

## **Processing Instruction and Second Language Grammar Acquisition**

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### **Introduction**

The significance of input, namely meaning-bearing linguistic instances of the target language (TL) (VanPatten, 1996), in accounting for how learners create second language (L2) grammars has long been established (Gass, 1997). Krashen (1985), in his Input Hypothesis, even argues that the sheer provision of abundant comprehensible input would be “necessary and sufficient” for second language acquisition (SLA). In light of such characteristics as “lack of success” and “the importance of instruction” in Bley-Vroman’s (1989) Fundamental Difference Hypothesis vis-à-vis adult L2 learners, however, it appears that manipulating aspects of learning conditions may facilitate L2 grammar acquisition. Some researchers (e.g., Sanz and Morgan-Short, 2005) suggest that external manipulation of input through textual (Jourdenais, Ota, Stauffer, Boyson, & Doughty, 1995) or prosodic (Leeman, 2003) enhancement, or even input flood (Trahey & White, 1993) might induce internal processing, considering that the target forms are made more salient and are thus more likely to be detected by the learner. Others (e.g., Chaudron, 1983; Corder, 1967; Faerch & Kasper, 1980; Krashen, 1982; Sharwood Smith, 1986; VanPatten, 1996, 2002a, 2004a, 2007), while acknowledging the difficulty of controlling and measuring L2 processing, still see value in theorizing about the learner’s internal language acquisition mechanism to make sense of the manner input processing (IP) works, i.e., what kind of L2 input gets converted to intake and the rationale behind it.

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To this end, VanPatten's (1996, 2002a, 2004a, 2007) IP model has attracted considerable attention in instructed SLA over the past decade, most probably because it seeks to go beyond theoretical issues and get down to pedagogy with a specific approach to grammar instruction, namely processing instruction (PI), as its interventional counterpart. In other words, PI is unique in that it is not only research-motivated but also informed by an SLA model of how learners process L2 input in real time to make form-meaning connections (Wong, 2004a) and is therefore grounded in the psycholinguistic strategies they employ during comprehension. It appears to offer a solution to the problem "How can input processing be manipulated to fuel the development of an implicit linguistic system?" by priming the learner to more efficiently extract meaning from non-salient features, such as functors, third-person inflections, and syntactic structures (VanPatten, 2002a).

The research question for this paper is: To what extent is PI effective in facilitating the making of accurate form-meaning connections? The purpose of the paper is threefold. The first is to scrutinize the landmark and current strands of research on PI. The next is to underscore specific theoretical issues with VanPatten's IP model and PI, as well as issues of generalizability as evident from empirical research. This is followed by a discussion of how the efficacy of PI and the roles of its major components may be put into perspective. Through this exercise, a general picture regarding the efficacy and limitations of PI will emerge, hopefully yielding pedagogical insights for practitioners to broaden their repertoire. The paper will end with probable directions for future PI research.

### **What is processing instruction?**

To the extent that all potentially problematic formal features and the corresponding defective processing strategies to be corrected via PI are predicated on or derived from his insights of input processing (VanPatten, 2005), VanPatten's own IP model is pivotal to the operation of PI. To him, IP concerns how learners derive intake, or the linguistic data actually processed and held in working

memory for further processing, from input. With the primary concern being “What form-meaning connections do learners make, when do they make them, and why some and not others?” (p. 268), it echoes Carroll’s (1999) view that acquisition, of which input processing is the beginning phase, is a failure-driven process. Two theoretical assumptions are relevant here (VanPatten, 2002a). One is the Availability of Resources Principle, which has its roots in Kahneman’s (1973) capacity model of attention in cognitive psychology. It speaks to the limited information processing capacity of humans, and the trade-off between attention to content, and redundant meaningful grammatical or non-meaningful forms in the input (Long & Robinson, 1998). This postulation seems to be supported by one of VanPatten’s (1990) own studies, in which learners recalled the least about a passage when instructed to simultaneously attend to grammatical morphology and meaning during listening comprehension, suggesting that this might be the task that taxed their limited computational resources the most. Beyond this premise of selective attention, there is the Primacy of Meaning Principle, which states that learners tend to process input for meaning before processing it for form, probably following the same logic: to ensure adequate attentional resources for any subsequent type of processing.

The IP model also posits the First Noun Principle (VanPatten, 2005). It stipulates that learners tend to assign subject statuses to the first (pro)noun in a sentence, and that they tend to process elements in the initial position of a sentence or an utterance first (VanPatten, 2002a). The body of research confirming the psycholinguistic validity of this principle, as cited in Farley (2005), is generally robust (e.g., Gass, 1989; VanPatten, 1984).

Another key construct is “communicative value,” i.e., the meaning a form contributes to the overall sentence meaning (VanPatten, 2002a). It possesses two features: [+/-inherent semantic value] and [+/-redundancy]. Intuitively, forms with [-semantic value] have no communicative

value, regardless of redundancy. It follows that the more a form contains communicative value and the more frequent it is present in the input, the more likely it is to get processed and be available in the intake data for interaction with grammar and for acquisition.

