The Effects of Processing Instruction on the Acquisition of English Simple Past Tense: Age and Cognitive Task Demands

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Abstract

The present study[1] investigates the effects of Processing Instruction on two different age groups and the role that cognitive task demands might play in the results generated by Processing Instruction. This study includes school-age children and adult native speakers of German learning English as a foreign language - a language combination not previously investigated within the Processing Instruction and individual differences research paradigm. The present study investigates directly whether two different age groups will benefit equally from Processing Instruction in altering their reliance on lexical temporal indicators and redirecting their attention to verb forms on Processing Instruction activities with different cognitive demands. The grammatical feature chosen for this study is the English past simple tense marking tested on both interpretation and production measures. The results from this study provide further evidence that the Processing Instruction is an effective instructional treatment in helping school-age children and adult L2 learners to make accurate form-meaning connections. The results from the first

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sentence-level interpretation task and the production task showed that Processing Instruction has positive and equal effects on both age groups (school-age learners and adults). The positive effects of instruction were maintained over the delayed post-test for both age groups who made similar gains on the immediate post-test. The results from the second (cognitively more complex) sentence-level interpretation task indicated that the adults made greater gains than school-age learners. However, both groups retained the positive effects of instruction over time. The difference in gains between the two age groups on the second sentence-level interpretation task can be explained in terms of cognitive processing load.

Key words: processing instruction, age, cognitive tasks demands

1. Introduction

VanPatten's model of Input Processing (1996, 2004, 2007) is the theoretical base that directly informs the practices of Processing Instruction. Input Processing refers to "the initial process by which learners connect grammatical forms with their meanings as well as how they interpret the roles of nouns in relationship to verbs'' (VanPatten 2004:5). The main purpose of Processing Instruction is "to help learners circumvent ineffective processing strategies or to instill appropriate processing strategies, so that they derive better intake from the input" (Lee and Benati 2007:16). The English simple past tense is affected by the *Lexical Preference Principle* (see Section 4.3). Research on Processing Instruction has investigated the effects of this pedagogical intervention in altering how L2 learners process the linguistic feature *-ed*. Benati (2005) measured the effects of Processing Instruction, traditional instruction and meaning output-based instruction on the acquisition of English past simple tense. Data were collected in two different secondary schools (12-13 years old) in China and Greece with native speakers of Chinese and Greek, respectively. The results from this study revealed that on the interpretation task both Chinese and Greek Processing Instruction groups made significant progress compared to the other instructional groups which made no significant improvements. All treatment groups made equal gains on the written production task.

Benati, Lee and Houghton (2008) examined whether learners who received Processing Instruction on the English simple past tense (primary effects) can transfer this instructional training to the acquisition of the third person singular present tense (secondary effects). Data were collected among Korean native speakers studying English in a secondary school in Korea (14 years old). The overall outcome of this study indicated that Processing Instruction not only provides learners with the primary benefit of learning to process and produce the morphological form on which they receive instruction (primary target item past simple tense *–ed*), but also a secondary benefit in that they transferred that training to processing and producing another morphological form on which they had received no instruction. In both classroom experiments, Processing Instruction was effective in helping learners making correct form-meaning mappings.

1.1. *The Age factor and Processing Instruction*

Based on previous empirical findings (Benati 2005; Benati, Lee and Houghton 2008), Benati and Lee (2008) formulated the so-called *Age Hypothesis* for Processing Instruction. According to this hypothesis, Processing Instruction will be an effective intervention with younger learners as well as with adult learners (Benati and Lee 2008:168). 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; the children (8-10 years old) were enrolled in primary school and the other school-age learners (15-17 years old) in secondary school. Performance was measured with interpretation and sentence completion form production tests. The results showed that the two 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 test.

Mavrantoni and 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 simple present tense. The participants were all native speakers of Greek (two groups, 8-10 and 15-17 years old). Their performance was measured with an interpretation and a production sentence-level task. The Processing Instruction groups significantly outperformed the traditional groups on the interpretation task. The instructional groups both improved significantly and equally on the production task. When the mean scores of the two age groups were compared, there was not significant difference suggesting that age was not a factor in the results.

