Input manipulation, enhancement and processing: theoretical views and empirical research

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Abstract

Researchers in the field of instructed second language acquisition have been examining the issue of how learners interact with input by conducting research measuring particular kinds of instructional interventions (input oriented and meaning-based). These interventions include such things as input flood, textual enhancement and processing instruction. Although, the findings are not completely conclusive on whether these instructional interventions have an impact on acquisition, it is clear that we have witnessed to a shift in the field from the original question "Does instruction make a difference?" to the more specific question "Does manipulating input make a difference?" In this article, the author will review key classroom-based research conducted to measure the relative effects of different types of enhancement and manipulation. Three main research foci will be considered: (i) research measuring the effects of saturating the input with the target form (input flood); (ii) research measuring the effects of different types of textual enhancements to draw learners' attention to the target form; (iii) research measuring input restructuring to improve interpretation and processing of target forms or structures (processing instruction).

Key words: input enhancement, input flood, textual enhancement, processing instruction

1. Introduction

The role of instruction in second language acquisition (SLA henceforth) has been

one of the key issues in this field. Scholars have been debating whether instruction

makes a difference in the acquisition of language properties such as morphology and

syntax. VanPatten & Benati (2015) have provided a succinct review of the role of

instruction in SLA. Two main positions around the role of instruction can be

identified: the first position is that instruction has a limited and constrained role; the

second position asserts that instruction might have beneficial role under certain

conditions.

1.1. Instruction is limited and constrained

Krashen (1982, 2009) argues that instruction plays an extremely limited role in SLA. He suggests that L2 learners acquire the target language mainly through exposure to comprehensible and meaning bearing input. The acquisition of the grammatical system of a target language is driven by the exposure to the input and not by the practicing of grammatical rules. In one of the five hypotheses of the *Monitor Theory*, Krashen indicates that instruction is constrained by natural and predictable orders of acquisition. For example, a morphological feature such as the progressive *-ing* in English is acquired (not matter the learner L1) before the regular past tense *-ed*, or irregular past tense forms, which subsequently is acquired before the third-person singular *-s*.

White (2015) views language as an abstract and complex system. Although many aspects of language are acquired by interaction with input (e.g. syntax, morphology, lexicon), one exception are those aspects of language that are universal and built in prior to exposure to the input language. These language universals features constraint the acquisition of grammar.

Pienemann and Lenzing (2015) argue that L2 learners acquire single structures (i.e. negation, question formation) through predictable stages. According to the *Processability Theory*, instruction is constrained by these developmental stages as L2 learners follow a very rigid route in the acquisition of grammatical structures. The role of instruction is therefore limited and constrained by L2 learner's readiness to acquire a particular structure. Instruction might even be detrimental to acquisition if it does not consider learners' current developmental stage.

1.2. Instruction might be beneficial

VanPatten (2015a) assigns a more positive role to instruction. It is effective and beneficial if it manipulates input so that learners process grammar more efficiently and accurately. According to his theoretical framework (*Input Processing*), L2 learners seem to skip grammatical features in the input as they process input for

meaning (words) before they process it for forms. Learners make use of a number of internal strategies when they comprehend and process input. These strategies might cause a delay in the acquisition of formal properties of the target language as learners systematically fail to make form-meaning mappings. Instruction has a beneficial role if exposes L2 learners to meaningful input that contains many instances of the same grammatical meaning-form relationship and forces learners to focus on form to get meaning.

Gass & Mackey (2015) consider the possibility that comprehensible input might not be sufficient to develop native-like grammatical competence. Instruction might be beneficial if it is provided through the enhancement of the input and the use of techniques such as textual enhancement. Instruction might have a facilitative role in helping learners paying attention to the formal properties of a targeted language without the need of metalinguistic explanation and/or discussion.

Ellis & Wulff (2015) assert that the role of instruction is limited. It can have a facilitative role in developing 'noticing' of target forms which might not be salient in the input language learners are exposed to. However, due to a number of factors (e.g. instruction is sometime provided when learners are not psycholinguistically ready, there is a mismatch between explicit knowledge and implicit mental representation) it is not always effective.

A close review of contemporary views on the role of instruction in SLA would lead to the following conclusion:

- Instruction does not alter the route of acquisition (i.e., acquisition orders and developmental sequences);
- Instruction might speed up the rate of acquisition;
- Instruction in the form of 'input manipulation', under certain conditions, might facilitate the noticing and the processing of linguistics features.

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The goal of this paper is twofold:

(i) to briefly review the main findings from research manipulating the way L2 learners interact with input;

(ii) to highlight some limitations of the existing research and provide suggestions for further research.

In the next sections of this paper, the main empirical studies, which have investigated whether instruction as 'input manipulation' might have a facilitative role in grammar acquisition, will be briefly reviewed. In particular, three main research foci will be considered: (i) research measuring the effects of saturating the input with the target form (input flood); (ii) research measuring the effects of different types of textual enhancements to draw learners' attention to the target form; (iii) research measuring input restructuring to improve interpretation and processing of target forms or structures (processing instruction).

2. Classroom-based research on the effects of input enhancement

Sharwood Smith (1993) introduced the concept of input enhancement for the first time with reference to role of grammar in L2 instruction. Input enhancement is a pedagogical intervention that aims at helping L2 learners to notice specific forms in the input. Leow (2001) defines enhanced input as input that has been altered typologically to enhance the saliency of target forms. Input enhancement varies in terms of explicitness and elaboration. One input enhancement technique consists of modifying a text so that a particular target item would appear over and over again. In this way, the text will contain many exemplars of the same feature (input flood).

A different technique would consist of underlying or capitalizing a specific

grammatical item (providing typographical cues) in a text (textual enhancement).

Input enhancement techniques (Wong, 2005) expose learners to comprehensible input

and positive evidence while at the same time drawing learner's attention to specific

linguistic properties of the target language.