With the IP model as its backbone, PI, in VanPatten's (2005) words, is a type of "explicit instruction" or focus on form (FonF), i.e., any manner in which the learner's attention is directed to the formal properties of the L2 and how they work (VanPatten, 1996). It is "explicit" in the sense that specifically readjusted input is utilized to push the learner away from nonoptimal processing strategies insofar that (s)he must attend to the communicative value of a certain form in the input to grasp the overall meaning. This way, the learner would be encouraged to perceive and parse L2 stimuli more effectively and accurately and thereby make better form-meaning connections. A secondary salient feature is: at no point during the instructional phase are learners pushed to produce the target form.

Simply put, PI constitutes: (1) explicit grammatical explanation pertinent to the target form or structure and relevant examples, in that order; (2) information about natural but faulty processing strategies, which may prevent the learner from selecting the proper feature for comprehension; (3) structured input (SI) activities, which entail: (a) referential SI, or input that pushes the learner to attend to or even rely on form or structure to get meaning, i.e., toward more optimal processing tendencies; (b) affective SI, or input that allows the learner to express an opinion or a belief and be engaged in processing information about the real world, but not necessarily to get meaning from the target feature (Wong, 2004a).

Some researchers (e.g., Doughty, 2004; Morgan-Short & Bowden, 2006; Sanz, 2004) also highlight "feedback" as part of the PI package, and not without good reason. As can be seen in the next section, negative evidence in the form of explicit and/or implicit feedback is indeed present in many PI studies. This is especially so in those aiming to ascertain the importance of the explicit

information (EI) component, which has come to encompass not only metalinguistic rules about the target form and explanation regarding nonoptimal processing strategies, but also the explicit and/or implicit feedback given immediately after each response during treatment. In general, feedback helps the instructor assess whether learners have made proper form-meaning connections. Implicit feedback, to Doughty, seems especially necessary, for learners would need it as cues to determine whether there is a need to revise their approach to input processing.

### **Principal strands of empirical research**

#### ***Comparing Processing Instruction with Other Types of Grammar Instruction***

Since inception, a sizable amount of research has been carried out to determine the extent to which PI is superior to other types of instruction, notably traditional instruction (TI), meaning-based output instruction (MOI) or meaningful output-based instruction (MOBI), and “Enriched Input” (EnI), which is an input-based approach. Taken together, results from the majority of the studies designed by VanPatten and other advocates of PI seem compatible with the claim that PI is at least as effective as the types of instruction listed, if not more so on specific tasks.

In their first seminal study, VanPatten and Cadierno (1993) set out to compare the efficacy of PI and TI on Spanish object pronouns and word order, which, considering that the subjects were native speakers of English and second-year learners of the TL, put the First Noun Principle to the test. In particular, TI was chosen as a basis for comparison because it arguably was, and probably still is, the most pervasive pedagogical tool in the foreign language classroom and characterizes the most typical way of manipulating input, i.e., through providing learners with metalinguistic information and rules. At the same time, as TI involves output practice by nature, it may provide solid ground for testing the degree to which such practice might lead to the development of fluent and accurate production from one’s implicit linguistic system. Abiding by Paulston’s (1972)

working definition, the TI administered involved giving learners explicit explanation about the form, with input through examples, followed by oral or written controlled output practice, which progressed from mechanical drills to meaningful and more open-ended communicative activities. In other words, TI differed from PI in that it did not include explanation about ineffective processing strategies, and that its practice activities were only sometimes meaningful, but always output-focused (Morgan-Short & Bowden, 2006). Unlike the two experimental groups, the control group was not exposed to the target form at all.

Overall, the results suggested that PI appears to be more beneficial than TI (VanPatten & Cadierno, 1993): although subjects in the PI group never practiced producing the Spanish object pronouns during treatment, they were able to not only perform significantly better than the TI group on the interpretation task, but also do just as well on the production task as those in the TI group, who received a great deal of practice in producing the structure. Based on these findings, the researchers argue that the PI group's input processing for this form resulted in changes in the developing system, or interlanguage (IL) (Selinker, 1972), which could be accessed for production.

A number of subsequent studies adopted a similar research design. Cadierno (1995) investigated the benefits of PI and TI on the preterit tense and morphology in Spanish, and the Lexical Preference Principle, a corollary of the Primacy of Meaning Principle that puts lexical items over grammatical form when extracting meaning; Cheng (1995, 2004) studied the acquisition of the lexical-aspectual items *ser* and *estar*, the two major copular verbs in Spanish of low "communicative value." Both reported superior results of PI over TI.

The remarkable finding that PI might lead to significant gains in not only language comprehension, or interpretation, but also production, generated a spawn of replication studies, some of which claimed to have yielded contradictory results. For one thing, DeKeyser and

Sokalski (1996), modeling their study on VanPatten and Cadierno's (1993), selected object pronouns and the conditional tense in Spanish as the target items. The two experimental groups both received EI as well as practice exercises that progressed from mechanical to meaningful and communicative, except that the practice set for one group was input-based in nature, whereas that for the other group was primarily output-based. Both groups were provided with EI and compared to a control group. Results concerning object clitic pronouns showed that input-based activities were correlated with better performance on the comprehension task only; the output-based group did better on the production task. For the conditional, the output-based group obtained better scores in both comprehension and production. This prompted DeKeyser and Sokalski to conclude that PI is not superior to TI and that PI could not bring about transfer of task skills from interpretation to production even within the paradigm of one particular feature.