Empirical research investigating whether age plays a role in the results generated by Processing Instruction seems to indicate that it does not play a significant role (Lee and Benati 2013). Despite these findings, no previous research has been conducted within the Processing Instruction research framework to investigate whether age is confounded by other factors which might play a role in L2 processing abilities.

1.2. *Cognitive task demands*

Despite the controversy in the ongoing debate on whether there are differences between early and late L2 learners, there is evidence showing that age alone as a factor cannot be taken as a full explanation for success in second language acquisition (see Special Issue in *Studies in Second Language Acquisition*, Vol. 31, Issue 2, 2009). The age factor might interact with other factors such as amount of exposure and nature of input (Muñoz 2006), cue strength and entrenchment (MacWhinney 1997), motivational or educational factors and typological similarity between L1 and L2 (Bialystok 1997; Birdsong 2006), and language attrition (Schmid 2012). Further research is needed to measure whether cognitive task demands might be an additional factor with age in influencing L2 processing and production.

In second language acquisition research the relation between attentional capacity and L2 development has been studied by contrasting performance on tasks with different cognitive demands in different age groups. This issue has been investigated measuring written production tasks (Kuiken and Vedder 2008; Ojima 2006) and fluency and lexical complexity (Ong and

Zhang 2010). The results of these studies seem to confirm Robinson's view (2001, 2011) that higher task complexity[2] might lead to higher L2 development. However, other researchers (Foster and Skehan 1996; Nuevo 2006; Skehan 1998) have argued the opposite: the higher the task complexity, the lower the L2 development. According to these scholars, higher cognitive task demands will exhaust learner's attentional capacity and decrease their ability to process language. Skehan's Limited Attentional Capacity Model (1998) assumes that humans have limited information processing capacity. According to Skehan (1998), the more cognitively complex a task is, the less likely a learner will have attentional resources to use for language processing.
Révész et al (2014), have indicated that different learners (young adults vs. school-age) might perform differently depending on the cognitive demands posed by a specific task.
Previous research measuring the extent to which task demands correlate with L2 development are still mixed. Moreover, to our knowledge there are no studies investigating the effects of task demands on the ability to interpret and produce target forms between different age groups within the Processing Instruction research framework. To add to this line of research, our study goes beyond age comparisons and includes a second variable (cognitive task demands) to uncover any possible interactions between age and task demands.

1.3. *Research Questions and Hypotheses*

In the attempt to provide further support for the *Age Hypothesis*, and measure possible correlation between the age factor and cognitive task demands, the present study investigates directly whether two different age groups will benefit equally from Processing Instruction in altering their reliance on lexical temporal indicators and redirecting their attention to verb forms on processing instruction activities with different cognitive demands. The research that guided this study is framed by the following questions:

(Q1): Will Processing Instruction equally affect school-age learners and adult native speakers of German in their ability to process the English simple past regular tense *-ed* as measured by two interpretation sentence-level tasks with different cognitive demands?
(Q2): Will Processing Instruction equally affect school-age learners and adult native speakers of German in their ability to produce the English simple past regular tense *-ed* as measured by a written production task?
(Q3): Will the positive effects of Processing Instruction be retained over two weeks by both age groups on all tasks?

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[2] *Task complexity* refers to "the result of the attentional memory, reasoning, and other information processing demands imposed by the structure of the task on the language learner"(Robinson 2001:29).

Based on the results of the previous Processing Instruction research the following hypotheses were formulated:
(H1): L1 German school-age learners and adult learners of English will make similar gains from pre-test to post-tests in the first interpretation task (cognitively less demanding) than in the second interpretation task (cognitively more demanding);
(H2): L1 German school-age learners and adult learners of English will obtain similar gains from pre-test to post-tests in the written production task;
(H3): Both age groups will equally retain the positive effects of Processing Instruction for both interpretation tasks and the written production task over delayed post-tests administered two weeks after instruction.