2.1 Research measuring the effects of input flood

Input flood is an instructional intervention known by flooding the input language

with a particular linguistic feature. Trahey & White (1993) examined the effects of

input flood on the acquisition of adverb placement in English. English allows the

word order Subject-Adverb-Verb but does not allow the French word order Subject-

Verb-Adverb-Object. Participants (French native speakers) were ESL school-age

learners. The population was divided into three instructional groups and a control

group: the first group received input flood where adverbs were embedded in the

instructional material (e.g., stories, games) and no explicit instruction on adverbs or

placement was provided; the second group received explicit instruction in adverb

placement in addition to input flood with adverbs; the third group received explicit

instruction only; the control group received no instruction. Immediately after

instruction and again three weeks later, learners performed a number of assessment

measures: grammatical judgment test, contextualized preference test, sentence

manipulation, and an oral production test with an adverb prompt. The overall results

from this study showed that input flood alone would has an effect on learning what

adverb placement positions were possible, but not what it is not possible.

Williams & Evans (1998) examined the possible effects of input flood on the

acquisition of participial adjectives and passives in English. Participants were adults

from different first languages, and were enrolled in an intermediate university-level ESL composition class. They were grouped into three instructional treatments: input flood-only; input flood plus explicit instruction on the target forms; and a control group. A pre and post-test procedure was used with a grammaticality judgment test, a sentence completion test, a pictured-based sentence completion test and a picture narration test. The overall results were mixed. In the case of the participial adjective forms the input flood plus explicit instruction was the most effective combination. In the case of the passives, there were not significant differences between the two instructional groups.

Reinders & Ellis (2009) investigated the acquisition of negative adverbials with subject-verb inversion. Subjects were ESL learners and were assigned to two groups: enriched condition (tasks flooded with the target feature); and an enhanced condition where the target feature had been enhanced. A grammatically judgment test was designed to assess student's performance. The results showed no difference in noticing in both groups. The enriched and enhanced input did not help learners noticing the target structure, and this might have been caused by the complexity of the target structure itself.

Hernàndez (2011) investigated the combined effect of explicit instruction and input flood vs. input flood alone on learners' use of discourse markers to narrate past events. Participants were English-speaking adults enrolled in fourth-semester college Spanish courses. Three groups were formed: explicit information plus input flood group; input flood-only group; and the control group. The main findings from a speaking task administered as a pre-test, immediate post-test, and delayed post-test indicated that both instructional treatments had a similar positive effect on students'

use of discourse markers. Learners in the input flood treatment received a longer and more intense treatment (60 discourse markers) compared to the previous studies.

Zyzik & Marqués Pascual (2012) examined the impact of instruction on L2 learners' ability to recognize and produce differential object marking in Spanish. Participants were English-speaking learners and were assigned to one of three groups: input flood group; enhanced input flood group; and explicit grammar group. Three written tasks were used to assess learners: a grammatical preference task, a cued sentence production task, and a discourse-length narrative task. The results from this study indicate a significant advantage for the explicit grammar group on the preference task and the cued sentence production task compared to the other two groups. The input flood and the enhanced input flood group showed modest improvement after the treatment.

A review of the main studies measuring the relative effects of input flood provides the following insights:

- Input flood might be effective in increasing learners' knowledge of what it is possible in the target language;

- Input flood might be an effective instructional technique subject to factors such as the length of the treatment, and the nature of the linguistic feature;

- Input flood might not be effective in increasing learners' knowledge of what it is not possible in the target language. VanPatten & Lesser (2006) state that while input flood could increase the chances that an L2 learner would notice a specific target form, it did not guarantee noticing.

2.2. Research measuring the effects of different types of textual enhancements

Textual enhancement is an instructional intervention carried out to enhance the saliency of input in written or oral texts with a view to facilitating learner's noticing of targeted forms and thereby enhancing their acquisition (Sharwood Smith, 1993). Textual enhancement makes use of typographical cues (e.g., boldfacing, italicizing, underlining, coloring, enlarging the font size, etc.) to draw learners' attention to particular forms in a text. Researchers have used textual enhancements under a variety of conditions and with a variety of intentions.

Shook (1994) examined the effects of textual enhancement on the acquisition of Spanish present perfect tense and relative pronouns (*que/quien*). Participants were first year and second year English L1 university learners of Spanish (first and second year). Population was divided into three groups: the first group read the passages without enhancements; the second group received the passages with textual enhancements; and the third group received the enhanced passage plus a focus on form. A pre and post-test design was used and the assessment procedures were a multiple choice form recognition test and a cloze form production test. The overall findings from this classroom-study showed that the two groups that read the enhanced texts performed better than the group that read the unenhanced texts on all the assessment tests.

Alanen (1995) carried out a study measuring the acquisition of locative suffixes and consonant changes by native speakers of English reading a semi-artificial language resembling Finnish. Alanen used four groups: the first group read the unenhanced passages; the second group read the passages with the target forms enhanced (they were italicized in order to enhance their perceptual saliency); a third

group was provided explicit information regarding the target forms and read the unenhanced passages; the fourth group received the same explicit information as the third group but they read the enhanced passages. The assessments measured used were: a sentence completion test, a grammaticality judgment task, and a think-aloud protocol. The overall findings of this study indicated that textual enhancement alone was not a significant factor affecting performance (production). However, on the think aloud protocol, the results showed that those who read the enhanced texts noticed more of the target forms than those who read unenhanced texts.

Jourdenais et al. (1995) investigated the relative effects of textual enhancement on noticing and producing Spanish preterit and imperfect past tense forms. Participants were English native speakers and they were studying Spanish at the university (second semester university-level course). Two groups were formed: group one received an enhanced version of the text (character size was increased, and colors used); the second group received the unenhanced version. Learners read the passage silently and then they were instructed to think aloud while they wrote a narrative based on a number of drawings depicting various Christmas-related events. The analysis of the think aloud protocols showed no overall significant difference between the two groups. However, in the written narratives the enhancement group produced significantly more accurate preterit and imperfect forms than the other group. Overstreet (1998) carried out a conceptual replication of this study targeting preterit/imperfect aspectual distinction in Spanish. Participants were enrolled in a third-semester university-level Spanish course. He used the Spanish version of Little Red Riding Hood (Caperucita Roja), and a short version unknown to the subjects, *Una carta a Dios* (A Letter to God). One version was enhanced (underlining, bolding, using a larger character size the imperfect forms and the preterit forms) the other one

not. He assessed performance through a written narration, and a true/false comprehension test in a pre and post-test design. He found a significant but negative effect for textual enhancement on comprehension. He hypothesized that the enhancements were too numerous and might have negatively interfered with learners' comprehension of the texts.

