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

Adem Soruç

Abstract

This study explored the effectiveness of processing instruction (PI) and production-based instruction (PBI) with and without explicit information (EI) on the acquisition of the English simple past tense regular verb 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 the pre-test to the post-test. Regarding specific group differences, the PI-EI and PBI-EI groups made equal gains in both interpretation and production tasks. When EI was included as a component, 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 the PI condition than the PBI condition 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, implications are provided for the teachers; directions are made for further research.

Keywords: Processing instruction, production-based instruction, explicit information, structured input, structured output

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Introduction

It is rare to encounter an applied linguistics researcher who does not accept the role of input on the development of grammar knowledge, or morphosyntactic development when learning the second language (L2). For instance, Krashen (1982) argues that explicit instruction or deliberate attempts to draw learners' attention to a specific linguistic structure does not necessarily help learners acquire it, and instead suggests

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that learners should acquire language 'by understanding messages, or by receiving comprehensible input' (Krashen, 1985, p. 2). On the other hand, Schmidt (1990) points out the importance of 'noticing' as a 'necessary and sufficient condition for converting the input to intake' (p. 129), and he suggests that incidental acquisition of linguistic structures does not automatically happen when learners are exposed to comprehensible input but occurs 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) suggests 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, whether comprehensible or meaning-bearing, not all input 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) recommends that the learner's processing mechanisms should be strengthened by focused practice or structured input activities (see Figure 1), so that correct form-meaning connection is made and the data in the input are interpreted correctly. As can be seen clearly in Figure 1, according to the input processing model, L2 learners develop default processing strategies when learning grammar. However, through structured input activities (focused practice), teachers can ensure that correct form-meaning connection is made because structured input activities facilitate students' cognitive processing of the input in the data as well as precluding students from developing default processing strategies.

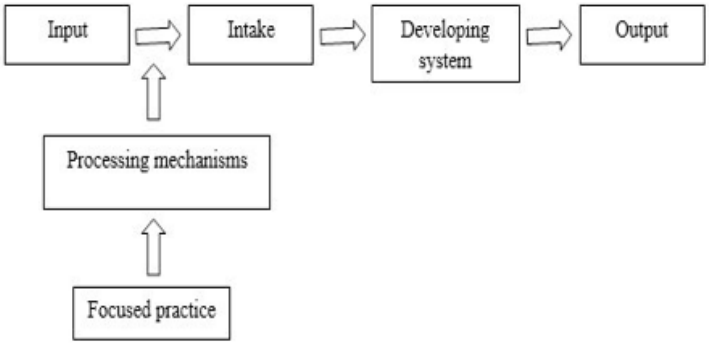

Figure 1. Processing instruction in foreign language teaching (VanPatten, 2004, p. 26)

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 a form from the 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 the

meaning principle of input processing suggests that simultaneous processing of both form and meaning is complicated 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.

As a direct application of VanPatten's input processing theory (Sharwood-Smith, 2015), processing instruction (PI) is based on the primacy of the meaning principle and its associated sub-principles for morphological development, and it includes three components: explicit grammatical information, strategy training, and structured input activities. In processing instruction, students start, firstly, with explicit linguistic information about the rules for the target grammatical form, and then they receive strategy training in which they are told to rely on morphological form alone, not on temporal adverbs. And finally, students are exposed to a series of structured input activities in which the input is manipulated in a way that allows easier processing of the form, or the connection between form and its meaning to be taken for granted. On the other hand, structured input activities are also prepared as referential and affective structured input activities (Lee & VanPatten, 2003). While in the referential activity, students make a correct choice between right and wrong option 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). To conclude, students in a PI condition are never asked to produce the targeted structure; but instead, they perform a plethora of both aural and written interpretation tasks (see Appendix A for the sample referential and affective input activities).

