order. So, I didn't have rules, per se, that I was developing.
208	No, not until after you told me that they were grammatically correct. Then I tried to remember back and figure out a rule. But when I was just repeating them, it was gibberish to me.
209	Kind of. I noticed in some sentences, a word would be in the middle instead of the beginning…like, if I said, "I ran to the store," it would be like, "the store ran I."
210	No.
211	There was a lot of inverted word order, sometimes twice in a sentence. You would start with a prepositional phrase and then, it was kind of opposite of American syntax, English syntax…you would put the indirect object before the word used to address that part of speech. The subject and predicate were often separated from each other. The way that I could tell things weren't a part of this proper grammar was that they were just in a natural word order [to English].

Table I3 (cont'd)

Subject	Report
212	I felt like I did at certain points, and as it went on and I heard more sentences, I questioned the rules that I thought I picked up on…I would listen to the end of the sentence to see if it was verb, if they were putting a verb at the end of the sentence, versus if they were talking about what they did at the end of the sentence. Like if they said, "at the table," versus "table" then like "sitting at."
213	It sounded as if the time or place…was at the beginning of the sentence. So, that's what I tried to base one of the rules on.
214	N/A
215	Sort of, but not anything to a high level…not anything structured or what I could put into words.
216	Not really when I was repeating them back because I was just so focused on getting it right.
217	Yeah…I think in most sentences it wouldn't be a simple subject-verb, in that order.
218	They'd say the verb before the subject. That's the only rule I got out of it.
219	Yeah, I noticed a lot of it…was very backwards…like, "yesterday, blank, someone did something later," as opposed to, "Maria did this."
220	That the verb was at the end. So, it would be like, "she store goed," or something like that.
221	I think the sentences never started with nouns…at the very least, the sentences never started with names. [Also] every fragment of the sentences was scrambled in some way. So, with some of these tests, if I noticed that the second half of the sentence made sense in the English language, then I'd be like, "ok, it didn't make sense [in the new language]."
222	It seemed like the time was listed first, and then a noun or an adjective would be right after it.
223	Not really, no.
224	I just noticed that they seemed to be flipped. Like, "if Jennifer was talking," "talked Jennifer about whatever." It seemed backwards, the placing of the words.
225	I could tell that it was switched…the subject was after the action of the sentence. Like, "to Paris John went" instead of, "John went to Paris."
226	I thought that it either had something to do with the time, like, "before dinner" or "yesterday." I thought the time had to come before the subject and then the action. Or, I thought that it ended with the action.

Table I3 (cont'd)

Subject	Report
227	Yeah…if the words were out of order [as compared to English], then that's one way I determined if it was grammatical.
228	N/A
229	I kind of guessed that one of the rules might have been if one word was switched around with another word.
230	Yeah…something like they would have feeling first, like the action the guy did. Like, "Jack was upset about getting fired from his job," it would be like, "upset after getting fired from his job was Jack." Something like that.

Table I4

Noticed Verb Patterns or Grammatical Regularities, Neutral Group

Subject	Report
301	I think what I started picking up was that the action word came after the object, so after the noun. There was a distinct order in which you'd say the person and you're looking for what they did, but where they did it came first, and then what they did was coming next.
302	The chronological order of things…when you're including a "day" of some sort, like a "yesterday" or a "during this time" was always misplaced in the sentence a little bit. That was one thing that I noticed. Nouns, specifically people, were often misplaced. Just hardly, but enough for you to realize it.
303	If it ended in a location or ended in a verb, then that was my rule.
304	The only thing I did notice was that a lot of the things were flipped or backwards. I knew that if it sounded too "good" it probably was not a rule. Things that sounded more confusing to me was how I was indicating whether it was part of the new grammar or not.
305	I think today I tried to figure out…that the verb comes after the timeframe, maybe. That's kind of what I put together today [Session 2]. When I was saying them, I could definitely feel a rhythm…there were some that were similar, with the back half of the sentences, but I couldn't figure it out from there.
306	I don't think I came up with any rules, no.
307	No, not really.
308	Just where the verb was placed. I feel like the verb can often be placed at the end of the sentence, instead of after the subject.
309	No.
310	I think the verb was in front of the subject. If you swapped it around, it would make sense [in English]. But the structure was different. I don't think I could pick out a specific rule, though.
311	Yeah. A lot of them had the action before the name. So, "acquired Jennifer," when you would normally say, "Jennifer acquired." So I think that's one of the rules…it was also flipped around…like Chinese…their structure is different than ours, but it still makes sense.
312	The two things that stuck out to me were the verb comes before the subject…so it would be like, "drank Paul yesterday." I'm not sure about this one, but it would be something with the prepositions, like "after dinner" or "yesterday." Like, "yesterday drank Paul" and then there's some that said, "drank Paul yesterday."