Leow (1997) measured the effects of textual enhancement and text length on learners' comprehension and intake of Spanish informal imperatives verb forms. Participants were English native speakers enrolled in a second semester Spanish course. Leow used for passage conditions in his study: enhanced (the target form was underlined and bolded); unenhanced version; long version; and short version. Comprehension was assessed using a multiple choice comprehension test. The results showed no effects for textual enhancements on comprehension. A second similar study (Leow, 2001) was conducted a on the effects of textual enhancement on the acquisition of the Spanish formal imperative. Learners (first year university-level Spanish course) were asked to perform a think aloud as they read the assigned text. The results from this study showed that learners who encountered enhanced forms did not notice more forms than learners who encountered unenhanced forms.

White (1998) examined the acquisition of English possessive determiners (his, her) by primary school-level Francophone children. Three groups were formed: the first group received input flood plus textual enhancements; the second group received, in addition to the instructional treatment just described, extensive reading and listening during the treatment period; the third group received only input flooding with no enhancement of the target forms. An oral picture description test as a pretest, immediate posttest and delayed posttest was the measure used to measure instruction.

The main findings from this study indicated that all three groups improved in their ability to use the target forms in an oral communication task.

Leow et al. (2003) examined the effects of textual enhancement on comprehending and noticing Spanish present perfect verb tense and Spanish present subjunctive mood. Subjects were enrolled in a first year university-level Spanish course. Leow et al. created enhanced and unenhanced versions of two passages, one for each target form. In the enhanced versions, they bolded the tense/mood morpheme, underlined the word containing the morpheme, and increased the character size of the underlined words. Learners performed a think aloud as they read the passage. Subsequently they performed a multiple choice comprehension test and a multiple choice form recognition test. The analysis of the think aloud protocols showed that textual enhancement had very little effect on the noticing of forms in the input.

Wong (2002) examined whether the level of input (sentence vs. discourse) has an impact on textual enhancement. The target structure was the use of prepositions in geographical locations in French. Subjects were enrolled in the first year university-level French course. Four groups were created: the first group read the text (discourse-level input) with the prepositions enhanced (bolding and italics); the second group received the same text but no enhancement; the third group received sentence-level input with visually enhanced target forms; the four group read the same set of sentences as the third group but did not get enhancement. Overall, the results showed that the two groups who received textual enhancement performed better on a paper-and-pencil test of the target structures.

Lee 2007 conducted an experimental study among Korean EFL learners to measure four different treatments involving textual enhancement and topic familiarity conditions. The responses of the participants were compared with respect to their

ability to identify and correct English passive errors and their degree of reading comprehension. The main findings from this study revealed that textual enhancement aided the learning of the target forms while having unfavorable effects on meaning comprehension. Topic familiarity, by contrast, aided the students' comprehension but was ineffective in terms of their learning of form. Lee's study (2007) was partially replicated by Winke (2013) using eye-movement data. This study aimed at assessing whether English passive construction enhancement affects English language learners in terms of learning the form and improving text comprehension. The main findings of this study are different than the one conducted by Lee (2007). Winke (2013) found that enhancement did not have an effect on learning the target forms. However, it did significantly have an impact on the ability for learners to notice the passive forms in the text.

In a meta-analytic review of sixteen previous textual enhancement studies, Lee & Huang (2008) explored the overall magnitude of textual enhancement on grammar learning. The authors found a very small effect size for textual enhancement. However, they argued that the mixed results and variations obtained in research investigation the effects of textual enhancement might be the result of a number of factors: different design adopted; different collection tools and procedures; the difference in type and number of enhanced cues in the materials; different objectives pursued in each study.

Simard (2009) investigated the effects of textual enhancement on learners' intake of English third person singular possessive determiners. Participants were grade eight native speakers of French. They were exposed to different textual enhancement versions of the same text. A control group received an unenhanced version of the same text. An information transfer test and a multiple choice recognition test were

used. Overall, the results showed positive effects for textual enhancement. Different formats had different effects on learners' intake.

LaBrozzi (2014) examined how different types of textual enhancement affect L2 form recognition and reading comprehension. Participants were English speakers learning Spanish preterit tense. Two groups were used: the first group read a passage where the target structure was enhanced; a control group read the same passage without any type of enhancement. Assessments consist of a L2 to first language translation task, and a multiple-choice test with questions focusing on form or meaning from the reading. Results for the present study revealed positive effects for the enhancement treatment in both measures.

The results of the research on the effects of textual enhancements are quite mixed. A review of the main studies measuring the relative effects of textual enhancement provide the following insights:

- A number of textual enhancement studies measuring L2 development provided evidence for the favorable effects of textual enhancement (e.g., Shook, 1994; Jourdandenais et al., 1995; Wong, 2003; Simard, 2009; LaBrozzi, 2014);
- Others studies found no significant effect for textual enhancement (e.g., Alanen, 1995; Overstreet, 1998; Loew, 1997, 2001; Loew et al., 2003);
- Lee & Huang (2008) conducted a meta-analysis of the previous research on the effects of textual enhancement. The meta-analysis showed that overall input enhancement groups did not outperform the other unenhanced groups. However, they found out that, learners who were exposed to enhancement-embedded texts showed slight improvement from before to after the treatment;
- Overall, the existing empirical research measuring the effects of textual enhancement has shown a small-sized positive effect. However, different researchers have come to different conclusions on the efficacy of input

enhancement. A number of factors might constrain the effects of input enhancement on the acquisition of grammar: proficiency level, the developmental stage and the degree of readiness of the learner, the type of linguistic feature chosen, and the treatment intensity.

3. Research measuring the effect of processing instruction

Processing instruction is a pedagogical intervention to grammar instruction based on the SLA theoretical model called input processing (VanPatten, 1996, 2004, 2015a). Processing instruction main goal is to alter the processing strategies that learners use when interpreting and processing input language and help learners in making correct form-meaning connections and computing sentence structure. The scope of processing instruction is not to make a form salient in the input (like in the case of textual enhancement) but to ensure that L2 learners make form-meaning mappings during real time comprehension. Noticing and processing are different in nature. Noticing is when L2 learners become aware of something in the input. Processing is when L2 learners make a form-meaning connection. Data must be processed (linked to meaning) during comprehension (e.g. a past tense marker such as –*ed* has to be tagged as meaning <+past> <-present> for it to be acquired).