As a form of explicit output practice (Keating & Farley, 2008), and theoretically based on Swain's (1985) comprehensible output hypothesis, production-based instruction (or PBI) allows students to notice the linguistic form, produce the structure and make 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 and confirmed or disconfirmed their hypotheses. More importantly, they reflected on the metalinguistic rules of the language, serving more like an internal priming device (Izumi, 2003). As with the components of processing instruction, PBI likewise includes three components: students receive an explicit explanation of the grammatical form and strategy training, 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. In contrast, in the affective structured output activities, their utterances about their own lives, including the targeted form are elicited (see Appendix B for sample referential and affective structured output activities).

According to DeKeyser and Botana's (2015) narrative review and the other meta-analysis work (e.g., Shintani, 2015; Shintani, Li, & Ellis, 2013), few studies have investigated and compared 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. Therefore, the study reported in this paper will first investigate any

relative effectiveness of PI and PBI on the acquisition of the English simple past tense regular inflectional form (-ed) by Turkish learners of English. Secondly, the study will report on whether explicit information mediates the effectiveness of PI or PBI on the acquisition of the same linguistic form.

Literature Review

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 were engaged in comprehension-based structured input activities only; on the other hand, in the traditional instruction (TI) group, the students produced the targeted structure and completed a series of mechanical production activities moving on to more meaningful communicative practices (e.g., VanPatten & Cadierno, 1993). In the meaning-based output instruction group, to direct learners' attention to the 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, analysis, and correction. To conclude, PI condition was compared to a variety of production-based instructional types.

Viewed as the original experimental research in the PI literature, VanPatten and Cadierno's (1993) study aimed to compare the effects of PI to traditional instruction on the acquisition of Spanish clitic object pronouns, a typical default processing problem especially for learners of Spanish as a second language. Learners' performance was measured by 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 task used as the PI instructional material. However, what was surprising is that although the PI group was never trained to produce the targeted structure during the instructional stage, they were still able to produce it as well as the other students in the TI group. This finding was surprising because it was the students in the TI group who were explicitly engaged in performing 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 helps the development of both their interpretation and production of the target linguistic form.

VanPatten and Cadierno's (1993) article has acted as a catalyst in the PI literature, leading to publication of many 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; Chan, 2019; 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 found 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 the PI group 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 the PI components: explicit information and structured input activities. That is, it was also investigated whether explicit information (EI) or structured input activities are primarily responsible for the greater effectiveness of the PI condition. Similarly, in one of the initial studies, VanPatten and Oikkenon (1996) compared three groups receiving PI with EI (PI+EI), structured input activities only (PI-EI), 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 realized 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 the 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 structured input in particular. At the same time, Sanz (2004) similarly argued that 'it is practice in decoding structured input rather than the 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, 2004; 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 higher 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, 2004, 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 a 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 present study will reveal 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 studies, 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 more significant role over EI on L2 morphological development.

The main research question addressed is as follows: Are there significant differences among instructional groups receiving structured input only (PI-EI), structured output only (PBI-EI), structured input with EI (PI+EI), and structured output with EI (PBI+EI) in terms of their performances on written interpretation and written production tasks? Based on the literature, the hypotheses for the potential differences among the groups according to the task can be developed as follows:

Hypothesis 1. On the written interpretation task, the PI groups (+EI and -EI) are likely to perform better than the PBI groups (+EI and -EI);

Hypothesis 2. On the production task, although they will never be asked to produce, the PI groups (+EI and -EI) are likely to perform as equally well as the PBI groups (+EI and -EI);

Hypothesis 3. The comparison of PI-EI to PI+EI and of PBI-EI to PBI+EI instructional groups within one another will not reveal any significant difference on both tasks.

The Study

Setting

This quasi-experimental study was carried out at a foundation school of an English medium instruction university in Istanbul, Turkey. Before selecting the faculty (major)

of their choice, the students at the school were taking the Michigan English language proficiency and placement test. According to this test, the students were placed at a language proficiency level (such as A1, A2, B1 etc.), in which they learned English at least for a year until they reached a satisfactory level of proficiency.