Similarly, Salaberry (1997) replicated VanPatten and Cadierno's (1993) study, again targeting the form of Spanish object pronouns. Both the input processing group and the output processing group were presented with sequenced activities moving from mechanical to communicative language. The only difference was that the latter group was required to produce the target form, while the former, other than receiving instruction that was input-based but not composed of SI, was not. When compared to the control group, no significant differences were found between the two treatment groups' performances on the comprehension test, the discrete-item production test, and the free video narration test. Salaberry thus concluded that PI is not better than TI.

Allen's (2000) replication also produced results conflicting with VanPatten and Cadierno's (1993). With the target structure being the French causative with *faire* and the processing strategy being the First Noun Principle in mind, Allen compared a PI group and a TI group with the control group. In fact, she particularly reminded those in the PI group not to rely on the faulty first-noun

strategy in her activities. It was found that both experimental groups performed equally well on the sentence-level interpretation task, with the TI group making more gains on the sentence-level production task. Thus, the researcher concluded that the superior results of VanPatten and Cadierno could not be generalized to the causative structure in question.

Upon close examination of these replications, however, advocates of PI (e.g., VanPatten, 2002a; Wong, 2004a) notice the following caveats. First and foremost, the studies by DeKeyser and Sokalski (1996) and Salaberry (1997), though both containing specific target items, seemingly did not aim to circumvent any natural processing strategy. As such, the input-based activities therein could not be classified as SI, which is supposed to do exactly that. In the absence of true SI activities that required learners to process the input for both meaning and form, it is unlikely that participants in their studies were pushed to depend on form or sentence structure to derive meaning. Thus, VanPatten and Wong argue that they do not qualify as true replications. As for Allen's (2000), though a faulty processing strategy had been identified, the SI activities were still problematic because they did not prompt any meaning-based processing of structure, or any distinction between causative and non-causative sentences with *faire*. To make their case, VanPatten and Wong (2004) replicated Allen's study, remedying the problems stated. The results obtained were different: the PI group did better than the TI group on the interpretation test, whereas both groups were superior to the no instruction group in terms of production.

However sound VanPatten's (2002a) and Wong's (2004a) analysis might be, it still does not explain the grounds on which one can argue that PI succeeds in impacting the IL system, while TI does not directly do so but results in a different knowledge system (Morgan-Short & Bowden, 2006). More intriguingly: Is it reasonable to conclude that instruction seems more beneficial when directed at how learners perceive and process input than when focused on practice via output?



This question calls for serious effort to explore the role of output practice in instructed SLA. In hopes of generating fresh insight void of mechanical practice, Farley (2001, 2004a) initiated research that compared PI with MOI, which consists of “structured output” (SO) (Lee & VanPatten, 2003), i.e., activities involving the exchange of previously unknown information, which compel learners to access form in order to express meaning. MOI resembles PI in that it comprises metalinguistic explanation, IP strategy information, and input through examples; its practice, however, is output-based, not input-based. The rationale behind SO activities stems from Swain’s (e.g., 1985, 1998, 2005) Output Hypothesis, which boils down to this: Does output practice improve both performance and grammatical *competence*? To Swain, output production pushes learners to notice: (1) any “gap” (Schmidt, 2001), i.e., discrepancy, between their IL and a form in L2 input, and thus to formulate, test, and obtain feedback on their hypotheses about encoding L2 meaning based on “cognitive comparison;” (2) any “hole” (Doughty & Williams, 1998), i.e., something they cannot articulate precisely using their own IL, even though they want to say it in the TL. All this is critical to input processing, for once learners consciously recognize their linguistic problems, their attention is more likely to be selectively drawn to relevant input. Along with advancing fluency, or automatizing performance, output practice also seems to induce improvement in existing grammatical knowledge and ultimately competence.

In probing into whether the superiority of PI would obtain or not when compared with a “drills-free” meaning-based output approach, or MOI, Farley (2001, 2004a) targeted the development of the Spanish subjunctive, and, for that matter, the Lexical Preference Principle. In the earlier study, the PI group and the MOI group were made up of a relatively small subject pool of 29 college students. Notably, the MOI group, instead of SI activities, received activities that elicited production of the subjunctive forms in utterance-initial position. The results on the whole

supported the superiority of PI: while the two groups did equally well in production, PI generated a greater effect on the interpretation task than the MOI. The latter one, besides having a much bigger subject pool of 129 university students, also attempted to find out if any transfer of knowledge from exemplars to novel test items would occur. The results turned out to be different from those obtained earlier: PI did not seem to be more beneficial than MOI. Rather, PI and MOI impacted learners' interpretation and production of regular, irregular, and novel subjunctives, as well as subjunctive forms in general, very similarly. To account for this, Farley draws upon the concept of "incidental input": when learners respond in the follow-up phase of each activity, their utterances become "incidental input" for one another, making the target feature salient. The fact that those in the latter MOI group received more incidental input than their earlier counterparts might explain why they could do as well as the PI group in interpretation.