VanPatten's theory of input processing (2015a) directly informs the practices of processing instruction. Processing instruction is useful only if addresses a processing problem and steers learners away from non-optimal processing strategies (e.g., Primacy of Meaning Principle, First Noun Principle) and ensure that learners make correct and appropriate processing of forms and sentences. VanPatten (2015a) has identified two main processing strategies learners might use when they are exposed to

language input. According to the Primacy of Meaning Principle (and sub-principles such as the Lexical Preference Principle), learners will first process input for meaning before they process the linguistic form. The result of this will be that learners will not make natural connections between forms in the input and their meanings (e.g. past tense forms and the concept that the action took place in the past).

According to the First Noun Principle, learners will tend to process the first noun or pronoun they encounter in a sentence as the subject or agent. The result of this will be that learners will misinterpret sentences in which the first element in a sentence is not the subject or agent (e.g. passive constructions, causative, object pronouns in certain languages).

As argued by VanPatten (2015b) ''PI is not focused on rule internalization but the acquisition of underlying formal features. By definition, such acquisition will be implicit in nature''. Processing instruction consists of two main components: (i) explanation about the processing strategy; (ii) structured-input practice (Lee & VanPatten, 2003; Lee & Benati, 2009).

3.1. Studies measuring the effects of processing instruction vs. traditional instruction

Van Patten & Cadierno (1993) investigated the relative effects of processing instruction on the acquisition of Spanish direct object pronouns (this structure is affected by the First Noun principle). Three groups of English native speakers of Spanish at intermediate level received different instructional treatments: one group received traditional instruction which emphasized grammar explanation and oral-written production; the second group received processing instruction; the third group was used as a control receiving no instruction.

A pre-test\post-test design was used to measure the possible effects of instruction through an interpretation and a sentence-level written test. The results from the statistical analyses showed that processing instruction was superior to traditional instruction as learners receiving processing instruction improved in their ability at interpreting object pronouns in Spanish correctly and furthermore the study demonstrated that processing instruction was also effective in improving learners' production.

Cadierno (1995) carried out an experimental study measuring the effects of processing instruction on the Spanish *preterit* tense (this feature is affected by the Lexical Preference Principle). This study was a partial replication of VanPatten and Cadierno's study (1993) in terms of the design used (pre-post tests) and the overall aims. The participants of this study were English native speakers studying intermediate Spanish at University. Processing instruction was compared to traditional instruction and a control group on the acquisition of this grammatical feature and two tests were used (sentence-level interpretation and production written test). The results showed that the group who received processing instruction outperformed the group exposed to traditional instruction and the control group in the interpretation task. The results of the production task were the same as the results of the original study (Van Patten & Cadierno, 1993). Both the processing instruction group and the traditional group improved from pre to post-test on the production task.

Interpretation and production effects have been subsequently supported by other research comparing processing instruction and traditional instruction (e.g., Benati 2001; Cheng, 2004; VanPatten & Wong, 2004; Lee & Benati 2007b.). All these studies address the fundamental question of the effectiveness of processing instruction as a type of intervention and take VanPatten & Cadierno (1993) and Cadierno (1995)

as their point of departure.

The results of the studies comparing processing instruction and traditional instruction have reached the following conclusion:

- Processing instruction is a more effective pedagogical intervention than traditional instruction as it seems to have a direct effect on learners' ability to process input (various processing strategies (e.g., First Noun Principle, Lexical Preference Principle)); various languages linguistic forms (e.g., Spanish past tense, Italian future tense, copular verbs in Spanish (*ser* and *estar*); French *faire* causative;

- L2 learners have gained the ability to interpret sentences efficiently and correctly. Processing instruction is responsible for learners increase rate of processing;

- L2 learners have gained the ability to produce the target linguistic features during output practice. Processing instruction is responsible for the increase rate of accuracy in production.

3.2. Studies measuring the effects of processing instruction vs. meaning output-based output instruction

Farley compared the effects of processing instruction versus meaning output-based instruction on the acquisition of the Spanish subjunctive in two consecutive studies (2001a; 2004). Participants were English native speakers learning Spanish in a University-level course. Processing instruction was compared to a meaning output-based output instructional treatment (structured-output tasks) and the activities learners were exposed to did not

contain any mechanical drills. The effects of the two instructional treatments were measured on the acquisition of Spanish subjunctive (this feature is affected by the Sentence Location Principle). A pre and post-test design was adopted with an interpretation and production sentence level tests. The results were mixed. In the first study (2001a) the processing instruction group outperformed the output-based group on the interpretation test and both groups were similar in the production test. In the second study (2014), both groups made equal and significant improvements on both the interpretation and the production tests. Farley attributed the equal performance of the two treatments to one main factor. The meaning output-based treatment is different from traditional instruction practice as it does not contain mechanical drills practice and its communicative and interactive nature might have resulted in incidental input.

Benati (2005) investigated the effects of processing instruction, traditional instruction and meaning output-based instruction on the acquisition of English past simple tense (feature affected by the Lexical Preference Principle). The subjects involved in the present studies were Chinese and Greek school-age learners of English. The participants in both schools were divided into three groups: the first group received processing instruction; the second group was exposed to traditional instruction; the third group received meaning output-based instruction. One interpretation and one production measure were used in a pre and post-test design. The results are very consistent in both studies and clearly indicated that processing instruction had positive effects on the processing and acquisition of the target feature. In both studies the processing instruction group performed better than the traditional and meaning output-based groups in the interpretation task and the three groups made equal gains in

the production task.

The effects of processing instruction have been compared to the effects of meaning-based output instruction in other studies (Morgan-Short & Bowden, 2006; Lee & Benati, 2007a), and other interventions such as dictogloss (Uludag & VanPatten 2012; VanPatten et al. 2009). The results of these studies confirmed the effectiveness of processing instruction in improving learners' performance in both interpretation and production sentence-level tests. Based on the findings measuring primary effects for processing instruction compared with other instructional intervention, we conclude the following:

- Processing instruction is an effective approach to alter a variety of L2 learners processing strategies in different languages and with native speakers of a variety of L1s (e.g. Greek, Chinese);
- Processing instruction is overall more effective than other types of output-based instruction (e.g., meaning output-based instruction).