Participants

At the time of the research, there were 700 elementary A1 Level students placed at thirty-five classes. Of these classrooms, after receiving the school director's consent, nine classrooms at the elementary level were randomly selected and assigned into eight instructional classes and one control class. All participants provided written informed consent prior to enrolment in the study.

Nine classes were intentionally selected 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. However, 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), students' pre-test scores were further analyzed to leave out the 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 administered to 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 administered at the school. Of these students, 700 were at the A1 level, and 300 were either at A2 or B1 Levels. A1 classes were deliberately selected for the study because, before the study started, some A1 level students were interviewed in which they were encouraged to talk about what they did in the past (e.g., last week or last summer). All the interviews were audio-recorded and then transcribed for the morphological analysis of the inflectional form (such as -ed). The initial qualitative exploratory part of the research revealed that although the students produced irregular forms of the verbs accurately (e.g., go-went), they were not able to use the regular inflectional form of English simple past tense -ed. They were not even aware of their lack of use of the regular verb form. Therefore, the elementary (A1) level students were selected for the sampling population of the study. Regarding the selection of the target form investigated in the study, as well as students' failure to use the regular inflectional form (-ed), a large body of research reveals that regular inflectional forms are 'processed in the default procedural-memory system in left-frontal structures (including Broca's area and left basal ganglia)' (Leminen, Smolka, Dunabeitia, & Pliatsikas, 2019, p. 6) and therefore 'notoriously difficult' (Jiang, 2004, p. 603).

Instructional Materials

First, two different material packets with structured input or structured output activities were prepared using the students' A1 level coursebooks taking into account 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, a supplementary handout was prepared for the PI+EI and the PBI+EI groups only. In this handout, metalinguistic rules of the target structure (–ed) were directly explained to the students. Besides, they were warned to rely on the tense ending (–ed) to process the meaning of the form, not to look for lexical adverbs in the sentence. To address any possible problems before the main study started, both material packets and assessment materials were piloted on the same group and student level in different classrooms, but the data obtained from the piloting stage were not involved in the raw data for later analysis.

Packet A: PI Activities. Both PI+EI and PI-EI groups received Packet A, which involves 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 before structured input activities. The direct explanation of the structure and strategy training in the EI handout continued for about ten minutes. Students who received the Packet A never produced but were engaged in both aural and written interpretation tasks. All the tasks were prepared and piloted for the study considering VanPatten's primacy of the 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 involves a total of ten structured output activities: six referential and four affective (see Figure 2). However, the EI handout prepared only for the PBI+EI group includes direct and explicit information of the grammar rules and strategy to rely on when processing the target linguistic form. Completion of the EI handout continued for about ten minutes. The activities in the Packet B helped students to produce the structure by completing both written and oral production activities, which were all designed for the study considering Lee and VanPatten's (2003) guidelines and VanPatten's primacy of the 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. While the interpretation task expected the students to choose 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 assessment task involved ten target items (except for five masking sentences in the interpretation task), a total of 20 when all were answered correctly. Three similar

versions of both types of tasks were designed for the pre-test, the immediate post-test, and the 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 at the beginning, and then followed the production task. It continued for 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 the pre-test, the post-test and the delayed post-test, respectively).

Procedure of the Study

A series of precautions were taken before the research. First, to ensure that students never encountered the target structure, the textbook syllabus was modified for the whole level at the school: the unit including the target structure was replaced by another during the instructional weeks. 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 inflectional forms in their classes throughout the study. Third, to prevent teacher effect or variability, the researcher gave all the instructional activities in four regular classroom hours successively within two days. That is, 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 to one group over another, the regular classroom teacher stayed in the classroom, observed and filled out a checklist while the researcher was giving the instructions. The checklist included items related to the 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 involved ten target items, a total of 20. Since the target items were definite, a one item one-point procedure was administered in the scoring stage; so, there were no partially-correct responses or partially-correct credits. A score of zero was assigned for the blank and incorrect responses. The researcher and one of the classroom teachers marked all the tests, and no disagreements were observed. Any spelling mistakes in the written production tasks were ignored on the condition that the target structure was written correctly.

