The Mediating Role of Explicit Information in Processing Instruction and Production-Based Instruction on Second Language Morphological Development

Adem Soruç
Sakarya University

Abstract
This study explored the effectiveness of processing instruction (PI) and production-based instruction (PBI) with and without explicit information (+/-EI) on the improvement of the English simple past tense morpheme (-ed). To this end, nine Turkish EFL classes at a preparatory school of an English medium university in Istanbul were randomly selected and assigned into four instructional groups: PI+EI (N = 28), PI-EI (N = 32), PBI+EI (N = 32), PBI-EI (N = 36), and one control group (N = 16). Pre/post-test analyses showed that all the instructional groups outperformed the control group from pre-test to post-test. As to specific group differences, the PI-EI and PBI-EI groups made equal gains in both interpretation and production tasks. When EI was a factor, however, the PI+EI group performed significantly better than the PBI+EI group on the interpretation task, while both groups showed equally improved performance on the production task. That is, EI mediated for the greater effectiveness of PI than PBI on the interpretation task. Further comparisons of PI+EI to PI-EI and of PBI+EI to PBI-EI showed no significant difference within the groups. Findings are discussed and implications are provided, as well as directions for further research.

Keywords
Structured input • Structured output • Processing instruction • Production-based instruction • Explicit information

* I would like to thank Dr. Ayşe Akyel and Dr. Rod Ellis for their invaluable comments on the design of the study.

Correspondence to: Adem Soruç, Department of English Language Education, Faculty of Education, Sakarya University, Sakarya 54300 Turkey. Email: ademsoruc@sakarya.edu.tr

It is rare to find a second language researcher in applied linguistics who does not accept the role of input on the development of L2 grammar knowledge, especially on morphosyntactic development. For instance, Krashen (1982) argued that explicit instruction or deliberate attempts to draw learners’ attention to a specific linguistic structure does not necessarily help learners acquire it, suggesting instead that learners should acquire language ‘by understanding messages, or by receiving comprehensible input’ (Krashen, 1985, p. 2). On the other hand, Schmidt (1990) argues the importance of ‘noticing’ as it is ‘necessary and sufficient condition for converting input to intake’ (p. 129), and he supports the view that incidental acquisition of linguistic structures does not happen automatically when learners are exposed to comprehensible input but occur only ‘when the demands of a task focus attention on what is to be learned.’

To help learners notice linguistic structures that ‘comprehensible input’ or incidental exposure alone cannot provide, VanPatten (1990) put forward his model of input processing and processing instruction (PI) as a pedagogical approach to grammar teaching. For more than two decades, VanPatten (1993, 1996, 2015) has stated that not all input, whether comprehensible or meaning-bearing, is noticed and processed, because noticing occurs when the learner consciously focuses on a form ‘but not necessarily with any meaning attached to it’ (VanPatten, 2004, p. 6). Therefore, in his input processing model, VanPatten (1993, 1996) suggests that the learner’s processing mechanisms should be strengthened by focused practice or structured input activities (see Figure 1), so that correct form-meaning connections are made, and the data in the input are taken in correctly. Put simply, as seen clearly in Figure 1, according to the input processing model, L2 learners develop some default processing strategies when learning grammar. However, through structured input activities (focused practice), teachers can ensure that correct form-meaning connections are made in their minds because structured input activities facilitate students’ cognitive processing of the input in the data as well as precluding students from developing default processing strategies.

Figure 1. Processing instruction in foreign language teaching (VanPatten, 2004, p. 26).
The Framework of Input Processing, Processing Instruction and Production-Based Instruction

VanPatten (1996, p. 7) defines his model of input processing as ‘what learners do to input during comprehension – how intake is derived’ or ‘how learners get form from input and how they parse sentences during the act of comprehension while their primary attention is on meaning.’ (VanPatten, 2002, p. 757). The primacy of meaning principle of input processing suggests that simultaneous processing of both form and meaning is difficult for students who thereby prefer meaning to form (e.g., VanPatten, 1990). This overarching principle is supported by six associated sub-principles, including the preference for content words, lexis, non-redundancy, meaning before non-meaning, availability of resources, and the initial position in a sentence.

Prepared in consideration of the above-mentioned principle and sub-principles, processing instruction (PI), which is a direct application of VanPatten’s input processing theory (Sharwood-Smith, 2015), involves three components: explicit grammatical information, strategy training, and structured input activities. In PI condition, after students receive explicit linguistic information about the rules for the target grammatical form, they also receive strategy training in which they are told to rely on morphological form alone, and not on temporal adverbs. And finally, in a PI environment, students are exposed to a series of structured input activities in which the data input is manipulated in a way that allows the processing of the form or the connection between form and its meaning to be taken for granted. Structured input activities are divided into referential and affective activities (Lee & VanPatten, 2003). While in the referential activity, students make a correct choice between right and wrong options by focusing on the form itself; in the affective activity, they either ‘express an opinion, belief or some other affective response … about the real world’ (Wong, 2004a, p. 43) or ‘offer opinions or indicate something about themselves’ (VanPatten & Borst, 2012, p. 272). Put simply, students in a PI condition are never asked to produce the targeted structure while completing these two types of activities; but instead they perform a plethora of both aural and written interpretation tasks (see Appendix A for sample referential and affective structured input activities).