Seeking to further research effort in this direction, Benati (2005) compared the efficacy of PI, TI, and MOI on the acquisition of the English simple past tense marking, which concerned the Lexical Preference Principle, by secondary school subjects in China and Greece. This specific target form was chosen to verify VanPatten's (2004b) claim that learners with an L1 like English, i.e., with tense marking (Greek), would connect past tense markers to meaning before those whose L1 does not mark tense grammatically (Chinese). Meanwhile, all three groups received feedback that only indicated whether their answers were correct. The results showed that the PI group did significantly better than the TI group and the MOI group on the interpretation task, while all groups improved almost equally in production. Benati concluded that PI appears to be not only a better instructional treatment than TI, but also superior to MOI. He even argues that this seemingly reaffirms the positive effects of PI in altering learners' nonoptimal strategies, and subsequently on their developing system.

To verify whether the non-converging results above could be taken to mean that PI and MOI

simply have differential results, Morgan-Short and Bowden (2006) studied the effectiveness of PI and what they termed “MOBI” on acquiring Spanish preverbal direct object pronouns, thus speaking to the First Noun Principle again, as in VanPatten and Cadierno (1993). Native English-speaking first-semester Spanish learners in college were randomly placed into the PI, MOBI, or control groups. MOBI is virtually the same as MOI, except that it was delivered via computer; it was developed to match PI in the provision of EI, but diverged from PI in the mode of practice. Adapted from the study’s PI materials directly, the MOBI activities required target form production, instead of interpretation, for completion. Contrary to the overall trend, though, this study did not confirm the superiority of PI: the MOBI group performed at least as well as the PI group in both interpretation and production. More strikingly, only the MOBI group outdid the control group in production in general. This suggests that the use of meaningful output practice alongside meaningful input-based practice is likely to improve both fluency and accuracy in the L2 classroom.

Recent research has begun looking into the importance of pushing learners to “interpret the meaning of language form” (Marsden, 2006, p. 507) during input processing for the purpose of making integrated form-meaning connections. Targeting the French verb inflections for tense, number, and person, Marsden compared PI with “Enriched Input” (EnI), another input-based approach. To test the essentiality of interpreting the meaning of such communicatively redundant forms, the Lexical Preference Principle was again under examination. EnI was operationalized as featuring the same brief grammar explanation as in PI, followed by equal numbers of target feature exemplars. Learner attention to such forms or their meanings, however, was not required for the EnI tasks. In this sense, EnI could be viewed as an attempt to externally manipulate input processing via the presentation of ample instances to ingenerate “noticing,” while PI sought to impact this process internally by pushing learners to make the correct form-meaning connections.

Results from two native English-speaking groups at different proficiency levels suggested that PI is superior to EnI (Marsden, 2006). In Experiment 1, unlike the PI group, those receiving EnI did not make great gains in the target form, probably because they were not compelled psycholinguistically to process inflections “in a way that aided learning” (p. 544). With slightly higher-level learners in Experiment 2, the PI group still improved significantly more in listening and reading than both the EnI one and the test-alone one. This reaffirms that opportunities to derive meaning from form in the input, like those given to the PI group, may impact acquisition positively. What is more, this study should be credited for having advanced the PI research agenda to evoking comparisons with other input-based approaches, rather than just output-based ones.

### ***Comparing the Significance of Explicit Information and Structured Input***

A later strand of PI research isolates the respective roles of EI and SI, the two fundamental components, in contributing to its efficacy. To some (e.g., DeKeyser, 1997), EI is somewhat synonymous with “declarative rules or knowledge;” others conceive EI as encompassing a “focus on forms” (FonFs) orientation, which engages metalinguistic processing (e.g., Doughty, 1991, 2004), and/or may have been put in place to trigger the “noticing” function (Schmidt, 1990, 2001). Either way, explicit grammatical information is generally believed to have a positive effect on L2 development.

VanPatten and Oikennon (1996), against this background, pioneered a study to determine whether the effectiveness of PI is more a result of EI or SI activities. The research design was based on VanPatten and Cadierno’s (1993) for the most part, except that EI was singled out as an independent variable. Three groups were compared: PI; SI, which received SI activities and immediate feedback as to whether their answers were correct, only; and EI, which briefed learners purely on relevant metalinguistic information and processing strategy. It turned out that the PI group and the SI group both improved considerably in interpretation, but no improvement was

evident in the EI group; on the production task, the PI group showed greater gains than the EI one, whereas the PI group and the SI group did equally well. The researchers concluded that the beneficial effects of PI is likely to be due to the “task-essential” nature of SI activities, particularly so of the referential ones, in which learners cannot perform the tasks successfully unless the target form is used (Loschky & Bley-Vroman, 1993). This extreme demand on a target structure may undermine the effects of EI, leading VanPatten (2002a) to later suspect that EI does “not contribute anything significant” (p. 786) to the efficacy of PI.