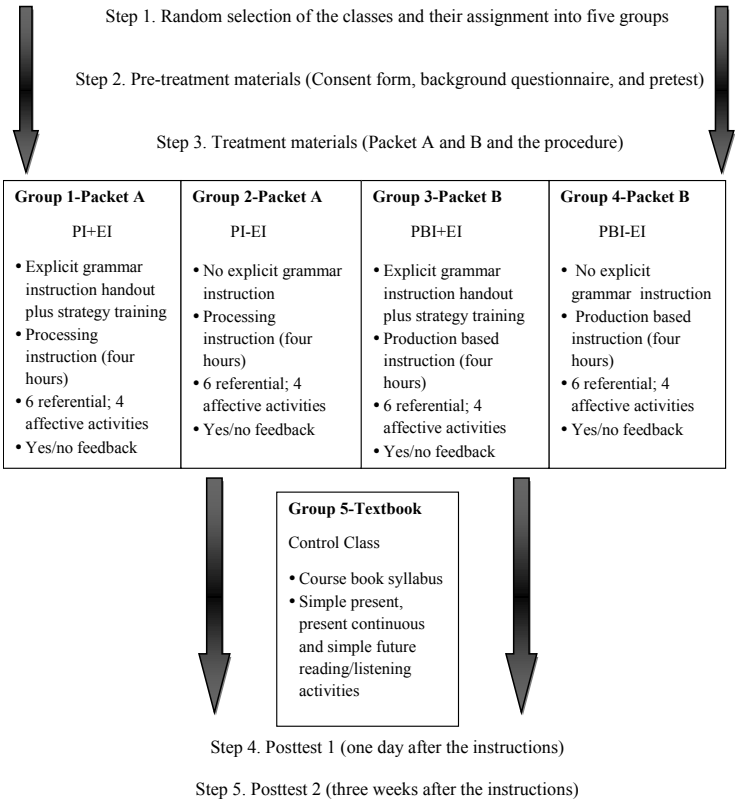

Figure 2. A step by step summary of the research design and procedure

Results

Before analyzing 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 us to assume that any higher 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.

Table 1. Mean scores on the written interpretation task by treatment group and time

		Pre-test		Post-test		Delayed Post-test	
Groups	n	Mean	SD	Mean	SD	Mean	SD
PI+EI	28	6.68	2.61	9.79	0.69	9.96	0.19
PI-EI	32	6.78	2.72	9.72	0.68	9.66	1.43
PBI+EI	32	5.88	2.38	8.63	2.06	8.28	3.06
PBI-EI	36	7.25	2.50	9.06	1.93	8.92	2.10
Control	16	6.75	2.05	5.69	2.27	6.13	1.89

Note. PI = processing instruction, PBI = production-based instruction, EI = explicit information

To examine group effect and test (time) effect, a 5×3 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 × Group interaction, $F(8,144) = 5.97$, $p < 0.001$, $\eta^2 = 0.15$. The Test × Group interaction appears visually in Figure 3.