As a form of explicit output practice (Keating & Farley, 2008), and theoretically based on Swain’s (1985) comprehensible output hypothesis, PBI maintains that input is not sufficient to acquire the language; in other words, according to output hypothesis, only when students produce the linguistic structure can they notice and learn the linguistic form as well as making the necessary linguistic modifications in the linguistic competence. For instance, according to Swain’s studies (1995, 2007), when students were encouraged to produce the language, they noticed different functions of the language that confirmed or disconfirmed their hypotheses. Most importantly, they reflected on the metalinguistic rules of the language, which serves
more like an internal priming device (Izumi, 2003). As with the components of PI, PBI likewise consists of three components: students receive explicit explanation of the grammatical form and strategy training sessions, but they vary in their exposure to structured output activities, including both referential and affective activities. While participating in the referential structured output activities, students are encouraged to produce the targeted form correctly using the provided verbs and/or pictures to talk, while in the affective structured output activities, their utterances involving targeted forms about their own lives are elicited (see Appendix B for sample referential and affective structured output activities).

According to DeKeyser and Botana’s (2015) narrative review study and meta-analysis studies (e.g., Shintani, 2015; Shintani, Li, & Ellis, 2013), few studies have investigated the role of input and output while comparing the components of processing instruction (explicit information and structured input activities) to the components of production-based instruction (explicit information and structured output activities) in a single experimental study. The study reported in this paper will therefore first investigate any relative effects of PI and production-based instruction on the acquisition of the English simple past tense regular verb form (-ed) by Turkish learners of English. Secondly, the study will report on the extent to which explicit information mediates the effectiveness of PI or PBI on the acquisition of the same targeted linguistic form.

**Previous Research**

**Studies comparing PI to PBI**

Since the publication of VanPatten and Cadierno’s (1993) seminal article, a lot of relevant research has been conducted in various ways to compare PI to meaning-based output instruction (e.g., Farley, 2001; Keating & Farley, 2008), to meaning-based drills instruction (e.g., Keating & Farley, 2008), to another kind of PBI, communicative output instruction (Toth, 2006), and finally to dictogloss tasks (e.g., Qin, 2008; VanPatten, Inclezan, Salazar, & Farley, 2009). In these experimental studies, learners in the PI group never produced the targeted structure, but instead engaged in comprehension-based structured input activities only; meanwhile, in the traditional instruction (TI) group, the students produced the targeted structure, completing a series of mechanical production practices and moving on to more meaningful communicative practices (e.g., VanPatten & Cadierno, 1993). In the meaning-based output instruction group, to direct learners’ attention to production of the target structure, learners received ‘explicit information about the target item and structured output activities’ (Farley, 2001, p. 291), while in meaning-based drills instruction group, learners received neither explicit explanation nor strategy training,
allowing it to seem like ‘a more traditional yet meaningful approach’ (Keating & Farley, 2008, p. 643). In the communicative output instruction group, learners progressed ‘from guided, less demanding production to more demanding, open-ended tasks’ (Toth, 2006, p. 339). Finally, in the dictogloss group, learners engaged in following four procedures such as dictation, reconstruction, and analysis with correction. Put simply, PI was compared to a variety of production-based instructional types.

Viewed as the first study in the PI literature, VanPatten and Cadierno’s (1993) study compared the effect of PI to traditional instruction on the acquisition of Spanish clitic object pronouns, a common default processing problem, especially for learners of Spanish as a second language. Learners’ performance was measured by both interpretation tasks (similar to PI materials) and production tasks (similar to TI materials); the results showed that the PI group performed better than the TI group on the interpretation task. This was not surprising, because the interpretation task in the tests was similar to the one used in the PI instructional materials. However, it was surprising that although the PI group was never trained to produce the targeted structure in the instructional stage, they were still able to produce it as well as those in the TI condition group. This finding was surprising, because it was the students in the TI group who were specifically engaged in completing similar types of production-based activities in the instructional stage. Therefore, VanPatten and Cadierno (1993) argued that PI serves as a ‘double bonus’ (p. 54) for the L2 learner because it both leads to the development of their interpretation and helps to produce the target linguistic form.

VanPatten and Cadierno’s (1993) article has acted as a catalyst in the PI literature, leading to publication of a number of studies; for example, on different linguistic structures: Spanish preterit (past) tense (Cadierno, 1995), Spanish accusative clitics direct object pronoun (VanPatten, Farmer, & Clardy, 2009; VanPatten & Fernandez, 2004; VanPatten et al., 2009; VanPatten & Sanz, 1995), Spanish subjunctive (Farley, 2001), Italian future tense (Benati, 2001), Spanish copula verbs ser and estar (Cheng, 2002), French causative (VanPatten & Wong, 2004), English simple past tense (Benati, 2005; Benati & Angelovska, 2015; Soruç, Qin, & Kim, 2017), and English simple present tense (Bayrak & Soruç, 2017). All these studies made the same types of comparisons, such as comparing PI to one type of PBI group, and they all similarly discovered that on the interpretation task, students exposed to the PI condition outperformed those in the PBI condition, whereas on the production task, both instructional group types made equal gains even though PI was never encouraged to produce in the instructional period.

**Studies comparing PI+EI to PI-EI**

Another line of inquiry occurred in the comparison of PI components: explicit information and structured input activities. That is, further studies have examined
whether explicit information (EI) or structured input activities are mainly responsible for the greater effectiveness of the PI condition. Similarly, in one of the first studies, VanPatten and Oikkenon (1996) compared three groups receiving PI+EI, PI-EI (structured input activities only, without explicit information), and EI only. They found out that both PI+EI and PI-EI groups performed equally well over time and both scored better on the interpretation and production tasks than the EI-only group. In other words, they discovered that it is structured input activity itself, not EI that directed learners’ attention to the acquisition of Spanish clitic object pronouns.