Table I4 (cont'd)

Subject	Report
313	Not initially.
314	Yeah, a lot of times the past part of the sentence would come before the first part of the sentence. The antecedent would come last, if that makes any sense. I didn't know if it was all the time or if it was specifically for action sentences, but I noticed that.
315	I think generally the noun after the verb was before the verb, that kind of thing. So instead of, "I ate pizza," it was like, "pizza ate Jan." It was out of order from the English way.
316	It's almost like listening to Yoda, where everything is backwards. It was pretty clear to me that if it sounded like normal English, it was almost certainly incorrect.
317	If you had a sentence or a phrase, the verb could be in the first part of the phrase, like, "John went to the store." But if there was a comma or another clause after that, it felt like if you immediately put another verb, like, "John to the store went," then you had another verb right after that, it just felt wrong for some reason.
318	The first time I noticed a pattern…it seems to start with a time signifier, like "yesterday" or "in the morning." Then it goes subject-object-verb and a prepositional phrase.
319	Yeah, I noticed that some things were backwards. Like, a verb and a noun were flipped. And usually at the end…words were put backwards, like, "this is a cat," it would be like, "this cat is."
320	It seemed like the verb was at the end of a lot of the sentences. So, she would say a bunch of things and the last word would be "arrived" or "lived." So, that was the general rule I was using.
321	Yeah, the verb always came before the subject.
322	It seemed like the sentence never started with its subject. I think it started with time…and then it would move onto the subject, and then where it happened, and I think the action was generally last.
323	I think it was something like the verbs were in different places, like, before the pronouns or the names a lot of times.
324	Yeah…do you know how you have a preposition between the person and the object? It was reversed. So, it was the object, preposition, and then the person.

Table I4 (cont'd)

Subject	Report
325	It seemed like if there was a clause that preceded the main part of the sentence, the verb and the object switched places. So, the verb always came after the object of the verb. And then in the main clause, I think, the verb always preceded the person doing the verb.
326	I felt like the second verb was in the past tense, or moved to a different place than it would in a regular English sentence.
327	I don't think so. No.
328	Yes. I feel like a lot of them used more of a passive voice-type grammar rule, where it was the action, then the person, and then the stuff afterwards.
329	The verb would come before the subject sometimes. It would say, "walked Ashley to blah, blah, blah," rather than, "Ashley walked to…" That was the big thing that I noticed.
330	It seemed like the subject was coming at the end of the sentence or in parts where whatever action the subject was doing would come before the introduction of the subject.