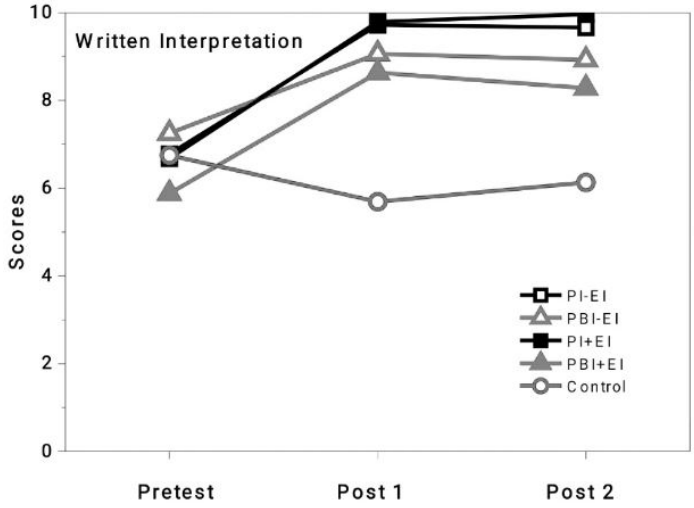

Figure 3. Test × Group interaction on the written interpretation task

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 ($M_{diff} = 2.62$, $p = .001$); PI-EI vs. the control group ($M_{diff} = 2.53$, $p = .001$); PBI+EI vs. the control group ($M_{diff} = 1{,}41$, $p = .05$); PBI-EI vs. the control group ($M_{diff} = 2.22$, $p = .001$). (b) However, it was only the PI+EI group that made higher gains than the PBI+EI group ($M_{diff} = 1.22$, $p < .05$). No other significant contrasts were found.

To examine the main effect for the 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} = 1.91, $p < .001$; delayed post-test scores were greater than the pre-test, M_{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, $p < .05$. The analysis also indicated that all the instructional groups performed much better than the control group: PI+EI vs the control group, $p < .001$; PI-EI vs the control group, $p < .001$; PBI+EI vs the control group, $p < .001$; PBI-EI vs the control group, $p < .001$. 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, $p < .05$. Besides, the instructional groups outperformed the control group: PI+EI vs. the control group, $p < .001$; PI-EI vs. the control group, $p < .001$; PBI+EI vs. the control group, $p < .001$; PBI-EI vs. the control group, $p < .001$.

Table 2. Summary of comparisons between treatment groups on the written interpretation post-tests

Immediate Post-test			Delayed Post-test		
Contrast	M_{diff}	p	Contrast	M_{diff}	p
PI+EI > PBI+EI	1.16	< .05	PI+EI > PBI+EI	1.68	< .05
PI+EI > Control	4.01	< .001	PI+EI > Control	3.84	< .001
PI-EI > Control	4.03	< .001	PI-EI > Control	3.53	< .001
PBI+EI > Control	2.94	< .001	PBI+EI > Control	2.16	< .05
PBI-EI > Control	3.37	< .001	PBI-EI > Control	2.79	< .001

Note. PI = processing instruction, PBI = production-based instruction, EI = explicit information

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 three weeks.

Table 3. Mean scores on the written production task by treatment group and time

		Pre-test		Immediate Post-test		Delayed Post-test	
Groups	n	Mean	SD	Mean	SD	Mean	SD
PI+EI	28	2.39	2.50	5.07	2.81	6.68	2.57
PI-EI	32	2.06	2.64	6.03	2.40	6.31	2.39
PBI+EI	32	2.47	2.67	5.44	3.18	6.47	2.83
PBI-EI	36	2.83	2.39	6.94	2.39	7.58	2.13
Control	16	3.19	2.81	2.63	1.89	3.13	1.99

Note. PI = processing instruction, PBI = production-based instruction, EI = explicit information

The analysis of a 5×3 factorial repeated measures ANOVA revealed a significant effect for within-subjects variable Test, $F(2,144) = 93.09$, $p < .001$, $\eta^2 = .40$; a main effect for between-subjects variable Group, $F(4,144) = 6.46$, $p < .001$, $\eta^2 = .16$; and a main effect for Test × Group interaction, $F(8,144) = 5.38$, $p < .001$, $\eta^2 = .13$. The Test × Group interaction is presented visually in Figure 4.