VanPatten and Oikkenon’s study was likewise replicated by a number of studies involving different linguistic structures such as the use of de with avoir in French (Wong, 2004b), Italian future tense (Benati, 2004a), gender agreement in Italian (Benati, 2004b), Spanish word order and clitics direct object pronouns (Fernandez, 2008, Exp. 1; Sanz, 2004; Sanz & Morgan-Short, 2004; VanPatten & Borst, 2012; VanPatten, Collopy, Price, Borst, & Qualin, 2013, Exp. 1), and Russian nominative/accusative case marking on nouns (VanPatten et al., 2013, Exp. 3). Their results showed that PI with and without EI groups made similar improvements (PI+EI = PI-EI) and both performed better than the EI-only group. Benati (2004b) explained the superiority of structured input over EI as a ‘privileged position’ (p. 78) of PI in general, and of structured input in particular; while Sanz (2004) similarly argued that ‘it is practice in decoding structured input rather than provision of explicit evidence that is responsible for the effectiveness of PI’ (p. 254).

On the other hand, other replications of VanPatten and Oikkenon’s (1996) original study found counterintuitive results. These studies were carried out on the Spanish subjunctive (Farley, 2004b; Fernandez, 2008, Exp. 2), German word order and accusative case marking on definite articles (e.g., Culman, Henry, & VanPatten, 2009; Henry, Culman, & VanPatten, 2009; VanPatten et al., 2013, Exp. 2), and French causative faire (VanPatten et al., 2013, Exp. 4). They all found a greater performance by the PI+EI group over the PI-EI group, thus revealing that EI either has a ‘facilitative effect’ (Henry et al., 2009, p. 571) for processing instruction, or ‘may be beneficial in PI for some features of language’ (Farley, 2004b, p. 242), or ‘might depend on the nature of the task and the processing problem’ (Fernandez, 2008, p. 277).

Given the findings of studies reviewed in the literature, there is still great need for further research to investigate the effectiveness of PI and PBI on second language morphological development and the mediating role of EI in either of the instructional groups. Therefore, the present study contributes to the literature for the following reasons: First, although the PI+EI group was compared to the PBI+EI group before (e.g., Benati, 2005; VanPatten & Cadierno, 1993), the PI-EI condition has not been compared to the PBI-EI condition (e.g., Shintani, 2015); thus, the findings of the
The present study will shed light on the effectiveness of structured input and structured output activities alone on L2 morphological development. Second, because the role of EI in PI is still unclear, elusive, or ‘open’ (VanPatten & Borst, 2012, p. 280), and ‘far from settled’ (DeKeyser & Botana, 2015, p. 13), this study will reveal how much EI mediates for the effectiveness of not only the PI condition but also for the PBI condition. Third, earlier investigations were made into the comparisons of the PI+EI and the PI-EI groups (e.g., Sanz & Morgan-Short, 2004; VanPatten & Oikkenon, 1996), and in these, structured input activities were found more effective than EI in the PI condition. However, given that ‘dismissing the potential of EI without further qualification may be too hasty’ (DeKeyser & Botana, 2015, p. 296), what would happen to the structured output group when they receive EI or not needs further attention; that is, based on the meta-analysis studies (e.g., Shintani, 2015; Shintani et al., 2013), the PBI+EI group has not been compared to the PBI-EI group. Therefore, such a comparison of the PBI groups with EI (PBI+EI) and without EI (PBI-EI) will reveal if structured output activities have any greater role over EI on L2 morphological development.

Therefore, the research questions addressed are as follows:

RQ1. Is there a significant difference between the instructional groups receiving structured input only (PI-EI) and structured output only (PBI-EI)?

RQ2. Is there a significant difference between the instructional groups receiving structured input with EI (PI+EI) and structured output with EI (PBI+EI)?

RQ3. Is there a significant difference between the instructional groups receiving structured input with EI (PI+EI) and structured input without EI (PI-EI)?

RQ4. Is there a significant difference between the instructional groups receiving structured output with EI (PBI+EI) and structured output without EI (PBI-EI)?

**The Study**

**Setting**

This quasi-experimental study was conducted at a foundation school of a medium-sized English university in Istanbul, Turkey. Prior to selecting the faculty (major) of their choice, the students at the school were taking the Michigan English language proficiency and placement test; this determined into which language level (such as A1, A2 etc.) they were placed, where they would study English until they reached a satisfactory level of proficiency.
Participants

After receiving the school director’s consent, all A1 level students (N = 700) were first randomly assigned into thirty-five classes. Of these, nine were randomly selected and assigned into eight instructional classes and one control class. Nine classes were intentionally involved in order to reach a higher number of participants because the study included four instructional groups (two classes for each of the four instructional groups) and one control group (one class). In total, there were 194 students at the beginning. But this number was lowered for several reasons: lack of participation consent (two students), and failure to participate in either the instructional classes or the tests (27 students). Furthermore, according to earlier PI studies (e.g., Cheng, 2002; Farley, 2001; VanPatten & Cadierno, 1993), to attribute any increase in the post-test scores ‘to the instructional treatments, not to the students’ differential prior knowledge’ (Lee & Benati, 2009, p. 144) without receiving criticism from them, students’ pre-test scores were further analysed to leave out students who scored at or above 60% on both the interpretation and production tasks (21 students). For pre/post-test analyses, the final size was 144, which was distributed into the groups as follows: PI+EI (N = 28), PI-EI (N = 32), PBI+EI (N = 32), PBI-EI (N = 36), and control class (N = 16).