To find out if such an assumption may hold vis-à-vis other forms and processing problems, Wong (2004b) studied 54 native English-speaking college students on their acquisition of the French *de/un* distinction, which corresponded to the Lexical Preference Principle. All without prior exposure to the target structure, the learners were randomly assigned to the PI, SI, EI, or control groups. Overall, the results were comparable to VanPatten and Oikennon’s (1996): the SI group and the PI group improved equally and were superior to the EI group and the control group on the interpretation task; on the production task, the PI group and the SI group both performed well enough to outshine the control group, while the SI group’s and the EI group’s improvement were not significantly different from each other’s. Wong thus argued that EI appears to play only a minimal role in PI, and that it might not be necessary or very beneficial for processing forms correctly.

In a similar way, Benati (2004) replicated VanPatten and Oikennon’s (1996) effort with the Italian future tense, experimenting with the Lexical Preference Principle. 38 college-level Italian learners were divided into three groups: PI, SI, and EI. An immediate- and delayed- posttest design was adopted, and the results obtained were congruent with the trend thus far: the SI group and the PI group yielded similar noticeable gains on the interpretation task and the production task, and outperformed the EI group on both occasions. It should be highlighted, however, that the EI group

did make some limited gains on the two tasks. As well, the treatment effects were sustained one month later. Benati, for that matter, contended that structuring referential input alone, especially via juxtaposing the target form with another structurally or functionally similar form to push processing changes, seems to be an appropriate approach to grammar instruction. Despite echoing the idea that EI's role in PI is insignificant, if not virtually non-existent, Benati speculates that the reason why EI did result in some gains might be that the structural rule in question is less complex than the one for the Spanish word order problem and might be easier to notice, comprehend, and internalize.

Moving on to testing the significance of SI alone with more complex structures, Farley (2004b) also replicated VanPatten and Oikennon's (1996) study, focusing on the Spanish subjunctive after expressions of doubt, which concerned the Lexical Preference Principle and the Sentence Location Principle. 54 college Spanish learners were put into one of two treatment groups, PI and SI. The posttest results indicated considerable improvement in both groups. However, unlike all previous research, the PI group's gains were much greater than the SI group's. Given that the SI group showed remarkable improvement from pretest to posttest, Farley concurred that SI alone seems necessary and perhaps even sufficient for triggering PI's effectiveness, namely evoking the making of appropriate form-meaning connections. However, Farley also acknowledged that EI may positively affect the rate of acquisition by orienting learners to notice and later to process form for generating accurate form-meaning mapping promptly. In particular, EI may be beneficial for certain features of language, i.e., those having opaque or semantically non-transparent form-meaning relationships, as those for the Spanish subjunctive. In relation to this specific structure, it is likely that EI is facilitative in that it makes the triggering clauses more transparent.

To extend research effort on EI to the element of feedback, Sanz and Morgan-Short (2004) optimized from the advances in computer assisted language learning (CALL) in recent years and

Retrievable at <http://www.tc.columbia.edu/tesolalwebjournal>  
delivered VanPatten and Cadierno's (1993) materials digitally to college learners of Spanish. Their goal was to examine the extent to which immediate, personalized, and target-form-focused feedback before and/or during SI activities might enhance positive changes in L2 behavior. Learners were randomly put into one of the four treatment groups by combining [+/- Explanation] ([+/-E]) with [+/- Feedback] ([+/-F]). Explanation, in this case, referred to grammatical rule and processing strategy presentation prior to practice. One clarification is needed: all learners, by default, received at least "implicit" feedback, i.e., the two [-F] groups were still informed whether their answers were correct; the [+F] groups, on top of implicit feedback, also received metalinguistic information that explained why their answers might be wrong. It was found that all groups improved significantly and similarly on the interpretation task and on the production tasks of sentence completion and written video-retelling. As for the effects of feedback alone on the acquisition of the same form, Sanz (2004) carried out a study parallel to this one. In this, there were only two experimental groups – explicit feedback, and implicit feedback – and the results were in line with Sanz and Morgan-Short's (2004). Thus, the researchers assert that EI, provided before practice, during practice, or on both occasions, might not necessarily facilitate acquisition of certain forms (Sanz & Morgan-Short, 2005). Rather, exposing learners to task-essential practice like referential SI activities, which entail decoding positive evidence manipulated to be more frequent and salient and thereby promote accurate form-meaning connections, or "FonF processing" (Doughty, 2004), may be sufficient.

Upon analyzing the implications of the EI research above, conflicting notions surface. On one hand, there is evidence that EI might lead to some learning gains when explicit rules are less complex, like those for the Italian future tense (Benati, 2004). On the other hand, Farley (2004b) found that EI may be beneficial for the acquisition of more complex structures like the Spanish subjunctive, whose form-meaning relationships may not be readily transparent. In that case, EI may, as

Doughty (2004) propounds, perform the potentially crucial function of “orienting” the learner to the form and processing problems, thereby fueling the rectifying of faulty strategies later on. Thus, whether or not EI has facilitative effects on PI for certain structures still remains to be seen.