3.3. Studies measuring the causative variable in processing instruction

Van Patten & Oikkenon (1996) investigated the relative effects of the two main components in processing instruction. The linguistic feature chosen was the object pronouns in Spanish and the processing principle under investigation was the First noun principle. English native speakers studying Spanish at University participated in this classroom experiment. Three groups were formed: one receiving only the explicit information component; the second only the structured input practice component; the third group received both components (full processing instruction). Pre and post-test design was used and instruction was measured through an interpretation and

production test. Results showed that the processing instruction and the structured input only group made similar gains whereas the explicit information only group did not. The main outcome of this study was that structured input activities were found responsible for learners' gains. Learners who carried out structured input activities in the absence of explicit information performed just as well as learners who carried out structured input activities after having received explicit information about the target form. This main finding has been subsequently supported by other research on the Italian future tense (Benati 2004a), Italian noun-adjective agreement (Benati 2004b), French negative plus indefinite article (Wong, 2004), Spanish object pronoun (Sanz, 2004), Japanese past forms and affirmative vs. negative present forms (Lee and Benati, 2007a) and for Russian case marking, German case marking and Spanish direct object pronouns (VanPatten et al. 2013).

Based on the findings measuring the causative factor in processing the following conclusion can be reached:

- The causative variable in processing instruction is performing structured input tasks

3.4. Studies measuring processing instruction and discourse

VanPatten & Sanz (1995) set out to investigate whether the effects of processing instruction, observed at the sentence-level, could be obtained on discourse-level production tasks. Participants consisted of English native speaker students of Spanish in their third year of a university programme. The subjects were assigned to two processing instruction groups and two control groups. The focus of instruction was the preverbal objects pronoun in Spanish. The effects of instruction were measured on three different tests: sentence-level tests; a structured question-answer interview; and a video narration test. The findings of Van Patten & Sanz's study showed that

processing instruction is still effective even when measured on less controlled and discourse type of tasks. Altering the processing strategies used by L2 learners when they are processing input leads to a change in knowledge, which is available for use in different types and modes of production tests. The effects of processing instruction were more significant in more controlled oral tests (completion test) rather than less controlled ones (video narration test).

Benati, Lee & Hikima (2010) and Benati (2015) have measured the effects of processing instruction on discourse-level interpretation tests. They measured the relative effects of processing instruction in the acquisition of Japanese passive forms (affected by a combination of principles such as the First Noun principle, Sentence location principle and Primacy of Content Words Principle). Participants were English native speakers learning Japanese at University. A pre-test and a post- test procedure were used. A processing instruction group and a control group was used. The assessment tasks consisted of sentence and discourse level interpretation tests and sentence and discourse level production tests. The discourse level interpretation tests consisted of a dialogue and a story. The findings from this study indicate that the processing instruction group made measurable gains not only in the interpretation sentence-level test but also in interpretation discourse-level test.

These main findings on the effects of processing instruction on discourse (production) and discourse (interpretation) have been subsequently supported by other research. Sanz (1997) showed that processing instruction on Spanish direct object pronouns led to an improvement in scores on oral and written video-based retellings and oral and written structured interview. Sanz (2004) and Sanz and Morgan-Short (2004), again with processing instruction on Spanish direct object pronouns, found positive effects on oral video retellings. Cheng (2002, 2004) found positive effects for

processing instruction on Spanish copular verbs using a picture-based guided composition. Benati & Lee with McNulty (2010) used a guided composition and found a positive effect for PI on the Spanish subjunctive after *cuando*. Benati & Lee (2010) extended interpretation discourse-level findings for processing instruction on English past tense.

Based on the findings measuring the effects of processing on discourse-level tests (interpretation and production) the following conclusion can be made:

- Processing instruction has a positive effect on discourse-level interpretation measures;
- Processing instruction has a positive effect discourse-level production measures.

3.5. Studies measuring processing instruction and long-term effects

VanPatten & Cadierno (1993) and Cadierno (1995) demonstrated that the effects of processing were sustained one month after instruction. Many subsequent processing instruction studies have included delayed post-tests to measure whether learners retain the benefits of processing instruction. One week after processing instruction (Lee & Benati 2007b; Lee & Benati with Aguilar-Sánchez and McNulty 2007; Morgan-Short & Bowden 2006). Two weeks after processing instruction (Farley 2001a; 2001b; 2004). Three weeks after processing instruction (Benati 2001; Cheng 2002; 2004); Four weeks after processing instruction (Benati 2004a; Keating & Farley 2008). Six weeks after processing instruction (VanPatten, Inclezan, Salazar & Farley 2009; VanPatten, Farmer & Clardy 2009). Eight months after processing instruction (VanPatten & Fernández, 2004).

Based on the findings measuring the short and long-term effects for processing instruction, the following conclusion can be drawn:

- The effects of processing instruction are durative. Processing instruction has been found to be an effective intervention who effects endure one week, two weeks, three weeks, and even eight months after immediate post-testing;
- The long lasting effect of processing instruction can be measured using a variety of tasks including aural interpretation (sentence and discourse), oral production and written production (sentence and discourse).

3.6. Studies measuring processing instruction and transfer of training effects

L2 learners receiving processing instruction can transfer their training on one linguistic feature to other forms or linguistic features affected by a similar processing problem without further instruction on the other forms. Benati & Lee (2008) provided processing instruction training to learners on Italian noun-adjective gender agreement and found that it transferred to the future tense. They measured the transfer effects on both interpretation and production sentence-level tasks. Benati & Lee with Houghton (2008) found that processing instruction training on the English past tense marker -*ed* transferred to the third-person singular present tense marker –*s*. The transfer was measured through interpretation and form production tasks. Benati and Lee with Laval (2008) trained learners to process imperfective verb morphology in French and found that it transferred to subjunctive forms. Statistically significant transfer effects were found on both interpretation and production tasks. Further research on transfer of training effects has supported Benati and Lee's findings (Leeser & DeMil, 2013; White & DeMil 2013a, 2013b).