Selection of the Target Language Structure and Level

At the time of the research, 1000 students had failed the proficiency test. Of these, 700 were at the A1 level and 300 were at the B1 level. A1 classes were intentionally selected for the study, because prior to the study, some of the A1 level students were interviewed and recorded; in the interviews, they were encouraged to talk about what they did last week or last summer, and it was clear that although the students were able to produce irregular forms of the verbs accurately (e.g., go-went), they were not able to use the regular verb form of English simple past tense – ed. In fact, they were not even aware of their lack of use of the regular verb form. In addition, the morpheme is itself ‘notoriously difficult’ (Jiang, 2004, p. 603), especially for elementary students to process, since it is an inflectional bound morpheme and is not stored in working memory together with the base form of the regular verb (Marslen-Wilson, 2007).

Instructional Materials

First, two different material packets with structured input or structured output activities were prepared using the students’ A1 level course books in consideration of the principles of VanPatten (2002, 2004) for PI+EI and PI-EI groups and of Lee and VanPatten (2003) for PBI+EI and PBI-EI groups. Second, an additional EI handout was prepared for the PI+EI and the PBI+EI groups only. In this handout, metalinguistic rules of the target structure (–ed) were overtly explained to the students. In addition, they were explicitly warned to rely on tense ending (–ed) to process the meaning
of the form, not to look for lexical adverbs in the sentence. To address any possible problems prior to the main study, both material packets and assessment materials were piloted on the same group and student level, but the data obtained from the piloting stage were not incorporated or included in the raw data.

**Packet A: PI Activities**

Both PI+EI and PI-EI groups received Packet A, which included a total of ten structured input activities: six referential and four affective structured input activities (see Figure 2). However, the EI handout was only given to the PI+EI group prior to structured input activities. For the PI+EI group, the explanation of the structure and strategy training in the EI handout lasted for about ten minutes. Students who received Packet A never produced but were instead engaged in both aural and written interpretation tasks, which were all produced for the study in consideration of VanPatten’s primacy of meaning principle and its sub-principles (see a sample of the activities used in Appendix A).

**Packet B: PBI Activities**

Both PBI+EI and PBI-EI groups received Packet B, which included 10 total structured output activities: six referential and four affective (see Figure 2). However, the EI handout included an overt explanation of the grammar rules and strategy training was only given to the PBI+EI group before structured output activities. Completion of the EI handout similarly took about ten minutes. The activities in Packet B helped students to produce the structure by completing both written and oral production activities, which were all produced for the study following Lee and VanPatten’s (2003) guidelines and VanPatten’s primacy of meaning principle (see a sample of the activities used in Appendix B).

**Assessment Materials**

Students’ performance was measured both by written interpretation and written production task completion. While the interpretation task required students to make a choice between right and wrong options, never producing the targeted structure as in the PI instructional packet, the production task encouraged students to produce the structure as in the instructional PBI packet (see a sample of the activities used in Appendix C). Each of the assessment tasks included ten target items (except for five masking sentences in the interpretation task), for a total of 20 when all were answered correctly. Three similar versions of both types of tasks were produced for pre-test, immediate post-test, and delayed post-test, and they were all counterbalanced to ‘rule out possible effects of test item familiarity and test order’ (Cheng, 2002, p. 312). During the tests, students received the interpretation task first, and then production
task. It took almost half an hour to complete both tasks in the tests. All versions of the tasks in the tests were piloted, and coefficient alpha reliability analysis showed preferable levels of internal consistency of the tests (Cronbach’s alpha .84, .83, .83 for pre-test, post-test and delayed post-test, respectively).

Procedure of the Study

A series of precautions was taken prior to the research. First, to ensure that students never encountered the target structure, the textbook syllabus was controlled for the whole level at the school: the unit including the target structure was replaced by another during the instructional weeks throughout the study. Second, the control class was not exposed to the target structure at the school, as they were engaged in other types of classroom activities such as writing, reading, etc. They also practised simple present and/or present continuous forms in their classes throughout the study. Third, to prevent teacher effect or variability, the researcher gave all the instructions consecutively within two days to each of the experimental groups; in

![Figure 2. A step by step summary of the research design and procedure.](image-url)
other words, four equal instructional hours were given to the experimental groups in two consecutive days during students’ regular classes. Put simply, all the instructional groups received the same number of instructional hours and the same number of input or output activities from the same teacher (the author of this article). Finally, to prevent experimenter expectancy effect or any possible bias toward one group over another, the regular classroom teacher observed and filled out a checklist while the researcher was giving the instructions. The checklist included items related to structured input or structured output activities. One week before the research started, students received the pre-test, a background questionnaire, and a consent letter. One day after the instructions were completed, they received the immediate post-test; after three weeks, they took the delayed post-test (see Figure 2).

**Scoring**

Both task types included ten target items, for a total of 20. Because the target items were definite, a one item one-point procedure was followed in the scoring stage, so there were no partially-correct responses or partially-correct credits. A score of zero was assigned for blank and incorrect responses. The researcher and one of the classroom teachers marked all the papers, and no disagreements were found. Any spelling mistakes in the written production tasks were ignored on the condition that the target structure was written correctly.