APPENDIX J

Impacts from Film Clips and Images

Table J1
Impacts from Film Clips and Images, Positive Group

Subject	Report
101	I don't think so…because by the time I had to start saying stuff, I was focusing on that.
102	Maybe at the very beginning, but I think I just kind of got used to them…they just became a part of the test.
103	I don't think so…it's hard to affect me in that way, but maybe they did.
104	No, I don't think so.
105	No, they were just annoying. It was like, "really?"
106	A little bit. Sometimes, I could just ignore them and then focus on the words. But sometimes they would pop up at a certain time when I was trying to think about something, then it showed me, and threw me off a little bit…because the images were very "out there," so it wasn't something I was expecting to see.
107	Sort of. Some of the clips were really long, so they distracted me. Sometimes I'm trying to remember what was said and then suddenly there is a clip or an image, and I'm like, "oh, OK." So, I didn't really remember what was going on before.
108	Yeah, they were definitely distracting. There were a few times where I would be in the zone and then one of them would pop up and I would forget about what I was going to write down…I mean it was kind of strange and it was definitely distracting.
109	Yeah. I think during the first part, I'd be trying to say one of the sentences, and it would come up and distract me a little bit. And sometimes I would forget what I was supposed to be saying. But I don't think it had a heavy impact, just a little distracting. The content…I wouldn't say was positive for me. I would say it caught me by surprise. It was like, "whoa!"
110	I think so. Some, when they would pop up randomly, it would avert my attention from what I was doing and I had to regroup and focus my attention on the task.
111	Probably. It was distracting. They would randomly come up and sometimes they wouldn't, so I was wanting to look at them because I wasn't sure what I was doing, and I was also trying to think of these sentences, and it was just confusing…I was definitely shocked by the film clips and not expecting it, so I was a little off-kilter.

Table J1 (cont'd)

Subject	Report
112	I'd say they were distracting…it was harder to listen to what was going on. You would want to look at that [images] over listening to what was being said.
113	Yes. Sometimes it was distracting. It would just break the focus…it's like you're trying to repeat something, you're trying to hear something and repeat it, and something pops up and you're like, "oh, what was I thinking of? And did I repeat it correctly or not?"
114	Maybe a little bit because it got in the way…it was annoying. I just didn't feel like seeing it. I was trying to listen and that popped up and I'd be like, "ah, OK." [I also felt] irritated, because it's pretty much like porn and I kind of think porn is gross.
115	Yes…when you're really trying to concentrate, the last thing you expect to see is naked people. You're trying really hard not to pay attention to it, but at the same time you're like, "God, what did that girl just say to me over the thing? I just saw some naked dude. Like, weird." It definitely threw me for a loop. I don't think it completely deterred me from learning, but it was definitely a distraction.
116	I don't think so.
117	I do feel that there was a bit of, not necessarily a distraction, but it changed my level of attention away from the task to what was being presented on the screen. So I would definitely say there was something there with that.
118	I don't. I was actually kind of confused when I was watching all of those clips.
119	No, I don't think so. It made it more interesting…but I don't think it affected how I took in the information.
120	I don't think so. I was so focused on memorizing the actual sentences, that was all I was thinking about really.
121	Yeah, probably…it would just make you lose your train of thought a little bit. Especially because some of them popped up when we were repeating the sentences. That really threw me off because it was already hard enough trying to remember what they said.
122	Yeah, I think they distracted me some. I would have trouble remembering the next sentence, or the sentence after that more. I think [that the content] got me to a more aroused state sometimes, and made it harder to concentrate.
123	Yeah, it threw me off sometimes…although if they were cupcakes, it was weird, if there were images of food, I felt like I got through it more easily…because I really like food. But the other things…I was like, "what's going on?" And I would stop thinking about what I was trying to do.

Table J1 (cont'd)

Subject	Report
124	Not really. They may have confused me a bit, but not a lot.
125	When random images would pop up…I wasn't expecting that and I kind of forgot what I was thinking, how I was processing the information. So, yeah, a little bit.
126	No.
127	Probably distracting…just distracting and aroused.
128	Some of them were distracting. Probably [had an effect], but not to a high level of degree. They [also] made me feel uncomfortable…it was hard to focus, but I tried.
129	No, [but the] content made me feel uncomfortable.
130	Not really. Maybe a little bit. If it was saying it [a sentence from the exposure set] and then an image would appear while I was trying to say something, it would maybe affect me more…trying to repeat the sentence back exactly like I heard it…being able to remember it.