Based on the findings measuring transfer of training effects for processing instruction, the following conclusion can be drawn:

- Processing instruction has secondary effects as learners who received processing instruction are able to transfer that training to processing and producing another form on which they had received no instruction.

3.7. Studies measuring processing instruction and individual differences (the age factor)

Processing instruction research has examined the possible 'age factor'. Benati (2013) has compared the performance of children and older school-age learners who received processing instruction on the English passive construction. Data were collected among native speakers of Turkish. Performance was measured with interpretation and sentence completion form production tests. The results showed that the both groups improved significantly and equally as a result of receiving processing instruction. No effect for age group was found on either the interpretation or production sentence-level test.

Mavrantoni & Benati (2013) have also explored the effect of age on the results of processing instruction and traditional instruction by examining two different age groups of children (pre- and post-puberty). The target of instruction was the English third person singular -*s*-. The participants were all native speakers of Greek. Their performance was measured with an interpretation and production sentence-level tests. In this parallel experiment, both processing instruction groups significantly outperformed the traditional groups on the interpretation task and equally improved

on the production task. Results on the effects of processing instruction on age suggest the following:

- Age does not seem to play a role in the results generated by processing instruction. Processing instruction is an effective pedagogical intervention no matter the age of the learners.

4. Discussion and conclusion

In this paper, three main research foci investigating input manipulation and input enhancement interventions have been considered. The main findings from research measuring the effects of input flood indicate that it might be an effective instructional intervention in increasing learners' knowledge of what it is possible. However, input flood does not increase their knowledge about what it is not possible in the target language. In addition, input flood might have a facilitative role in helping L2 learners notice a specific target form. However, there is no guarantee that actually learners notice the form under input flood conditions. Because of the implicit nature of this pedagogical intervention, it is difficult to measure actual learning. Future research should continue to investigate the use of input flood in combination with explicit instruction (Hernádez, 2011). It should also continue to measure the possible success of this pedagogical intervention on factors such as the length of the treatment and exposure to the target feature (Zyzik & Marqués Pascual, 2012), and the nature of the target structure (Reinders & Ellis, 2009; Zyzik & Marqués Pascual, 2012)

Overall, the results from research measuring the effects of different types of textual enhancements to draw learners' attention to the target form are not consistent. The effectiveness of textual enhancement is variable and the specific conditions under

which textual enhancement might be an effective instructional intervention are not transparent.

Despite the fact that a number of textual enhancement studies provide support for the positive effects of this pedagogical intervention, there is also empirical evidence showing very limited or no effects (see meta-analytic review in Lee & Hung, 2008; and Han, Park & Combs, 2008). One of the possible reasons for the differences in the outcomes of these studies is that the targeted forms varied with regard to their semantic value and communicative function. Another reason is that most of these studies measuring textual enhancement adopt only a single exposure to enhanced input. From a methodological perspective, previous research measuring the effects of different types of textual enhancement have a number of shortcomings. Only White (1998) and Leow's study (2001), administered a delayed post-test. Only Simard (2009) included both experimental and control groups in its study. It is therefore difficult to establish whether any gains between pre-tests and post-tests might be attributed to instructional effects or learning taking place in performing the assessment tasks. Future research within this framework should take into account of these shortcomings and also make use of online data to investigate cognitive processes involved in noticing the targeted forms and processing input.

The findings from research measuring the input restructuring to improve interpretation and processing of target forms or structures has revealed that processing instruction is an effective pedagogical intervention. Learners from different first languages and backgrounds (Lee & Benati, 2013) make consistent gains in interpretation and production tests at sentence and discourse-level. The effects of processing instruction are consistent, durative, measurable on different languages,

different linguistics features affected by processing problems, with learners of different ages, and the positive effects are transferable (see full review in Lee & Benati, 2009; Benati & Lee, 2015). Structured input practice is an effective form of input enhancement.

Despite the large database, research within this research framework has primarily made use of listening and reading measures (so-called off-line measures) to elicit how learners comprehend and process sentences. On-line measurements such as eye tracking, self-paced reading and ERPs (event-related potentials) should now been incorporated into Processing Instruction future research to measure more directly implicit knowledge.

5. References

Alanen, R. (1995). Input enhancement and rule presentation in second language acquisition. In R. Schmidt (Ed.), *Attention and awareness in foreign language learning* (pp. 259–302). Honolulu: University of Hawaiʻi Press.

Angelovska, T. & Benati, A. (2013). Processing instruction and the age factor: Can adults and school-age speakers of German process English simple past tense correctly? In J. F. Lee & A. Benati (Eds.), *Individual differences and processing instruction* (pp. 131-152). Sheffield, UK: Equinox.

Benati, A. (2001). A comparative study of the effects of processing instruction and output-based instruction on the acquisition of the Italian future tense. *Language Teaching Research*, 5, 95-127.

Benati, A. (2004a). The effects of structured input and explicit information on the

acquisition of Italian future tense. In B. VanPatten (Ed.), *Processing instruction: theory, research, and commentary* (pp. 207-255). Mahwah, NJ: Erlbaum.

Benati, A. (2004b). The effects of processing instruction and its components on the acquisition of gender agreement in Italian. *Language Awareness* 13, 67-80.

Benati, A. (2005). The effects of PI, TI, and MOI in the acquisition of English simple past tense. *Language Teaching Research*, 9, 67-113.

Benati, A. (2015). The effects of re-exposure to instruction and the use of discourse-level interpretation tasks on processing instruction and the Japanese passive. *International Review of Applied Linguistics*, 53, 127-150.

Benati, A. & Lee, J. (2008). *Grammar acquisition and processing instruction: Secondary and cumulative effects.* Bristol: Multilingual Matters.

Benati, A. & Lee, J., with Scott D. Houghton. (2008). From processing instruction on the acquisition of English past tense to secondary transfer-of-training effects on English third person singular present tense. In A. Benati & J. Lee, *Grammar acquisition and processing instruction: secondary and cumulative effects* (pp. 88-120). Clavedon: Multilingual Matters.

Benati, A. and Lee, J. F., Laval, C. (2008) From Processing Instruction on the acquisition of French imparfait to secondary transfer-of-training effects on French Subjunctive and to cumulative transfer-of-training effects with French causative constructions. In Benati, A. and Lee, J. F. *Transfer of training effects for*

processing instruction: Research and Practice (pp. 89-121). Clavedon: Multilingual Matters.