**Results**

Prior to analysing the post-tests, the pre-test scores were firstly submitted to one-way ANOVA to ensure that all the instructional groups and the control group started at the same level of knowledge of the target linguistic structure. It showed no significant pre-existing difference among the groups on interpretation, $F(4, 144) = 1.31, p = .269$, and production task, $F(4, 144) = .67, p = .614$, which thereby allowed to assume that any greater performance was due to the instructional type(s) at the end.

**Interpretation Task Results**

Descriptive statistics in Table 1 indicate first of all that all the instructional groups increased their pre-test scores in the immediate post-test, whereas the control group did not.

To examine group effect and test (time) effect, a $5 \times 3$ factorial repeated measures ANOVA was conducted. It revealed a significant effect for within-subjects variable Test, $F(2,144) = 55.14, p < 0.001, \eta^2 = 0.28$; a main effect for between-subjects variable Group, $F(4,144) = 10.22, p < 0.001, \eta^2 = 0.23$; and a significant effect for Test $\times$ Group interaction, $F(8,144) = 5.97, p < 0.001, \eta^2 = 0.15$. The Test $\times$ Group interaction appears visually in Figure 3.
Figure 3. Test × Group interaction on the written interpretation task.

To find out the main effect for the instructional group differences, pairwise comparisons with a Bonferroni adjustment were conducted, and its results showed the following significant group contrasts: (a) all the instructional groups outperformed the control group, PI+EI vs. the control group ($M_{\text{diff}} = 2.62, p = .001$); PI-EI vs. the control group ($M_{\text{diff}} = 2.53, p = .001$); PBI+EI vs. the control group ($M_{\text{diff}} = 1.41, p = .05$); PBI-EI vs. the control group ($M_{\text{diff}} = 2.22, p = .001$). (b) However, it was only the PI+EI group that made higher gains than the PBI+EI group ($M_{\text{diff}} = 1.22, p < .05$). No other significant contrasts were found.

To examine the main effect for test (time), pairwise comparisons with a Bonferroni adjustment for multiple comparisons showed the following differences: post-test scores were better than the pre-test scores, $M_{\text{diff}} = 1.91, p < .001$; delayed post-test scores were greater than the pre-test, $M_{\text{diff}} = 1.92, p < .001$. Bonferroni adjustment analysis conducted on the immediate post-test (post-test 1) indicated that students in the PI+EI group scored significantly higher than those in the PBI+EI group, $M_{\text{diff}} = 1.16, p < .05$. The analysis also indicated that all the instructional groups performed much better than the control group: PI+EI vs. the control group, $M_{\text{diff}} = 4.01, p < .001$;
PI-EI vs. the control group, $M_{diff} = 4.03, p < .001$; PBI+EI vs. the control group, $M_{diff} = 2.94, p < .001$; PBI-EI vs. the control group, $M_{diff} = 3.37, p < .001$. According to the same Bonferroni adjustment analysis, on the delayed post-test (post-test 2), students in the PI+EI condition similarly scored better than those in the PBI+EI condition, $M_{diff} = 1.68, p < .05$. Besides, the instructional groups outperformed the control group: PI+EI vs. the control group, $M_{diff} = 3.84, p < .001$; PI-EI vs. the control group, $M_{diff} = 3.53, p < .001$; PBI+EI vs. the control group, $M_{diff} = 2.16, p < .001$; PBI-EI vs. the control group, $M_{diff} = 2.79, p < .001$.

Table 2

<table>
<thead>
<tr>
<th>Post-test</th>
<th>Contrast</th>
<th>$P$</th>
<th>Delayed Post-test</th>
<th>Contrast</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI+EI &gt; PBI+EI</td>
<td>$&lt; 0.05$</td>
<td></td>
<td>PI+EI &gt; PBI+EI</td>
<td>$&lt; 0.05$</td>
<td></td>
</tr>
<tr>
<td>PI+EI &gt; Control</td>
<td>$&lt; 0.001$</td>
<td></td>
<td>PI+EI &gt; Control</td>
<td>$&lt; 0.001$</td>
<td></td>
</tr>
<tr>
<td>PI-EI &gt; Control</td>
<td>$&lt; 0.001$</td>
<td></td>
<td>PI-EI &gt; Control</td>
<td>$&lt; 0.001$</td>
<td></td>
</tr>
<tr>
<td>PBI+EI &gt; Control</td>
<td>$&lt; 0.001$</td>
<td></td>
<td>PBI+EI &gt; Control</td>
<td>$&lt; 0.05$</td>
<td></td>
</tr>
<tr>
<td>PBI-EI &gt; Control</td>
<td>$&lt; 0.001$</td>
<td></td>
<td>PBI-EI &gt; Control</td>
<td>$&lt; 0.001$</td>
<td></td>
</tr>
</tbody>
</table>

**Production Task Results**

Descriptive statistics in Table 3 firstly reveal that all the instructional groups improved their performance in the pre-test remarkably more than the control group by the immediate post-test after the instructions and the delayed post-test over a three weeks’ period.