Table J2
Impacts from Film Clips and Images, Negative Group

Subject	Report
201	I think definitely yes. Because I'm not very susceptible to those sorts of things…they don't bother me very much. But it was just so much that I ended up getting overwhelmed. I would get nervous, like, "OK, what's going to come up next?!" It definitely affected my ability to focus on the language portion of the task.
202	They kind of made me paranoid in the second session, right now. I was wondering if they were going to pop up or not, like in the first one [session]. I didn't really remember a ton of the sentences that were being stated…it was more of the graphics.
203	I think they threw me off and made me more confused. I was less focused on what I was trying to do.
204	I watch True Crime and I look at crime scene photos…I watch all that kind of stuff, horror movies…so "eh."
205	I don't think they affected my performance, no. They definitely were not fun to watch…but no, I don't think they affected my performance with the tasks at all.
206	No. I don't even remember them.
207	Yeah. I wasn't expecting it at times and so it would throw me off a little bit…the images were a little more violent than I had anticipated, so that surprised me a little bit and threw my thought process off.
208	Yes, I felt like they were distracting when you would have to listen, and then all of a sudden something would pop up, and it would throw me off, like, "ohh!" Then I would forget what I had just heard before. So, yeah I think it did affect me.
209	Yes, they distracted me a little bit. Especially when I was repeating back sentences, I would get distracted and forget what it said.
210	Yes. First I was getting pretty frustrated trying to say the sentences back, and then those images made me even more frustrated. They were just so graphic. It was hard to put my mind back on the task after seeing something like that.
211	I think they did. Over time I kind of got used to them…but, there was one point where I had to force myself to keep looking at the images because that was what I was supposed to do, and I just wanted to look away. But I just had to distance myself emotionally from that so I could focus on the sentences…it was definitely distracting. It's upsetting.
212	I don't think so…I think I kind of got used to if after a while, so it wasn't affecting me too much.

Table J2 (cont'd)

Subject	Report
213	Extremely…I didn't think the images would be that bad, but to me they were very…it really affected my emotions. So, especially when listening to [the sentences] and they would pop up, I would forget almost instantly what was just read to me. So, that affected it a lot.
214	N/A
215	Not when I first started watching it, but when I was trying to think, I was looking at the screen and then something would pop up. It would draw my attention away from what I was thinking about…I lost track of what I was thinking of. I couldn't retain the sentence and it was all messed up.
216	Yeah, I think so, because I was like, "uh, ok…" (nervous laughter). Especially when I pressed the space bar and an image popped up. So, yeah, I think it kind of affected you because when you're sad with anything, you're not going to care as much or pay attention. So that affected it, definitely. [I felt] sad and not really that excited to do the task…I didn't really have much motivation to figure the sentences out.
217	It was almost like when I was doing the test, it was easier because it was a break from that…I was clearly not feeling as good after seeing it [the negative stimuli]. It was almost more enjoyable, I felt relaxed to be doing the problems [on the immediate posttest]. [After viewing the content] I felt very sad, anxious, uncomfortable.
218	Yeah, they kind of made me lose my train of thought. [They made me] kind of cringy and distracted, I guess.
219	Yeah, because I was distracted by it, it kind of caused me to think more on that than on what I was exactly saying. I think it caused arousal in a certain way that may have potentially caused me to remember some things a little better. Because I noticed being back in here, my heart started beating a little faster again, like, subconsciously…I think maybe it helped a little, which is weird.
220	I think it affect [me] when they showed the picture while I was trying to repeat [the sentence]. I would look at the screen and then I would be like, "oh shoot, what did they say?" [The content] was gross. I didn't like it at all…I didn't want to look at it at all.
221	Yeah, it did. On the first part, they distracted me. And for this part, two weeks later, my memory was very hazy on a lot of the grammatical things…the thing I took away from the test two weeks ago was the images and not really the grammar structures. I [felt] distressed. I didn't like looking at them.