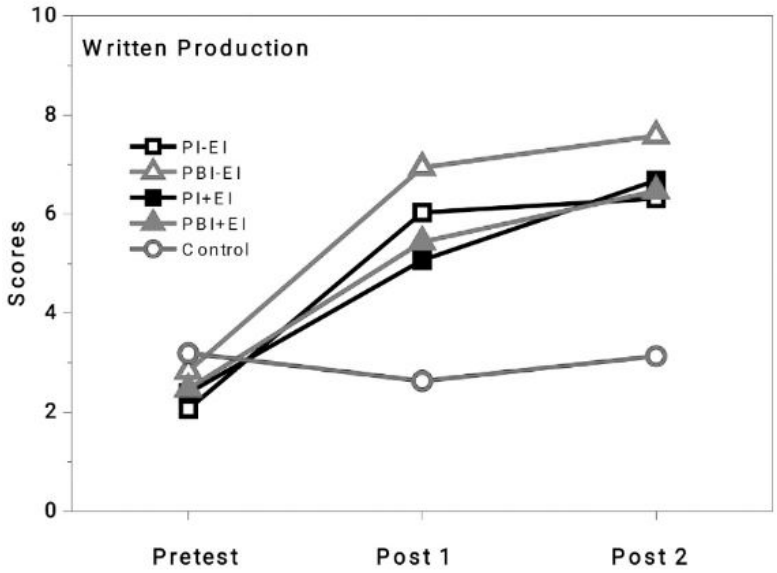

Figure 4. Test × Group interaction on the written production task

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 observed among the instructional groups on the written production task.

To find out any main effect for the 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, $p < .05$; PI-EI vs the control group, $p < .001$; PBI+EI vs the control group, $p < .05$; PBI-EI vs the control group, $p < .001$, 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, $p < .001$; PI-EI vs the control group, $p < .001$; PBI+EI vs the control group, $p < .001$; PBI-EI vs the control group, $p < .001$. No other significant contrasts were found among the instructional groups.

Table 4. Summary of comparisons between treatment groups on the written production post-tests

Immediate Post-test			Delayed Post-test		
Contrast	M_{diff}	p	Contrast	M_{diff}	p
PI+EI > Control	2.45	< .05	PI+EI > Control	3.55	< .001
PI-EI > Control	3.41	< .001	PI-EI > Control	3.19	< .001
PBI+EI > Control	2.81	< .05	PBI+EI > Control	3.34	< .001
PBI-EI > Control	4.32	< .001	PBI-EI > Control	4.46	< .001

Note. PI = processing instruction, PBI = production-based instruction, EI = explicit information

Discussion

This study investigated any relative effectiveness of PI and PBI conditions on second language morphological development. Also, the study explored whether EI had any mediating role in the greater effectiveness of either the PI or the PBI conditions. To this end, the study compared the instructional groups between each other such as PI-EI vs PBI-EI, and PI+EI vs PBI+EI, and within one another such as PI-EI vs PI+EI, and PBI-EI vs PBI+EI.

The results showed firstly 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 the groups, the first hypothesis predicting that students exposed to either of the PI+EI and PI-EI conditions would perform better than the students in either of the PBI+EI and PBI-EI conditions was partially confirmed on the interpretation task in the pre/post-tests. Partially confirmed, because, PI-EI and PBI-EI groups scored equally well on the interpretation task and showing no statistically significant group

differences, but when EI was included as another component, the PI+EI group performed significantly better than the PBI+EI group. This surprising outcome 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. This is the most exciting finding of the study because the group comparisons showed that without EI, the instructional groups, especially, the PI did not outperform the PBI on the interpretation task, but with EI it did. This is also surprising because the PI group (without EI) receiving structured input activities similar to the interpretation task in the tests could not score higher than the PBI groups but with EI it could.

The second hypothesis predicting that both the PI+EI and PI-EI groups are likely to produce as equally well as the PBI+EI and PBI-EI groups on the production task 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 can be attractive to the reader because, although the PI groups (with and without EI) never produced the targeted structure during the instructional period, they were still able to produce as equally well as the PBI groups (with and without EI) who did produce the structure.