2. Methodology

2.1. *Participants*

The participants belonged to two different age groups: school-age learners (fifth-grade pupils- mean age 10.5 years old) and adults (mean age 26 years old) enrolled in two different institutions in Germany: Maria Ward Gymnasium Nymphenburg (German grammar school) and the Language Centre of University of Munich (LMU), Germany. All were native speakers of German. Ethical approval to carry out this experiment was obtained and all participants completed a consent form agreeing to take part in the experiment. The original pool in both age groups was reduced around 20-30% due to a number of factors: previous knowledge and exposure to *-ed*, L1 background and knowledge of other foreign languages. Only L1 German native speakers with no knowledge of another foreign language than English and with no previous knowledge of the target form (*-ed*) were included in the final data pool. Subjects were pre-tested on the ability to interpret and produce the target feature. To be included in the final data-pool, participants had to score 60% or lower on the pre-tests battery. Thirty-six school-age learners and thirteen adults were included in the final pool. Adult students were tested with the *Oxford Quick Placement Test* and they were all at A1/A2 language proficiency level. School-age learners had learned English for 2 years (school instruction of 2 hours per week) and their level of English also placed at the A1/A2 language proficiency level. Their language proficiency level was determined using the CEFR (Common European Framework of Reference for Languages), the years of instruction, and assessed through oral exams ("*mündliche Prüfungen*") for their specific school type (regulated in § 54, 1, 1 of the School Rule for Grammar Schools in Bavaria- *Schulordnung für die Gymnasien in Bayern*).

Two groups were formed: school-age (n= 36); and young adults (n= 13). Participants' learning was limited to classroom instruction and only learners exposed to all phases of the instructional treatment were included in the final data pool.

2.2. *Procedures*

A pre-test/post-test design was used (see Figure 1.). Pre-tests were administered one week before the beginning of the instructional period. The teaching schedule in the two institutions allowed for the treatments to take place over two consecutive days for a total of two hours of instruction for each group. During the instruction period the groups were taught by the same instructor (the researcher). The instructor acted as a facilitator during the experiment. The participants were made aware of the nature of the experiment. Post-tests were used immediately after instruction and two weeks after the instructional period. Feedback from the instructor only indicated whether the participant's response was correct or incorrect. No additional feedback was provided.

FIGURE 1. ABOUT HERE

2.3. *The target feature*

The target feature in this study was chosen because it is affected by a combination of processing principles. The *Lexical Preference Principle* states that "Learners will tend to rely on lexical items as supposed to grammatical forms to get meaning when both encode the same semantic information" (VanPatten 2007:118). In the sentence '*Yesterday Paul played football in the park*' both the lexical item *yesterday* and the *-ed* verb ending communicate past tense. According to the *Lexical Preference Principle*, learners will rely on the lexical item over the verb inflection to interpret the sentence. The presence of a temporal indicator would make the grammatical form (*-ed*) redundant. The *Preference for Nonredundancy Principle* suggests that "Learners are more likely to process nonredundant meaningful grammatical form before they process redundant meaningful forms" (VanPatten 2004:14). Both processing principles indicate that L2 learners will not process this target form efficiently and appropriately when used with a temporal adverb encoding the same semantic information f.

The English simple past tense marking poses an additional and potentially unique problem to L1 German learners of English. German native-speakers are not always successful in making the distinction between the present perfect (German, *das Perfekt*) and the simple past (German, *Präteritum*). The *Präteritum* (simple past) is mostly reserved for written narrations. German speakers sometimes mix the two tenses indiscriminately. They tend to use exclusively the *Present Perfect* to express actions in the past. For example, the English sentence *Mary cleaned the kitchen yesterday* can be expressed in German in two ways: *Mary hat die Küche gestern geputzt*, or *Mary putzte die Küche gestern* (rarely used in oral communication). Hence, a German learner of English will experience difficulties in mapping the past simple marker (*-ed*) in English to the past time framework, because "(L2 learners) may borrow the concept of past tense in their L1 as the starting point" (Benati 2005:76) or "L2 learners may be processing according to a strategy that has been developed during L1 acquisition" (Doughty 2004: 262). Expanding the research line on the acquisition of English past simple tense will contribute to the generalizability of the effects of Processing Instruction across target and native languages.

2.4. *Instructional packet*

The same instructional treatment was used for both age groups. The material was developed following original Processing Instruction guidelines (Lee and VanPatten 1995; VanPatten and Sanz 1995). The Processing Instruction treatment had the following characteristics:

1. Presentation of the target feature pointing out to learners' possible processing problems (see Figure 2.);
2. Use of referential and affective structured input activities in which learners have to respond to the content of sentences (see samples in Figure 3. and Figure 4.).