Table J2 (cont'd)

Subject	Report
222	Yeah, I think so some times, because you're like, "oh, what's that," and then it gets you off track. [I was] not necessarily [affected by the content] because I watch a lot of horror movies and disturbing images, so I'm used to it. So, probably not as much as it should have.
223	There was one time when I got distracted and totally forgot the sentence. But, I got used to it after three clips. So, maybe at first, but definitely not towards the end…I don't think I felt too distressed…things like that usually don't bother me like some people.
224	Yes, but not in a good way. When the person was speaking, you're trying to think about that. And when the image popped up, my brain went to that image versus trying to think about the structure of the sentence and what she was saying. Some [images] definitely made me feel more uncomfortable than others, but I think the biggest thing is is that they were distracting.
225	I'd say so, just because they were distracting. It's hard to ignore [the explicit images and film clips]. It kind of puts you on edge. [They] were disturbing and put me in a different mood.
226	I don't think so. No.
227	Yes, sometimes. Sometimes I would just want to look at the clip for a second…some of them flashed and some of them were kind of gory with a lot of blood. So, then I was thinking, "ooh, that's gross," instead of thinking about the sentence structure.
228	N/A
229	Definitely. When I saw an image, it totally threw me off and I totally forgot the sentence that I was supposed to repeat. Some [of the images] were pretty disturbing.
230	At first, no, but when I had to repeat the sentences…it was weird, but I thought when I saw the picture, it helped me to remember the sentence more. It was really weird. For the first ten minutes…I felt all scrambled inside. I've seen a lot of horror movies since I was little, so it was fine, it was just when it was all at once, I was like, "ok, oooh."

Table J3
Impacts from Film Clips and Images, Neutral Group

Subject	Report
301	I don't think so. I didn't really pay attention to them because I was trying to recall what I was hearing. So, if anything they kind of gave me an extra second to try to recall. But they didn't distract me from what I was doing.
302	Possibly. They may have jolted my memory a bit. I'm super ADD, so when I saw that stuff, it made me think away from the sentences. Especially when I recited them, it was like a, "whoa, wait a second" kind of thing. So, I would say they impacted me.
303	The first time I was getting kind of sleepy because they were somewhat calming images, like the sky and the desert. I'm already a little tired, so when you throw this in there I'm watching something that makes me real peaceful. I felt like I could have been more alert, so it probably hurt me a little bit.
304	Not really, except that I would be thinking of that image as the last thing in my head. Like, "that thing is called a hammer and that thing is a nail." But no, it didn't really affect anything in terms of learning the grammar or the language.
305	No comment recorded.
306	I think waiting, because they were in between the recording and me repeating them [the sentences]. So, I guess having to wait affected how well I did, even though it was only a second.
307	It might have distracted me a little bit, but that's about it…it might have relaxed me a little bit.
308	Not particularly, no. They weren't really disturbing images. They were just random…it felt completely unrelated [to the incidental learning task].
309	No…I didn't understand them. Maybe they were a bit distracting, but overall I don't think they affected much.
310	Probably not. They were pretty relaxing, so it was kind of chill.
311	I don't think so. I think that they made me feel…they put me in a calm mood. I don't think it affected what I chose. I just feel like it affected how quickly I chose.
312	No.
313	I think they were a little distracting. Sometimes I would get distracted by the fact of wondering if that was something I needed to pay attention to or remember, or if it was just there to play interference…the content wasn't distracting, it was just the presence of.

Table J3 (cont'd)

Subject	Report
314	Yeah, probably. Just like it was more calm afterwards…I think it helped keep my focus.
315	I think it made me forget the sentences. I would get distracted and forget what I had to repeat.
316	No.
317	No, it was mostly just like, "this is a flower…ok, I really don't care." That was basically how I was thinking of it.
318	It might have confused me a little before I started.
319	Not that I know of. I don't think it had a conscious effect on me.
320	A couple of times I couldn't repeat what I was trying to say because it distracted me and I forgot what I just heard. So, I guess yeah, a little bit.
321	No. I can barely remember [the film clips and images]. Nothing too effective.
322	I don't think so. They definitely put me at ease at the beginning with the longer clips of all the nature and things like that. But, I don't think they affected me during the study at all.
323	I don't think so. If it came right afterwards, it would kind of distract me. But other than that, I don't think they had a huge impact.
324	No.
325	Not consciously, at least. A lot of pictures that I had were calming outdoor scenes, so maybe I was more relaxed.
326	No, I didn't find those to influence me.
327	Sometimes they did just because I would remember something and I would put the clip with the image and I would remember it better.
328	Not really.
329	No.
330	Yep. If the clip popped up at a certain point when I was trying to remember something, it would kind of throw me off. [The content] made me tired…it made me very tired. I was trying not to fall asleep.