Table 3

<table>
<thead>
<tr>
<th>Written Production</th>
<th>Mean Pre-test</th>
<th>SD</th>
<th>Mean Post-test</th>
<th>SD</th>
<th>Mean Delayed Post-test</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI+EI</td>
<td>2.39</td>
<td>2.50</td>
<td>5.07</td>
<td>2.81</td>
<td>6.68</td>
<td>2.57</td>
</tr>
<tr>
<td>PI-EI</td>
<td>2.06</td>
<td>2.64</td>
<td>6.03</td>
<td>2.40</td>
<td>6.31</td>
<td>2.39</td>
</tr>
<tr>
<td>PBI+EI</td>
<td>2.47</td>
<td>2.67</td>
<td>5.44</td>
<td>3.18</td>
<td>6.47</td>
<td>2.83</td>
</tr>
<tr>
<td>PBI-EI</td>
<td>2.83</td>
<td>2.39</td>
<td>6.94</td>
<td>2.39</td>
<td>7.58</td>
<td>2.13</td>
</tr>
<tr>
<td>Control</td>
<td>3.19</td>
<td>2.81</td>
<td>2.63</td>
<td>1.89</td>
<td>3.13</td>
<td>1.99</td>
</tr>
</tbody>
</table>

Note. PI+EI = 28, PI-EI = 32, PBI+EI = 32, PBI-EI = 36, Control = 16

The analysis of a $5 \times 3$ factorial repeated measures ANOVA revealed a significant effect for within-subjects variable Test, $F(2,144) = 93.09, p < 0.001, \eta^2 = 0.40$; a main effect for between-subjects variable Group, $F(4,144) = 6.46, p < 0.001, \eta^2 = 0.16$; and a main effect for Test × Group interaction, $F(8,144) = 5.38, p < 0.001, \eta^2 = 0.13$. The Test × Group interaction is presented visually in Figure 4.
To find out any main effect of the instructional groups or to examine the group differences, pairwise comparisons with a Bonferroni adjustment were made, and the analysis displayed the following significant contrasts: (a) all the instructional groups outperformed the control group, PI+EI vs. the control group ($M_{diff} = 1.74, p < .05$); PI-EI vs. the control group ($M_{diff} = 1.82, p < .05$); PBI+EI vs. the control group ($M_{diff} = 1.81, p < .05$); PBI-EI vs. the control group ($M_{diff} = 2.81, p < .001$). (b) However, no statistically significant difference was found among the instructional groups on the written production task.

To find out any main effect for test (time), pairwise comparisons with a Bonferroni adjustment for multiple comparisons showed the following differences: post-test scores were better than the pre-test scores, $M_{diff} = 2.63, p < .001$; delayed post-test scores were greater than the pre-test, $M_{diff} = 3.45, p < .001$ and the immediate post-test, $M_{diff} = .81, p < .05$. Bonferroni adjustment analysis was further conducted on the immediate post-test, and its results indicated that all four of the instructional groups performed significantly better than the control group: PI+EI vs. the control group, $M_{diff} = 2.45, p < .05$; PI-EI vs. the control group, $M_{diff} = 3.41, p < .001$; PBI+EI vs. the control group, $M_{diff} = 2.81, p < .05$; PBI-EI vs. the control group, $M_{diff} = 4.32, p < .001$, while showing no significant instructional group differences. The same Bonferroni adjustment analysis which was conducted on the delayed post-test revealed similarly that all the instructional groups outperformed the control group: PI+EI vs. the control group, $M_{diff} = 3.55, p < .001$; PI-EI vs. the control group, $M_{diff} = 3.19, p < .001$; PBI+EI vs. the control group, $M_{diff} = 3.34, p < .001$; PBI-EI vs. the control group, $M_{diff} = 4.46, p < .001$. No other significant contrasts were found among the instructional groups.
Table 4
Summary of Comparisons between Treatment Groups on the Written Production Post-tests

<table>
<thead>
<tr>
<th>Post-test</th>
<th>Delayed Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrast</td>
<td>$P$</td>
</tr>
<tr>
<td>PI+EI &gt; Control</td>
<td>$&lt; 0.05$</td>
</tr>
<tr>
<td>PI-EI &gt; Control</td>
<td>$&lt; 0.001$</td>
</tr>
<tr>
<td>PBI+EI &gt; Control</td>
<td>$&lt; 0.05$</td>
</tr>
<tr>
<td>PBI-EI &gt; Control</td>
<td>$&lt; 0.001$</td>
</tr>
</tbody>
</table>

Discussion

This study investigated the relative effects of PI and PBI conditions on second language morphological development. In addition, the study explored whether EI had any mediating role in greater effectiveness of either the PI or the PBI conditions. To this end, the study compared the instructional groups such as PI-EI and PBI-EI (the first research question), PI+EI and PBI+EI (the second research question), PI-EI and PI+EI (the third research question), and PBI-EI and PBI+EI (the fourth research question).

The results showed that all the instructional groups performed better than the control group on both interpretation and production tasks in the tests. As for the differences among groups, the hypothesis predicting that students exposed to either of the PI+EI and PI-EI conditions would perform better than those in either of the PBI+EI and PBI-EI conditions was partially confirmed on the interpretation task in the pre/post-tests. Put another way, while PI-EI and PBI-EI groups scored equally on the interpretation task, thus showing no statistically significant group differences, when EI was included as another component, the PI+EI group performed significantly better than the PBI+EI group, which clearly indicates that EI plays a mediating role on the greater effectiveness of PI than PBI, at least in the interpretation of English simple past tense.