When the findings and the two hypotheses were considered at the same time, contrary to earlier research (for instance, VanPatten & Cadierno, 1993; among others), what this study has strikingly revealed is the facilitative or mediating effect of EI for the PI groups to perform better than the PBI groups on the interpretation task. That is, this study demonstrated that the superior performance of the PI+EI group over the PBI+EI on the interpretation task was not because of the structured input activities per se; instead, it was because of the mediating role of EI in the PI condition. However, the implication of this facilitative role of EI should not be generalized for the productive knowledge of the morphological structure targeted in the study; that is, EI did not help students in either of the instructional groups to produce more but did facilitate the higher interpretation of the PI groups over the PBI groups. From this point of view, therefore, VanPatten's input processing model can be extended if it involves one more component as well as focused practice: *explicit information* (see Figure 5).

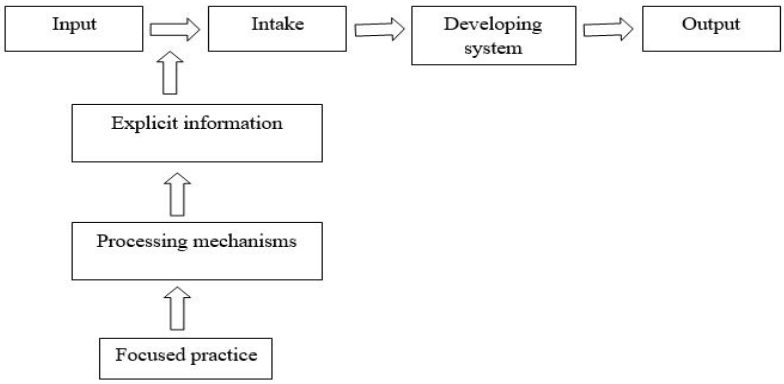

Figure 5. Processing instruction in foreign language teaching (extended version of VanPatten's input processing model)

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 in a 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 the 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.

Regarding the group comparisons with one another (such as PI+EI vs. PI-EI), given the fact that earlier research (e.g., Benati, 2004a&b; Farley, 2004; 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 (hypothesis 3) EI does 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. A similar hypothesis was also made for the PBI+EI and PBI-EI groups as well. The hypothesis was completely confirmed for both instructional groups (with and without EI). 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. It was, namely, structured input, and/or it was structured output activities that helped L2 students in this study to interpret and produce morphological form (–ed). As Wong (2004b) put it, just as the answer lies 'in the nature of the structured input activities' (p. 201), based on the findings, this paper also argues that the answer lies in the nature of structured output activities, not EI, when the comparisons are made within the same instructional groups.

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 the provision of explicit evidence. However, it is the practice in structured input activities, because according to

Wong (2004b, p. 203) when input is structured, form-meaning connections are 'privileged,' 'maximized,' and thus optimal input processing occurs. Although some earlier PI studies (e.g., Farley, 2004) 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 for the PI+EI condition to be able to outperform the PBI+EI condition and this is the most important and interesting finding of the study.

Concerning the role of structured output and explicit information in PBI groups, this study showed that, as with structured input activities, if the 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 as 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. EI did not help the students to produce more.

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 inflectional form (-ed). Further investigated was whether EI plays any pivotal role in the PI condition and the PBI condition within each other. The most important result of this 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 three weeks. This finding is based on the group comparisons: PI-EI and PBI-EI performed equally well without any significant group differences; however, when EI was introduced as another factor, this time, the PI+EI outperformed the PBI+EI on the task. So, this study statistically confirmed the importance of EI in PI (see Figure 5).

On the other hand, the findings of this study as to the production task supported VanPatten's input processing model. According to both PI (with and without EI) and PBI (with and without 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 (with and without EI) did not produce the targeted linguistic form in the instructional stage at any time, they still produced as equally well as the PBI (with and without EI) groups. In other words, the study showed that EI did not help students to produce the form and that PBI was not the only alternative when teaching the regular inflectional form in the simple past tense; PI groups could also produce while they were not trained to do so.