APPENDIX K

Exploratory Factor Analysis Structure Matrices

Table K1
Summary of Exploratory Factor Analysis Results for the BFAS Questionnaire (N = 120)

	Rotated Factor Loadings		
Item	Openness	Intellect	Escapism
Q5. I believe in the importance of art.	.77		
Q19. I see beauty in things that others might not notice.	.64		
Q17. I need a creative outlet.	.63		
Q2. I seldom notice the emotional aspects of paintings and pictures. (R)	.58		
Q13. I do not like poetry. (R)	.57		
Q7. I love to reflect on things.	.56		
Q14. I avoid philosophical discussions. (R)	.50		
Q4. I enjoy the beauty of nature.	.48		
Q10. I get deeply immersed in music.	.46		
Q3. I have difficulty understanding abstract ideas. (R)			
Q8. I can handle a lot of information.		.77	
Q9. I like to solve complex problems.		.65	
Q6. I formulate ideas clearly.		.64	
Q1. I am quick to understand things.		.61	
Q18. I have a rich vocabulary.		.53	
Q12. I learn things slowly. (R)		.51	
Q15. I think quickly.		.50	
Q11. I seldom daydream. (R)			.92
Q16. I seldom get lost in thought. (R)			.64
Eigenvalues	5.02	2.54	1.54
% of variance	26.39	13.37	8.11
α	.81	.79	.75

Note. All negatively-worded items (R) were reversed to the affirmative for this analysis. One item, Q20 (I do not avoid difficult reading material), was removed to increase the reliability of the subscale *intellect*.

Table K2

Summary of Exploratory Factor Analysis Results for the REI Questionnaire (N = 120)

Item	Rotated Factor Loadings	
	Intuitive Ability	General Intuition
Q8. I believe in trusting my hunches.	.73	
Q5. Using my gut feelings usually works well for me in figuring out problems in my life.	.72	
Q10. I hardly ever go wrong when I listen to my deepest gut feelings to find an answer.	.68	
Q2. I suspect my hunches are inaccurate as often as they are accurate. (R)	.67	
Q1. I like to rely on my intuitive impressions.	.67	
Q4. I don't have a very good sense of intuition. (R)	.66	
Q12. I trust my initial feelings about people.	.65	
Q13. If I were to rely on my gut feelings, I would often make mistakes. (R)	.61	
Q3. I can usually feel when a person is right or wrong, even if I can't explain how I know.	.58	
Q6. My snap judgments are probably not as good as most people's. (R)	.42	
Q17. I don’t think it is a good idea to rely on one’s intuition for important decisions. (R)		.75
Q20. I think it is foolish to make important decisions based on feelings. (R)		.74
Q11. I would not want to depend on anyone who described himself or herself as intuitive. (R)		.65
Q15. I generally don’t depend on my feelings to help me make decisions. (R)		.52
Q9. I don't like situations in which I have to rely on intuition. (R)		.50
Q14. Intuition can be a very useful way to solve problems.		.47
Eigenvalues	5.92	1.89
% of variance	37.00	11.83
α	.87	.74

Note. All negatively-worded items (R) were reversed to the affirmative for this analysis. The following items were removed to eliminate issues of multicollinearity: Q7 (I tend to use my heart as a guide for my actions); Q16 (I often go by my instincts when deciding a course of action); Q18 (When it comes to trusting people, I can usually rely on my gut feelings); and Q19 (I think there are times when one should rely on one’s intuition).