As for the hypothesis predicting that both the PI+EI and PI-EI groups would be able to produce equally well as the PBI+EI and PBI-EI groups on the production task, this was completely confirmed. In other words, on the production task, all the instructional groups with or without EI made equal gains: EI did not play a significant role in the students’ productive knowledge of English simple past tense. This result was interesting, especially for the PI conditions, because although the PI+EI and PI-EI groups were never encouraged to produce the targeted structure during the instructional period, they were still able to produce equally well as the PBI+EI and PBI-EI groups who received output-based activities.

When the results of the first and the second research questions were considered, contrary to earlier findings in the literature (for instance, VanPatten & Cadierno, 1993; among others), when input groups (PI+EI and PI-EI) with and without EI were compared to output groups (PBI+EI and PBI-EI) with and without EI, the facilitative
or mediating effect of EI was found. Put simply, the superior performance of the PI+EI group over the PBI+EI on the interpretation task, but not that of the PI-EI over the PBI-EI condition on the same task, was not only because of structured input activities contrary to earlier research (e.g., Benati, 2001, 2005; Cheng, 2002; VanPatten & Cadierno, 1993, etc.), but it was also because of EI’s mediating role related to the structure given to the PI students before input activities. Therefore, VanPatten’s input processing model can be extended if it involves one more component: explicit information (see Figure 5).

![Figure 5: Processing instruction in foreign language teaching (extended version of VanPatten’s input processing model).](image)

In fact, earlier PI studies (for instance, Culman et al., 2009; Fernandez, 2008; Henry et al., 2009; VanPatten et al., 2013) have already compared PI+EI to PI-EI groups, but they have not compared PI and PBI groups with and without EI all in one single experimental study. According to the results, they also found a superior effect of PI+EI over PI-EI, thus revealing that ‘EI was beneficial for the correct processing of the subjunctive’ (Fernandez, 2008, p. 595), and ‘explicit information speeds up the processes underlying acquisition (Culman et al., 2009, p. 28) for the processing of German case markings, and ‘EI does have a facilitative effect for L2 German students with PI’ (Henry et al. 2009, p. 571). VanPatten et al. (2013) also argued that EI is likely to produce different effects ‘depending on the intersection of the processing problem and the particular structure’ (p. 509). To conclude, by comparing multiple instructional groups in one study, the research reported in this article likewise explored the mediating role of EI on the greater effectiveness of PI over PBI on the receptive knowledge of regular verb form (– ed) as measured by interpretation task.

For the production task, the study completely confirmed VanPatten and Cadierno’s earlier results (1993), and it showed that although the PI groups never received output-
based activities, they still produced as well as the PBI groups. This result indicates that instruction should be as direct intervention as in input processing so that it can provide ‘a double bonus’ (p. 54) or a ‘better processing of input and knowledge that is apparently also available for production.’ (p. 54) According to Lee and Benati (2009), PI gives students a great ‘opportunity to interpret the meaning–form relationship correctly without any practice in producing the targeted form or structure’ (p. 75); so, it can be argued that when receiving PI materials, ‘students do not need to produce language to be led to syntactic analyses of language, at least with PI’ (VanPatten & Uludag, 2011, p. 52) when the target structure (–ed) is also taken into account, as it is in the present study.

For the third and fourth research questions, given the fact that earlier research (e.g., Benati, 2004a, b; Farley, 2004b; Sanz, 2004; Sanz & Morgan-Short, 2004; VanPatten & Borst, 2012; VanPatten & Oikkenon, 1996; Wong, 2004b) found equal effects of PI+EI and PI-EI on both interpretation and production tasks, it was hypothesized that EI would not play a significant role in improved processing of the targeted morphological structures for both PI+EI and PI-EI groups on the interpretation and production tasks (third research question). A similar hypothesis was made for the PBI+EI and PBI-EI groups as well (fourth research question). Both hypotheses were completely confirmed. PI+EI and PI-EI groups did not show significant group differences; nor did PBI+EI and PBI-EI groups. In other words, EI did not help the PI+EI group to outperform the PI-EI while interpreting and producing the targeted structure. Neither did EI help the PBI+EI to perform better than the PBI-EI group. Put simply, it was structured input, and/or it was structured output activities that helped L2 students in this study to interpret and produce morphological forms (–ed). As Wong (2004b) put it, just because the answer lies ‘in the nature of the structured input activities’ (p. 201), so too it is because the answer lies in the nature of structured output activities, according to the results of this study.

For any greater effectiveness of the PI components when PI+EI group was compared to PI-EI group, Sanz (2004) pointed out that it is not provision of explicit evidence, but it is practice in structured input activities, because according to Wong (2004b, p. 203) when input is structured, form-meaning connections are ‘privileged,’ ‘maximised,’ and thus optimal input processing occurs. Although some earlier PI studies (e.g., Farley, 2004b) found the effect of EI within PI groups, and although they argued that the beneficial effect of EI in PI is ‘for some features of language; those that have opaque or semantically non-transparent form-meaning connections’ (p. 242) such as Spanish subjunctive, this study did not find any significant beneficial effect of EI when PI+EI and PI-EI groups were compared to one another, but did find a mediating effect of EI that created an advantage of the PI+EI condition to be able to outperform the PBI+EI condition.
With regard to the role of structured output and explicit information in PBI groups, this study showed that, as with structured input activities, if output is similarly structured or manipulated (either like PBI+EI or like PBI-EI), then the possibility of students’ making a form-meaning connection increases equally. According to the results of the study, EI was also found to be incongruous in the PBI instructional sequence because the structured output (PBI-EI) condition improved students’ productive knowledge equally well as the PBI+EI condition in all the tests. That is, all these data showed that when students did production-based activities irrespective of EI, they improved their production scores over time equally well.