Benati, A., & Lee, J. (2010). *Processing instruction and discourse*. London: Continuum.

Benati, A., & Lee, J., with Noriko Hikima. (2010). Exploring the effects of processing instruction on discourse-level interpretation tasks with the Japanese passive construction. In A. Benati & J. Lee, *Processing instruction and discourse* (pp.148-177). London: Continuum.

Benati, A., & Lee, J., with Erin McNulty. (2010). Exploring the effects of processing instruction on a discourse-level guided composition with the Spanish subjunctive after the adverb *cuando*. In A. Benati & J. Lee, *Processing instruction and discourse* (pp. 97-147). London: Continuum.

Benati, A. G. & J. F. Lee. (2015). *Processing Instruction: New Insights after Twenty Years of Theory, Research and Application*. Special Issue in *IRAL*.

Cadierno, T. (1995). Formal instruction from a processing perspective: An investigation into the Spanish past tense. *The Modern Language Journal* 79. 179-93.

Cheng, A. (2002). The effects of processing instruction on the acquisition of *ser* and *estar*. *Hispania* 85. 308-323.

Cheng, A. (2004). Processing instruction and Spanish *ser* and *estar*: Forms with semantic-aspectual value. In B. VanPatten (Ed.), *Processing instruction: Theory, research, and commentary*, (pp. 119-141). Mahwah, NJ: Erlbaum.

Ellis, N., & Wulff, S. (2015). Usage-based approaches to SLA. In B.VanPatten & J. Williams, J. (Eds.) *Theories in second language acquisition 2nd edition* (pp.75-93). New York: Routledge.

Farley, A. (2001a). Authentic processing instruction and the Spanish subjunctive. *Hispania*, 84, 289–299.

Farley, A. (2001b). Processing Instruction and meaning-based output instruction: A comparative study. *Spanish Applied Linguistics*, 5, 57–93.

Farley, A. (2004). The relative effects of processing instruction and meaning-based output instruction. In B. VanPatten (Ed.), *Processing instruction: theory, research, and commentary* (pp.143-168). Mahwah, NJ: Erlbaum.

Gass, S., & Mackey, A. (2015). Input, interaction and output in second language acquisition. In B.VanPatten & J. Williams, J. (Eds.), *Theories in second language acquisition 2nd edition* (pp.180-206). New York: Routledge.

Han, Z., Park, E. S., & Combs, C. (2008). Textual enhancement of input: Issues and possibilities. *Applied Linguistics*, 29, 597–618.

Hernandez, T. (2011). Reexamining the role of explicit instruction and input flood on the acquisition of Spanish discourse markers. *Language Teaching Research, 15,* 159-182.

Jourdenais, R., Ota, M., Stauffer, S., Boyson, B., & Doughty, C. (1995). Does textual enhancement promote noticing? A think aloud protocol analysis. In R. Schmidt (Ed.), *Attention and awareness in foreign language learning* (pp. 183–216). Honolulu: University of Hawai'i Press.

Keating, G., & Farley, A. (2008). Processing instruction, meaning-based output instruction, and meaning-based drills: Impacts on classroom L2 acquisition of Spanish object pronouns. *Hispania*, 19, 639-650.

Krashen, S. (1982). *Principles and practice in second language acquisition.* London: Pergamon.

Krashen, S. (2009). The comprehension hypothesis extended. In T. Piske & M. Young-Scholten (Eds.), *Input matters* (pp. 81-94). Bristol: Multilingual Matters.

LaBrozzi, R. (2014). The effects of textual enhancement type on L2 form recognition and reading comprehension in Spanish. *Language Teaching Research* (published online before print, December 15, 2014, doi:10.1177/1362168814561903).

Lee, J., & VanPatten, B. (2003). *Making Communicative Language Teaching Happen, 2nd ed.* New York: McGraw-Hill.

Lee, J., & Benati, A. (2007a). *Delivering processing instruction in classrooms and virtual contexts: research and practice*. Equinox: London.

Lee, J., & Benati, A. (2007b). *Second language processing: an analysis of theory, problems and possible solutions*. Continuum: London.

Lee, J., & Benati, A. (2009). *Research and perspectives on processing instruction*. Berlin: Mouton de Gruyter.
Lee, J., & Benati, A. (Eds.) (2013). *Individual differences and Processing Instruction*. Sheffield, England: Equinox.

Lee, S-K. (2007). Effects of textual enhancement and topic familiarity on Korean EFL students' reading comprehension and learning of passive. *Language Learning*, 57, 87-118.

Lee, S.-K., & Huang, H. (2008). Visual input enhancement and grammar learning: A meta-analytic review. *Studies in Second Language Acquisition*, 30, 307-331.

Leeser, M., & DeMil, A. (2013). Investigating the secondary effects of processing instruction in Spanish: From instruction on accusative clitics to transfer-of-training effects on dative clitics. *Hispania*, 96, 748-762.

Leow, R. (1997). The effects of input enhancement and text length on adult L2 readers' comprehension and intake in second language acquisition. *Applied Language Learning, 8,* 151-182.

Leow, R. (2001). Do learners notice enhanced forms while interacting with the L2? An online and offline study of the role of written input enhancement in L2 reading. Hispania , 84 , 496-509.

Leow, R., Egi, T., Nuevo, A., & Tsai, Y. (2003). The roles of textual enhancement and type of linguistic item in adult L2 learners' comprehension and intake. *Applied Language Learning*, 13, 1-16.

Mavrontoni, M., & Benati, A. (2013). The effects of processing instruction and traditional instruction on two different school-age learners: The case of English present simple tense, third person singular. In J. Lee & A. Benati (Eds.), *Individual differences and processing instruction* (pp. 185-210). Sheffield, UK: Equinox.

Morgan-Short, K., & Bowden, H. W. (2006). Processing instruction and meaningful output-based instruction. *Studies in Second Language Acquisition*, 28, 31-65.

Overstreet, M. (1998). Text enhancement and content familiarity: The focus of learner

attention. *Spanish Applied Linguistics*, 2, 229-258.

Pienemann, M., & Lenzing, A. (2015). Processability theory. In B.VanPatten & J. Williams, J. (Eds.) *Theories in second language acquisition 2ⁿᵈ edition* (pp.159-179). New York: Routledge.