In an effort to reach a more definitive conclusion on this issue, Fernández (2005) set out to observe how EI would impact learners’ behavior during processing of two distinct TL structures: the more complex Spanish subjunctive, and the less complex Spanish word order with object pronouns. 82 college-level participants were divided into two groups: [+EI] and [-EI]. The treatment was computer delivered and both groups received feedback on accuracy immediately following their responses to SI activities. Fernández was particularly interested in the number of SI items or trials learners had to go through before answering at least four items in a row correctly. At the same time, response time and accuracy after criterion were tracked. The results conjecturally lent support to Farley’s (2004b) view: Among those who reached criterion only in the subjunctive, which is a more complex structure with much less transparent form-meaning relationships, the [+EI] group reached criterion sooner, responded faster, and was more accurate after criterion than the [-EI] one; there was no significant difference between the groups among those who reached criterion only in word order. The type and nature of a structure does seem to make a difference in terms of whether EI is beneficial to PI, especially in alerting learners to non-transparent form-meaning connections, thus speeding up the resolution of processing failure (VanPatten, 2004b).

### **Theoretical issues with processing instruction**

Precisely because PI is founded upon VanPatten’s (1996, 2002a, 2004a, 2007) evolving IP model, it is bound to be susceptible to issues inherent therein. One criticism from DeKeyser, Salaberry, Robinson, and Harrington (2002) comes down to its cognitive underpinnings: the arguably outdated theory of selective attention and limited processing capacity (e.g., Kahneman, 1973),



Retrieval at <http://www.tc.columbia.edu/tesolalwebjournal>  
described earlier. VanPatten (2002b) rebuts by stressing that while some models of attention from first language (L1) studies no longer argue for fixed resources but instead assume distributed resources and parallel processing, at least one recent comprehension-oriented model of L1 capacity limitations has been proposed (Just & Carpenter, 1993). Carroll (2004), to say the least, merits PI activities for being “rooted in a viable psychology perception and learning” (p. 295). Still, there are disputing voices from within the SLA field. Tomlin and Villa (1994), for one, propose that attention could occur without conscious awareness, and may lead to such gains as incidental learning of certain form-meaning relationships in the complex English article system. Robinson (1995) also postulates that rather than attention alone, detection at the level of awareness, together with distributed practice, may result in more efficient form-meaning mapping. Carroll (2004), on a different note, doubts the role of “noticing” (Schmidt, 1990), which seems loosely equal to “attention,” in the IP model, given that it does not explain how phonological knowledge occurs unconsciously and/or below the threshold of awareness. However, as these propositions offer no corresponding instructional approaches in return, little could be said about their applicability to the hands-on teaching of L2 grammar.

Along this line, DeKeyser et al. (2002) question the meaning-driven nature of VanPatten’s (2002a) IP parser. Given that VanPatten (1996) restricts the term “form” to bound grammatical morphemes and functors like prepositions, articles and pronouns, instead of the more standard use that refers to the surface of the utterance, the overall, referential, and communicative meanings are carried in two types of mappings between surface elements and underlying functions: word-meaning mappings for content words, and form-meaning mappings for “‘free’ and bound grammatical morphemes” (DeKeyser et al., 2002, p. 810). In such cases, the parser would need to distinguish between referential meaning appearing in the content words and that appearing in the forms, thus implying that some sort of “preprocessing” stage would be necessary. They argue that while this kind

of parser might exist, no current sentence-processing models are even remotely related.

In connection with this postulation that the default approach to non-primary language input processing is meaning-based (VanPatten, 2002a), Han and Peverly (2007) obtained contrary findings from their study on how 12 adult absolute beginners of Norwegian processed novel linguistic data: the learners adopted a primarily form-based approach when processing this language, to which they had never been exposed. On this basis, Han and Peverly argue that when positing input processing principles, it is necessary to differentiate between learners with intermediate grammars of the TL, and those without any existing knowledge of such kind. It follows that the latter kind of learners are apt to employ form-based processing, because to them, the input is linguistically incomprehensible, not to mention lacking extralinguistic clues completely. This appears to pose a valid challenge to not only the model's meaning-based processing assumption, but also whether and how PI could be modified to accommodate this seemingly overlooked need of *ab initio* beginners of practically any language, who may not possess any such predisposed processing strategies in the first place.

As documented by Farley (2005) earlier, supporting research from which the processing principles of the IP model are derived is reasonably sizable. Even so, insofar as any PI effort targeting any linguistic form must be based upon certain faulty processing strategy, researchers and practitioners alike are confronted with the challenging issue of how to identify what these strategies are exactly. This problem may be further complicated by such factors as differential crosslinguistic influence and individual differences, like one's misconception about specific linguistic features. Perhaps one point of departure would be to approach the learners and pinpoint their strategies with multiple episodes of incidental FonF (Long, 1991) as the first steps of diagnosis, followed by having relevant, in-depth discussions with them. Even so, this may be easier said than done, considering that there are still many gaps to be filled.