**Conclusion and Implications**

This study compared the effectiveness of structured input (PI-EI) and structured output (PBI-EI) on the acquisition of English simple past tense regular verb form (-ed). In addition, whether EI plays any pivotal role in the PI and the PBI conditions was also investigated, comparing PI+EI and PBI+EI groups. The main result of the study is that EI mediated for a superior effect of the PI group over the PBI group on the interpretation task both immediately after the instructions and over a three-week period, because while PI-EI and PBI-EI performed equally well without any significant group differences, when EI was a factor, the PI+EI outperformed the PBI+EI on the task. Therefore, this finding confirmed the importance of EI in PI (see Figure 5).

On the other hand, the findings of this study related to production task supported VanPatten’s input processing model, because, according to both PI (+EI/-EI) and PBI (+EI/-EI) students’ performance on the production task in the tests, all the students increased their pre-test scores in the immediate post-test and in the delayed post-test, which was given three weeks after the instructions. This finding has two important conclusions: first, EI helped neither PI nor PBI groups to produce more; second, although the PI groups (+EI/-EI) did not produce the targeted linguistic form in the instructional stage at any time, they produced equally well as the PBI (+EI/-EI) groups. In other words, the study showed that EI was not sufficient to help students produce the form, and that PBI was not the only option when teaching verb morphology; PI groups could also produce although they were not trained.

Put concisely, the following suggestions can be given to teachers of English as a foreign/second language:

- Both input-based and output-based activities could be used to treat L2 students’ default morphological processing problems.

- EI can help interpret and make form-meaning connections, but it may not necessarily help produce the form.
• EI can mediate the PI condition to perform more than the PBI condition on the interpretation task even in the long run, especially given the fact that when EI was given to PI students, they performed significantly better than PBI+EI.

• When PI+EI is compared to PI-EI group, and PBI+EI is compared to PBI-EI group, EI may not help students interpret and produce the targeted form remarkably more; that is, what is more effective is structured input or structured output activities, not EI in either PI or PBI conditions.

These results and implications should be considered carefully, taking the study limitations into account. Although the study can be viewed methodologically among the first studies, comparing all four experimental groups and one control group at the same time, the study could have benefited from including another EI-only group in order to reveal whether EI per se could improve students’ interpretation and production scores as well as the other instructional groups. In addition, the data could have been collected using an eye-tracking instrument so that students’ fixation, gaze, etc. could pave different roads for the PI and the PBI conditions. Future studies could therefore involve one more EI-only group to compare the PI and the PBI conditions, and they could measure students’ performance by getting help from an eye-tracking instrument instead of using traditional pen and paper tests.

References


Appendices

Appendix A: A sample for structured input activities in PI packet

Referential structured input activity: The comparative statements below come from a holiday magazine about John’s perfect holiday (in a campsite) at present but Henry’s terrible holiday (in a campsite) in the past. Listen to the phrases and decide whether each statement is referring to John’s or Henry’s holiday.

<table>
<thead>
<tr>
<th>John’s holiday</th>
<th>Henry’s holiday</th>
</tr>
</thead>
<tbody>
<tr>
<td>(NOW)</td>
<td>(IN THE PAST)</td>
</tr>
<tr>
<td>1 ___________</td>
<td>___________</td>
</tr>
<tr>
<td>2 ___________</td>
<td>___________</td>
</tr>
</tbody>
</table>

(8 more items)

Sentences heard:
1. He lives alone in a tent
2. He stayed in a tent

(8 more items)

Affective structured input activity: Read about Merve’s last week, and please indicate whether similar things happened to you. Circle the correct option for you.

<table>
<thead>
<tr>
<th>My brother and I …</th>
<th>This happened to me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. visited İzmir</td>
<td>True / False</td>
</tr>
<tr>
<td>2. liked the foods.</td>
<td>True / False</td>
</tr>
</tbody>
</table>

(8 more items)

Appendix B: A sample for structured output activities in PBI packet

Referential structured output activity: Ali was at home alone last night. He heard a strange noise. Look at the pictures and talk about his story about the fire using the verbs given.

1. open the window
2. pick the staircase

(8 more items)

Affective structured output activity: Talk about your holiday last year, and you can use the following verbs.

1. organize a day trip
2. visit the library

(8 more items)

Appendix C: A sample of the activities used in assessment tasks

Written interpretation task: The statements below come from an interview between Chimokel and a reporter in Kenya. Chimokel is a housewife but won the Nairobi Marathon last year. Read the following phrases and indicate whether the sentences refer to her training process last year or to what she usually does.
1. We lived in a poor environment.
   a. Past life  
   b. usually does

2. My mother died in an accident.
   a. Past life  
   b. usually does

3. I married Benjamin for love.
   a. Past life  
   b. usually does

(12 more items)

Written production task: The statements below come from an aviation magazine about Amelia Earhart. You will hear the first part of a sentence about her. Change the verb in brackets to complete the sentence.

1. _______________ (pass) across the Atlantic Ocean alone.

2. _______________ (start) in Newfoundland, Canada.

3. _______________ (arrive) in Londonderry, Ireland.

(7 more items)