Reinders, H., & Ellis, R. (2009). The effects of two types of input on intake and the acquisition of implicit and explicit knowledge. In R. Ellis et al. (Eds.), *Implicit and explicit knowledge in second language learning testing and teaching* (pp. 282-302). Bristol: Multilingual Matters.

Sanz, C. (1997). Experimental tasks in SLA research: Amount of production, modality, memory, and production processes. In A. Pérez-Leroux & W. Glass (Eds.), *Contemporary perspectives on the acquisition of Spanish: Vol. 2 production, processing and comprehension* (pp. 41-56). Somerville, MA: Cascadilla Press.

Sanz, C. (2004). Computer delivered implicit versus explicit feedback in processing instruction. In B. VanPatten (Ed.), *Processing instruction: Theory, research, and commentary* (pp. 241-255). Mahwah, NJ: Erlbaum.

Sanz, C., & Morgan-Short, C. (2004). Positive evidence versus explicit rule presentation and explicit negative feedback: A computer-assisted study. *Language Learning,* 54, 35-78.

Sharwood-Smith, M. (1993). Input enhancement in instructed SLA: Theoretical bases. *Studies in Second Language Acquisition* 15,165-179.

Shook, D. J. (1999). What foreign language reading recalls reveal about the input-to-intake phenomenon. *Applied Language Learning*, 10, 39–76.

Simard, Simard, D. (2009). Differential effects of textual enhancement formats on intake. *System. 37,* 124-135.

Trahey, M., & White, L. (1993). Positive evidence and preemption in the second language classroom. *Studies in Second Language Acquisition, 15.* 181-204.

Uludag, O., & VanPatten, B. (2012). The comparative effects of processing instruction and dictogloss on the acquisition of the English passive by speakers of Turkish. *International Review of Applied Linguistics*, 50. 189-212.

VanPatten, B. (1996). *Input processing and grammar instruction in second language acquisition: theory and research*. Norwood, NJ: Ablex.

VanPatten, B. (2002). Processing instruction: An update. *Language Learning*, 52, 755–803.

VanPatten, B. (2004). Input processing in second language acquisition. In B. VanPatten (Ed.), *Processing instruction: Theory, research, and commentary* (pp. 5–32). Mahwah, NJ: Lawrence Erlbaum.

Van Patten, B. (2015a). Input processing in adult SLA. In B.VanPatten & J. Williams, J. (Eds.), *Theories in second language acquisition 2nd edition* (pp.113-135). New York: Routledge.

VanPatten, B. (2015b). Foundations of processing instruction. *International Review of Applied Linguistics*, 53, 91-109.

VanPatten, B., & Cadierno, T. (1993). *Explicit instruction and input processing. Studies in Second Language Acquisition*, 15, 225–244.

VanPatten, B., & Sanz, C. (1995). From input to output: processing instruction and communicative tasks. In F.R. Eckman, D. Highland, P. W. Lee, J. Mileham, & R. R. Weber (Eds.), *Second language acquisition theory and pedagogy* (pp. 169-185). Mahwah, NJ: Erlbaum.

VanPatten, B., & Oikennon, S. (1996). Explanation vs. structured input in processing instruction. *Studies in Second Language* Acquisition, 18. 495-510.

VanPatten, B., & Fernández, C. (2004). The long-term effects of processing instruction. In B. VanPatten (Ed.), *Processing instruction: theory, research, and commentary* (pp. 273-289). Mahwah, NJ: Erlbaum.

VanPatten, B., & Wong, W. (2004). Processing instruction and the French causative: Another replication. In B. VanPatten (Ed.), *Processing instruction: Theory, research, and commentary* (pp. 97–118). Mahwah, NJ: Lawrence Erlbaum.

VanPatten, B., Farmer, J., & Clardy, C. (2009). Processing instruction and meaning based output instruction: A response to Keating and Farley (2008). *Hispania* 92, 116 126.

VanPatten, B., Inclezan, D., Salazar, H., & Farley, A. (2009). Processing instruction and dictogloss: A study on object pronouns and word order in Spanish. *Foreign Language Annals*, 42, 557-575.

VanPatten, B., Benati, A. (2015). *Key Terms in SLA* (2nd edition). London: Bloomsbury.

White, J. (1998). Getting the learners' attention: a typographical input enhancement study. In C. Doughty & J. Williams (Eds.), *Focus on form in classroom second language acquisition* (pp. 85-113). Cambridge, MA: Cambridge University Press.

White, J. P., & DeMil, A. (2013a). Primary and secondary effects of PI. *International Journal of Language Studies*, 7. 59-88.

White, J. P., & DeMil., A. (2013b). Transfer-of-training effects in processing instruction: The role of form-related explicit information. *Studies in Second Language Acquisition*, 35. 519-544.

White, L. (2015). Linguistic theory, universal grammar, and second language acquisition. In B.VanPatten & J. Williams, J. (Eds.) *Theories in second language acquisition 2ⁿᵈ edition* (pp.34-53). New York: Routledge.

Williams, J., & Evans, J. (1998). What kind of focus and on which forms? In C. Doughty & J. Williams (Eds.), *Focus on form in second language classroom Acquisition* (pp. 139-155). Cambridge, MA: Cambridge University Press.

Winke, P. (2013). The effects of input enhancement on grammar learning and comprehension. A modified replication of Lee (2007) with eye-movement data. *Studies in Second Language Acquisition*, 35, 323-352.

Wong, W. (2003). Textual enhancement and simplified input: Effects n L2 comprehension and acquisition of non-meaningful grammatical form. *Applied Language Learning, 13,* 17-45.

Wong, W. (2004). Processing instruction in French: The roles of explicit information and structured input. In B. VanPatten (Ed.), *Processing instruction: Theory, research, and commentary* (pp.187-205). Mahwah, NJ: Erlbaum.

Wong, W. (2005). *Input enhancement: from theory and research to the classroom.* New York: McGraw-Hill.

Zyzik, E., & Marqués Pascual, L. (2012). Spanish differential object marking: An empirical study of implicit and explicit instruction. *Studies in Hispanic and Lusophone Linguistics, 12,* 387-421.