Likewise, as VanPatten (2007) himself admits, the principles fueling his IP model are subject to modification, basically because the model is still evolving. This leads to the question: Should the IP model require considerable revision, what impact may this have on PI and all related research thus far? A case in point may be the L1 Transfer Principle, which has been officially added to his latest list of processing principles. It states that as learners begin their L2 acquisition with L1 parsing procedures, certain problems that are language-specific in terms of transfer may arise. This principle clearly may be in contention with the universal strategy of the First Noun Principle, stipulated all along. VanPatten (2004b) used to maintain that this would not affect the practice of PI at all, since the First Noun Principle would win out. In his latest work, nonetheless, VanPatten (2007) seems less certain about this position and suggests that research be conducted to verify which position would be more tenable. This may have profound implications as to how PI may need to be reformulated. Still, there is some truth in asserting that this body of research need not be tossed away altogether. Given the fairly robust volume of PI research as discussed earlier, what needs to be done, most likely, is to look for alternative explanations for the observed benefits of PI as different grammatical forms emerge as candidates for pedagogical intervention.

### **Issues of generalizability as evident from empirical research**

Meanwhile, issues of the generalizability or external validity of PI seem to exist in these facets: (1) across language forms or structures; (2) across task demands from the sentence level to the discourse level; (3) across types of language; (4) across time, meaning the durability of PI effects.

PI, as evident from the body of research reviewed (Morgan-Short & Bowden, 2006; Sanz & Morgan-Short, 2004; VanPatten & Cadierno, 1993; VanPatten & Fernández, 2004; VanPatten & Oikennon, 1996; VanPatten & Sanz, 1995; VanPatten & Wong, 2004;), appears to be reasonably effective at the morphological and syntactic levels, especially vis-à-vis communicatively redundant

morphosyntax, or even verb stems. Inasmuch that PI is designed to alter processing strategies for non-salient and/or semantically redundant forms, however, it also implies that there may be features that are unlikely to be amenable by PI (Lightbown, 2004). This may include: (1) features not problematic for acquisition during communication; (2) features that do not lead to changes in meaning, but only a more polished performance. The indistinct English article system may be but one sample structure with such characteristics. It seems questionable at this point, though, whether the kinds of complex syntactic structures typical of SLA research with a Universal Grammar orientation (e.g., White, 2003) could also be effectively dealt with through engaging learners in SI activities. Another related issue is: the case for identifying what complex features may be best learned via the joint provision of EI and SI has been somewhat established (e.g., Farley, 2004b; Fernández, 2005), but the empirical question of how this could be done systematically remains.

VanPatten and Sanz (1995) set out to explore the effects of PI, via its affective SI component, on improving communicative performance beyond the sentence level in particular. Partly modeling on VanPatten and Cadierno's (1993) work, they advanced the task demands to the discourse level by adding an oral video narration task. It turned out that the PI group performed better in the written mode than in the oral mode on the sentence-level completion task and the video narration task. In particular, they did not improve much on the oral narration task, which arguably involved the largest amount of attentional resources and "online" processing. This study is the only one that included a discourse-level assessment task in the oral mode, and the results seemed to support Lee's (2004) view that SI is likely to improve learners' performance only in sentence interpretation and production, as well as in written discourse-level production. At the same time, it points to some serious limits on the existing research database: there is a lack of empirical evidence substantiating that PI has any effect on unplanned discourse-level language use (Ellis, 1998); as well, no

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discourse-level interpretation tasks have been tested and analyzed in any PI research to date.

Synthesizing from the studies discussed, it is clear that the database about the generalizability of PI across languages has been built chiefly upon Spanish, French, and Italian, all of which belong to the Romance language family (Lee, 2004). While there is reason to believe PI may be effective for other Romance languages, like Portuguese, its generalizability to languages beyond that point remains to be seen. Benati (2005) has somehow broken new ground in this respect in selecting English, a Germanic language, as the TL in his study. Even so, PI stays largely an unexplored territory for languages typologically distant from the Romance and Germanic languages, like Asian languages. Carroll (2004) questions the applicability of the First Noun Principle in processing topic prominent languages like Chinese as opposed to subject prominent languages like English, on the grounds that they use different cues (i.e., topics versus subjects) to encode grammatical functions. The L1 Transfer Principle, she argues, may be more relevant in this case, citing Rutherford's (1983) findings about transfer of topic marking strategies among Chinese learners. Some scholars have, indeed, expressed concerns over the practical instructional effectiveness of PI on languages which are so different from those that the IP model and PI originate from, such as Chinese (S.-R. Cui, personal communication, May 1, 2007).

To observe the durative effects of PI over an extended period of time, VanPatten and Fernández (2004) replicated VanPatten and Cadierno's (1993) work on the Spanish word order. Learners' interpretation and production were measured both immediately after instruction, and eight months later. Despite challenges like insulating learners from target item exposure, it was found that significant learning gains persisted even after eight months, especially when compared with learner performance on the pretest rather than that on the one-week posttest. This seems to provide evidence for the reasonably durable effects of PI, contrasting with Lee's (2004) point that its short-term effects

were found to be one week (e.g., VanPatten & Cadierno, 1993), two weeks (Farley, 2001), and one month (Benati, 2001). Such effects are not necessarily permanent, given that learners regressed to their starting point 15 months later. Another consideration is: Whereas most experimental PI treatment takes place only for minutes, hours, or days, is it possible that longer periods of PI, aided by sustained feedback like recasts, would lead to correct, fluent use of the target form (Lightbown, 2004)?