Table K3

Summary of Exploratory Factor Analysis Results for the TEIQue-SF Questionnaire (N = 120)

Item	Rotated Factor Loadings		
	Emotional Self-Reg.	Emotion Towards Others	Stress Mgmt.
Q13. Those close to me complain I don't treat them right. (R)	.67		
Q12. Generally, I have a gloomy perspective on most things. (R)	.66		
Q18. I normally find it difficult to keep myself motivated. (R)	.64		
Q4. I usually find it difficult to regulate my emotions. (R)	.63		
Q20. On the whole, I'm pleased with my life.	.59		
Q5. I generally don't find life enjoyable. (R)	.58		
Q24. I believe I'm full of personal strengths.	.56		
Q9. I feel that I have a number of good qualities.	.56		
Q22. I get involved in things I later wish I could get out of. (R)	.53		
Q8. Many times, I can't figure out what emotion I'm feeling. (R)	.52		
Q19. I'm usually able to find ways to control my emotions when I want to.	.50		
Q7. I tend to change my mind frequently. (R)			
Q16. I find it difficult to show affection to those close to me. (R)		.67	
Q23. I often pause and think about my feelings.		.57	
Q1. Expressing my emotions with words is not a problem for me.		.56	
Q28. I find it difficult to bond well with those close to me. (R)		.55	
Q2. I find it difficult to see things from another's viewpoint. (R)		.42	
Q29. Generally, I'm able to adapt to new environments.			.74
Q15. On the whole, I'm able to deal with stress.			.66
Q17. I'm normally able to "get into someone's shoes" and experience their emotions.			.56
Q14. I find it difficult to adjust life according to the circumstances. (R)			.55
Q6. I can deal effectively with people.			.52
Q27. I generally believe that things will work out fine in my life.			.51
Q3. On the whole, I'm a highly motivated person.			.50
Eigenvalues	6.80	2.22	2.16
% of variance	28.33	9.26	9.01
α	.86	.69	.78

Note. All negatively-worded items (R) were reversed to the affirmative for this analysis. The following items were removed to eliminate issues of multicollinearity: Q10 (I find it difficult to stand up for my rights); Q11 (I'm able to influence the way other people feel); Q21 (I would describe myself as a good negotiator); Q25 (I tend to "back down" even if I know I'm right); Q26 (I don't seem to have any power at all over other people's feelings); and Q30 (Others admire me for being relaxed).

Table K4

Summary of Exploratory Factor Analysis Results for the FLCAS Questionnaire (N = 120)

Item	Rotated Factor Loadings	
	FLA	General Anxiety
Q1. I never feel sure of myself when speaking in foreign language class.	.80	
Q24. I feel self-conscious speaking a foreign language in front of others.	.73	
Q18. I feel confident when I speak in foreign language class. (R)	.71	
Q4. It frightens me when I don't understand what the teacher is saying in the foreign language.	.68	
Q25. Language class moves so quickly I worry about getting left behind.	.67	
Q28. When I'm going to language class, I feel very sure and relaxed. (R)	.63	
Q32. I would probably feel comfortable around native speakers of the foreign language. (R)	.59	
Q23. I feel that other students speak the foreign language better than I do.	.59	
Q2. I don't worry about making mistakes in class. (R)	.56	
Q14. I wouldn't be nervous speaking a foreign language with native speakers. (R)	.55	
Q10. I worry about the consequences of failing my foreign language class.	.53	
Q30. I feel overwhelmed by the number of rules you have to learn to speak a foreign language.	.53	
Q17. I often feel like not going to my language class.		.71
Q16. Even if I am well prepared for language class, I feel anxious about it.		.68
Q26. I feel tense and nervous in my language class than other classes.		.68
Q31. I'm afraid other students will laugh when I speak a foreign language.		.68
Q19. I'm afraid my language teacher is ready to correct my every mistake.		.65
Q12. In language class, I can get so nervous I forget things I know.		.61
Q15. I get upset when I don't understand what the teacher is correcting.		.53
Q21. The more I study for a language test, the more confused I get.		.45
Q5. It wouldn't bother me at all to take more foreign language classes. (R)		.41
Eigenvalues	8.47	1.62
% of variance	40.31	7.73
α	.89	.84