All in all, the following suggestions can be given to the teachers of English teaching the language as a foreign/second language:

- Both input-based and output-based activities could be used to treat L2 students' default morphological processing problems.
- EI helps interpret and make form-meaning connections, but it does not necessarily help produce the form.
- EI mediates 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 does help students neither interpret nor produce the targeted form remarkably more; what is more useful is structured input or structured output activities, not EI in either PI or PBI conditions when compared.

However, the reader should take its limitations into account when considering these findings and implications such as its being a quasi-experimental study. Although the study can be viewed among the first studies to compare the four experimental groups and one control group at the same time, it could have included another EI-only group to reveal whether EI group itself could improve students' interpretation and production scores as equally well as the other four instructional groups. This could be interesting research if conducted in the future. Besides, the data could have been collected using an eye-tracking instrument so that students' eye movements (including fixation, gaze, saccade) could yield more different results and new insights for the PI and the PBI research. Future studies could, therefore, measure students' performance using an eye-tracking instrument instead of a traditional pen and paper test.

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Açık Anlatım Destekli Dilsel Girdi İşlemleme ve Dilsel Çıktı Eğitiminin İkinci Dil Biçimbilgisi Gelişimine Etkisinin Araştırılması

Öz

Bu çalışma, dilsel girdi işlemleme (input) ve dilsel çıktı (output) eğitimlerinin İngilizce'deki geçmiş zaman ekinin (-ed) edinimine olan etkisini araştırmıştır. Ayrıca, çalışmada açık anlatım destekli dilbilgisi eğitiminin (explicit information) dilsel girdi işlemleme ve çıktı eğitim grupları üzerindeki etkisi de araştırılmıştır. Bu bağlamda, Istanbul'da eğitim dili İngilizce olan bir üniversitenin İngilizce hazırlık okulunda eğitim görmekte olan dokuz sınıf rastgele seçilmiş olup bu sınıflar açık anlatım destekli dilsel girdi işlemleme eğitimi grubu (n=28), sadece dilsel girdi işlemleme eğitimi grubu (n=32), açık anlatım destekli dilsel çıktı eğitimi grubu (n=32) ve sadece dilsel çıktı eğitimi grubu (n=36) olmak üzere dört deney grubuna ve bir de kontrol grubuna (n=16) rastgele dağıtılmıştır. Ön ve son testler göstermiştir ki bu dört deney grubunun, aldıkları eğitim sonucunda hedef dilbilgisi yapısı ile ilgili verilen hem kavrama hem de çıktı testlerinde kontrol sınıfından daha fazla başarı göstermişlerdir. Ayrıca sadece dilsel girdi işlemleme eğitimi ve sadece çıktı eğitimi alan gruplar kavrama ve çıktı testlerinde eşit düzeyde performans gösterirken, bu gruplar açık anlatımlı dilbilgisi eğitimi ile desteklendiğinde girdi işlemleme eğitimi grubu çıktı eğitimi alan gruptan kavrama testlerinde daha başarılı bulunmuştur. Bu sonuç, ilgili alınyazın için oldukça önemli bir sonuçtur, çünkü bu sonuç göstermiştir ki açık anlatımlı dilbilgisinin, girdi işlemleme için özellikle hedef dilbilgisi yapısının kavranmasına faydası olduğu görülürken, dilsel çıktı grubuna ise çıktı testlerinde girdi işlemleme eğitimi grubundan daha fazla katkı sağlamamıştır. Araştırmada ortaya çıkan bu önemli sonuca bağlı olarak bu makalede hem Bill VanPatten'a ait olan girdi işlemleme eğitimi modeline katkı sağlanacak hem de sonuçlar göz önünde bulundurularak İngilizce öğretmenlerine bir dizi önerilerde bulunulacaktır.

Anahtar sözcükler: Girdi işlemleme, üretime dayalı dilbilgisi çıktı eğitimi, açık anlatım destekli dilbilgisi eğitimi, yapılandırılmış girdi, yapılandırılmış çıktı