### **Gaining perspective on the efficacy of PI and the role of EI**

A macroscopic analysis of the key research strands reveals the following: PI appears generally effective in improving sentence-level interpretation (e.g., choosing between two pictures, one of which correctly conveys the meaning as read or heard) involving the target form, and seems moderately beneficial for sentence-level written production; learning gains seem less significant for discourse-level written production and reduced to having little significance for discourse-level oral production. Two sets of variables need to be differentiated: task skills and task modes (i.e., in written form or oral form). This issue of task skills is what has evoked substantial discussions in the field of SLA.

It seems obvious why a surge of interest in how PI is related to the development and/or transfer of task skills has emerged: now that the extent to which PI is effective in altering inappropriate strategies for processing particular features has been reasonably explored, it may be time to examine whether learners can transfer such strategies to other structures (Lee, 2004), and whether they can transfer the skills for handling one type of task (e.g., interpretation) to another (e.g., production). The latter, i.e., transfer of task skills, is considered incompatible with the notion of “skill specificity” vis-à-vis the effect of input and output practice from a skill acquisition perspective (e.g., DeKeyser, 1997). This might be why its advocates (e.g., DeKeyser & Sokalski, 1996) remain skeptical about the claim that PI, as suggested by research findings (e.g., VanPatten & Cadierno, 1993), may be effective in improving both the interpretation and production of certain target forms, especially

when learners practice only comprehension strategies, not production skills, during treatment.

In addressing the issue of transfer, DeKeyser (2007) cites the concept of “transfer-appropriate processing” (TAP) on practice as being especially relevant. TAP posits that transfer is likely to occur insofar as “the cognitive operations involved in the new context, task, or test recapitulate or overlap with those engaged in during initial learning” (p. 6). Intuitively, “context” may refer to either the physical conditions or linguistic feature, in which case transfer of strategies to similar forms could be predicted. What deserves contemplation may be the notion of “cognitive operations.” To some (e.g., Santamaria, 2007), this refers to the learner’s psychological state, which might constitute the skill-specific nature of practice, thus predicting that transfer of skills may not be probable. On the contrary, should this be taken to include the input processing at work during the interpretation practice of making appropriate form-meaning connections, which is also arguably essential for production, this might lend support to the possibility of transfer of task skills from interpretation to production, and thereby the efficacy of PI in improving both. As noted by VanPatten (2002a), though, the PI group may not be as efficient and/or accurate on production tasks as the TI group.

The notion of “practice” seems to provide another gateway to understanding how PI works via the components of EI and SI, one from a skill acquisition perspective. Unlike PI advocates who see only a minimal role in EI, DeKeyser (e.g., 1997, 1998, 2007) argues for its crucial function as “declarative knowledge,” a prerequisite for achieving automaticity, whereas SI activities are conceived as the kind of “practice” or “communicative drills” necessary for proceduralization (DeKeyser, 1998), i.e., converting declarative knowledge into “procedural knowledge”. This process is known as “the automatization of explicit rules” (DeKeyser, 1997; Leow, 2007). DeKeyser (2007) even regards VanPatten’s IP model as being “clearly in line with skill acquisition theory” (p. 7) in that it aims at “building the procedural knowledge needed for the use of grammar rules in comprehension *after* the

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declarative knowledge of these rules has been taught explicitly” (p. 7). SI activities, then, seem to serve as “practice” that connects the learner’s dual systems of knowledge. Whether VanPatten would agree with this interpretation is doubtful. It deserves credit, anyhow, for inducing reflections on the helpfulness of EI in L2 grammar instruction, reminding practitioners that EI and SI are not dichotomous, but can be used as complements in illustrating complex form-meaning relationships.

## **Conclusion**

Overall, there is mounting evidence suggesting that PI may be effective in facilitating the making of accurate form-meaning connections in sentence-level interpretation and production for specific features, especially those from the Romance languages. The question is: “What happens to grammatical development afterwards?” (Collentine, 2004, p. 173). Lee and VanPatten (2003) recommend regularly combining PI with meaningful output tasks like MOI, which comprises structured output, to sustain L2 development in terms of system accommodation and restructuring. Along this line, Toth (2006) looked into communicative output (CO) tasks, a type of meaningful output tasks that incorporate pushed output, incidental input, communicatively oriented activities, and negative evidence, as well as attention to and metalinguistic analyses of L2 structures. More importantly, CO tasks are in line with the skill acquisition view that automatizing and restructuring the cognitive procedures involved in such tasks are critical for acquisition. Still, more finer-grained research is obviously required in order to determine what combination(s) of input-based and output-based approaches would work best together.

Norris and Ortega’s (2000) conjecture that individual differences may be a major factor in why FonFs and FonF, of which PI is a kind, are found to be equally effective speaks to the need for research on the effects different facets of learner differences may have on the efficacy of PI. A few of such facets have been preliminarily explored. Farley (2005) examined whether learners’ developmental



readiness (Pienemann, 1998) to learn a form and the types of instruction provided (i.e., PI, SI, or EI), would have any effect on their ability to produce it. Another is Santamaria's (2007) study on the influence of learners' working memory capacity on PI and TI. In the same way, exactly how PI might interact with other facets like language aptitude and learning styles is worth investigating.

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