FIGURE 2. ABOUT HERE

Referential activities are those for which there is a right or wrong answer and for which the learner must rely on processing the targeted grammatical form to get meaning. Affective structured input activities are those in which learners express an opinion, belief, or some other affective response and are engaged in processing information about the real world. In the Processing Instruction treatment, lexical markers (temporal adverbs) were removed from the structured input activities, so that learners' attention was directed towards the verb endings (*-ed*) as the indicator of tense. As Processing Instruction aims at making learners interpret the linguistic feature more efficiently and appropriately, learners were never asked to produce a sentence with the past simple tense. They were engaged in processing input sentences in a controlled situation so that they could make better form-meaning connections. The input was structured so that the grammatical item carried the important meaning and learners had to rely on the target item to complete the task. The structured input activities in this instructional treatment were all communicative and meaningful, constructed in an attempt to direct learners to attend to the form to complete the task (i.e. to get the meaning). As there were no lexical temporal indicators, learners had to use verbal morphology as the indicator of tense.
The material included three referential and three affective structured input activities. Highly frequent vocabulary was used in the activities.

FIGURE 3. ABOUT HERE
FIGURE 4. ABOUT HERE

The instructions in each task were presented to them in written English and translated in German in order to avoid possible comprehension difficulties (participants were all language learning beginners of English) and to ensure that they have understood the task requirements correctly. Participants were allowed to pose questions in German related to the instructions provided to ensure that they did not have any comprehension difficulties with the task requirements. All participants were exposed to the same amount of explicit information (information about the processing strategy) and structured input practice.

2.5. *Assessment and scoring procedures*

One interpretation task (see sample in Figure 5.) was adopted from a previous study (Benati 2005) and a second interpretation task (see sample in Figure 6.) was developed especially for this experiment to account for the factor 'cognitive task demands'.

FIGURE 5. ABOUT HERE
FIGURE 6. ABOUT HERE

All tests were balanced in terms of difficulty and vocabulary as they were all previously piloted. Only the target items were scored. The maximum possible score was ten for the first interpretation task and ten for the second interpretation task. Both interpretation tasks consisted of twenty sentences each, ten distractor items in the simple present or the present perfect tense and ten targeted forms (English simple past tense, only regular forms. The participants listened to the sentences and indicated (interpret) whether the sentence they heard was related to a past or present action. Temporal adverbs were removed from all sentences. No repetition was provided, so that the test would measure real-time comprehension.

The raw scores were calculated as follows: incorrect response and can't tell response = 0 point; correct response = 1 point. No partial credit was given. All task items sentences were recorded by a native speaker of English played for the subjects using a CD-player.

2.5.1. *Description of the cognitively demanding interpretation task*

A second interpretation task was developed in this study to test whether the two age groups would be able to process the target form with equal success rates in a more cognitively demanding task. The complexity was accounted for through the inclusion of another complex tense, known to pose difficulties in distinguishing pastness due to the participant's L1: the Present Perfect. This tense is is used differently in German than in English. In German Present Perfect expresses pastness and learners could very likely end up with false mapping of the meaning 'pastness' to a verb in present perfect simple when presented with a target sentence in English containing a verb in present perfect. The interpretation task included distractor sentences which are known to pose difficulties in the interpretation of pastness. Temporal adverbs were removed. The questions aimed at testing learners' cognitive abilities to map the form and meaning of the target verb. The on-task demands for the modified interpretation task are to match the grammatical form (*-ed*) with the meaning of the whole utterance (finished past action) without a given temporal adverbial as an option to choose from, but to rather attend to the meaning of the whole utterance by reasoning, i.e. to decide whether there is a possibility that the action which started in the past may have continued in the present (present perfect[3]) or the

[3] Only such sentence in *Present Perfect* which carry the meaning that something started in the past and has continued up until now were included (e.g. *I have had a cold for two weeks*). *Present Perfect* sentences expressing change over time, experience or actions which happened at an unspecified time before now were omitted.

action was completed in the past. If the input sentence was in past simple, the learner's correct choice would be to exclude the possibility that the action has continued in the present. On the other hand, if the input sentence was given as a distractor i.e. containing a verb in the present perfect, the learner should reason that the action which began in the past could/may have continued in the present, as well.