Note. All negatively-worded items (R) were reversed to the affirmative for this analysis. The following items were removed to eliminate issues of multicollinearity: Q3 (I tremble when I'm going to be called on in language class); Q6 (During language class, I think about things that have nothing to do with the course); Q7 (I think other students are better at languages than I am); Q8 (I'm usually at ease during tests in my language class); Q9 (I panic when I have to speak without preparation in language class); Q11 (I don't understand why people get upset over foreign language classes); Q13 (It embarrasses me to volunteer answers in language class); Q20 (My heart pounds when I'm to be called on in language class); Q22 (I don't feel pressure to prepare well for language class); Q27 (I get nervous speaking in my language class); Q29 (I get nervous when I don't understand every word the language teacher says); and Q33 (I get nervous when the language teacher asks questions I haven't prepared in advance).

Table K5

Summary of Exploratory Factor Analysis Results for the UPPS Questionnaire (N = 120)

Item	Rotated Factor Loadings			
	Premed.	Sensation Seeking	Urgency	(Lack) Persev.
Q37. I usually think carefully before doing anything.	.89			
Q28. I usually make up my mind through careful reasoning.	.81			
Q24. I tend to follow a rational, “sensible” approach.	.73			
Q42. Before making up my mind, I consider all the advantages and disadvantages.	.73			
Q6. My thinking is usually careful and purposeful.	.73			
Q13. I like to stop and think things over before I do them.	.62			
Q29. I am a cautious person.	.62			
Q35. Before I get into a new situation I like to find out what to expect from it.	.58			
Q10. I am not one of those people who blurt out things without thinking.	.47			
Q20. I don't like to start a project until I know exactly how to proceed.	.43			
Q34. I sometimes like doing things that are a bit frightening.		.87		
Q18. I quite enjoy taking risks.		.84		
Q26. I welcome new and exciting experiences and sensations, even if they’re a little frightening and unconventional.		.76		
Q39. I would enjoy the sensation of skiing very fast down a high mountain slope.		.70		
Q21. I would enjoy parachute jumping.		.68		
Q3. I generally seek new and exciting experiences and sensations.		.68		
Q31. I would like to learn to fly an airplane.		.55		
Q8. I’ll try anything once.		.52		
Q45. I would enjoy fast driving.		.50		
Q15. I would enjoy water skiing.		.47		
Q38. In the heat of an argument, I will often say things that I later regret.			.78	
Q33. I often make matters worse because I act without thinking when I am upset.			.76	
Q44. Sometimes I do things on impulse that I later regret.			.74	
Q22. When I am upset I often act without thinking.			.70	
Q30. It is hard for me to resist acting on my feelings.			.66	
Q27. When I feel rejected, I often say things I later regret.			.62	
Q2. I have trouble controlling my impulses.			.60	

Table K5 (cont'd)

Item	Rotated Factor Loadings			
	Premed.	Sensation Seeking	Urgency	(Lack) Persev.
Q14. When I feel bad, I will often do things I later regret in order to make myself feel better now.			.53	
Q19. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.			.47	
Q5. I have trouble resisting my cravings (for food, cigarettes, etc.).			.45	
Q12. I often get involved in things I later wish I could get out of.			.45	
Q23. I finish what I start.				-.89
Q36. Once I start a project, I almost always finish it.				-.82
Q32. I'm a productive person who always gets the job done.				-.66
Q7. I tend to give up easily. (R)				-.61
Q4. I generally like to see things through to the end.				-.56
Q17. I concentrate easily.				-.43
Q9. Unfinished tasks really bother me.				
Eigenvalues	9.35	5.25	3.22	2.03
% of variance	24.60	13.80	8.47	5.33
α	.88	.87	.87	.83

Note. All negatively-worded items (R) were reversed to the affirmative for this analysis. The following items were removed to eliminate issues of multicollinearity: Q1 (I have a reserved and cautious attitude toward life); Q11 (I like sports and games in which you have to choose your next move very quickly); Q16 (Once I get going on something I hate to stop); Q25 (I'm pretty good about pacing myself so as to get things done on time); Q40 (There are so many little jobs that need to be done that I sometimes just ignore them all); Q41 (I am always able to keep my feelings under control); and Q43 (I would like to go scuba diving).

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