2.5.2. *The written production task*

The written production task (see sample in Figure 7.) was developed and used to measure learner's ability to produce correct sentences using the target feature. It consisted of twenty items (ten with the target form) structured as a modified cloze test, i.e. each target item, in its citation or dictionary entry form, was given to the learners in parentheses after a blank. Learners were supposed to use any appropriate verb form and not necessarily the target one (*-ed*). The task for the written production was to "*fill in the gap with the appropriate verb form*". In contrast to previous Processing Instruction studies on age requiring learners to fill in all gaps with the target verb form, i.e. without distractors (Benati 2005; Mavratoni and Benati 2013; Benati 2013), the current written production task intentionally did not contain any information about which verb forms should be used as not to frame students' answers in any way. Hence, learners were required to attend to the time/aspectual framework without being given explicit instructions as to which verb form to use. We included the following forms: present simple, present perfect and present continuous (as options, not counted) and only regular verb forms in past simple as "targets" (items to be measured).

FIGURE 8. ABOUT HERE

3. Results

3.1. *Interpretation task 1 (cognitively less complex)*

A one-way ANOVA conducted on the pretest scores showed no significant differences between the two age groups before instruction ($F(1, 48) = 1.645$, $p = .206$). Both age groups began instruction with equivalent knowledge of the target structure. Any differences found after instruction can be attributed to the effects of instruction. The descriptive statistics showed the gains made from pretest to post-test scores by the two age groups and at the same time reveals an extremely small difference between the first post-test and the delayed post-test. Table 1 provides the mean scores and standard deviations for both age groups (young adults and school-age learners) on the sentence-level first interpretation task.

Raw scores for the pre-test and post-tests (immediate and delayed) were tabulated and a two-way analysis of variances (ANOVA) with repeated measures was used. Age Group was the between-

participants factor, whereas Time (pre-test, immediate post-test and delayed post-test) was the within-participants factor.

TABLE 1 ABOUT HERE

The two-way ANOVA revealed a significant main effect for Time (F (1, 48) = 21.438, p < .000). There was no significant effect for Age Group (F (1, 48) =.449, p = .506) and no significant interaction between Age Group and Time (F (1, 48) =.870, p = .356). In summary, the results of the analysis of the interpretation data demonstrate that both age groups gained equally in their ability to interpret English simple past tense forms as measured by a sentence-level interpretation task. These effects were retained over time.

3.2. *Interpretation task 2 (cognitively more complex)*

A one-way ANOVA was performed on the pretest scores. The analysis revealed no significant differences between the two groups before instruction (F (1, 48) = 1.539, p = .221). The descriptive statistics show the gains made from pretest to post-test scores by the two age groups indicating a difference in scores among the two groups between the pre-test and the post-tests. Table 2 provides the mean scores and standard deviations for both age groups (adults and school-age learners) on the second sentence-level interpretation task.

Like in the case of the first interpretation task, a two-way analysis of variances (ANOVA) with repeated measures was performed. Age Group was the between-participants factor, whereas Time (pre-test, immediate post-test and delayed post-test) was the within-participants factor.

TABLE 2 ABOUT HERE

The results of the ANOVA revealed a significant main effect for Time (F (1, 48) = 16.205, p < .000). There was a significant effect for Age Group (F (1,48) = 12.664, p < .001) and a significant interaction between Age Group and Time (F (1,48) = 3.123, p < .000). The significant interaction indicates that there may be differential effects of the cognitive task demands for the different age groups. Post hoc means comparisons on the scores for the two age groups were carried out. It was confirmed that from the pre-test to post-test 1 (immediate) and from the pretest to post-test 2 (delayed) the scores are significantly different: PI (adult) > PI (school-age) (p <.000 and p < .000, respectively). The difference in scores from post-test 1 (immediate) and post-test 2 (delayed) was also significantly different: PI (adult) > (PI (school-age) (p = .004). Both groups retained the effects of Processing Instruction over time.

3.3. *Production Task*

A two-way analysis of variance (ANOVA) with repeated measures was conducted. Raw scores for the pre-test and post-tests (immediate and delayed) were tabulated and a two-way analysis of variances (ANOVA) with repeated measures was used. Age Group was the between-participants factor, whereas Time (pre-test, immediate post-test and delayed post-test) was the within-participants factor. The one-way ANOVA conducted on the pretest scores showed no significant differences between the two groups before instruction (F (1, 48) = 36.396, p = .106). Table 3 shows the mean scores and standard deviations for both age groups (adult and school-age learners) on the written production task.

TABLE 3 ABOUT HERE

The two-way ANOVA revealed a significant main effect for Time (F (1, 48) = 69.751, p < .000). There was no significant effect for Age Group (F (1, 48) = 3.310, p = .075) and no significant interaction between Age Group and Time (F (1, 48) =1.896, p = .175). In summary, the results of the analysis of the production data demonstrate that both age groups gained equivalently in their ability to produce English simple past tense forms as measured by a production task. These effects were retained over time.

3.4. *Summary of Results*

The results of the classroom experimental study presented in this paper provide affirmative answers to all the three research questions. The analysis of the data collected through the interpretation tasks show that both groups (L1 German school-age learners and young adults) improved equally from pre-test to post-tests in their ability to interpret English the *-ed* (English simple past tense marker for regular verbs) at the sentence-level. However, the adults performed better than the school-age learners in the second interpretation task. Moreover, the analysis of the data on the written production task clearly indicates that both groups made equal gains from pre-test to post-tests. All learners in these groups improved in their ability to produce English simple past forms at sentence-level. Finally, the positive effects of Processing Instruction were retained over time for both interpretation tasks and the written production task by the two groups.

4. Discussion and Conclusion

The overall results from this study have provided further evidence that Processing Instruction is an effective instructional intervention in helping L2 learners at different ages to make accurate form-meaning connections in different cognitive demand tasks.

The first hypothesis (H1) of this study was: L1 German school-age learners and adult learners of English will make similar gains from pre-test to post-tests in the first interpretation task (cognitively less demanding) than in the second interpretation task (cognitively more demanding).

The interpretation tasks included in this study required both adults and school-age children to process the target form in the input. In comparison with the results obtained by Benati (2005), the improvement made by L1 German learners on the first interpretation task in this study was not as higher (60% vs. 25% in the

present study). A possible explanation is that the school-age learners in Benati (2005) were 12-13 years old with cognitive abilities at a higher maturational-level than the learners in the present study (mean age 10.5 years old). In both studies the results from the first sentence-level interpretation task show that Processing Instruction has positive and equivalent effects on both age groups (school-age learners and adults). The findings from the second sentence-level interpretation task indicate that the adults made greater gains than the school-age learners. The difference in gains between the two age groups can be explained in terms of cognitive processing load (Skehan 1998). In the sentence-level interpretation task, L2 learners were exposed to verb forms with 'conflicting' meanings and this constituted a more demanding task for them. As VanPatten (2004:22) affirms "the issue of capacity (that is, limited resources) is not the same for everyone". Task demands and individual processing capacity can provide an explanation for the results on the second task. In addition, the findings from the second interpretation task seem to suggest that adults' capacity to reason analogically seem to be more developed than children's and they were more able to attend to both the *-ed* verb form and the auxiliary in contrast to children who might have only focused on the end of the verb.

The second hypothesis (H2) formulated in this study argued that: L1 German school-age learners and adult learners of English will obtain similar gains from pre-test to post-tests in the written production task. Although learners' improvement in the production task are not as high as the ones in the interpretation tasks (an outcome that this study shares with Benati 2005), the main findings from the production task clearly indicated that both age groups improved significantly and equally. The lower scores for processing instruction on the written production can be explained by the task learners were asked to accomplish. Learners were required to detect the temporal/aspectual frame and to use an appropriate verb form. The cognitive load was higher as learners were asked to choose the correct verb form to use.

The final hypothesis (H3) in the present study was: Both age groups will equally retain the positive effects of instruction for both interpretation tasks and the one written production task over a delayed post-test administered two weeks after instruction. The positive effects of instruction were maintained over the delayed post-test for both age groups who made similar gains on the immediate post-test for all the assessment measures. Both groups retained the positive effects of the instruction over time.

The present study is a valuable contribution to the Processing Instruction research agenda as it provides further evidence for the effects of Processing Instruction on the acquisition of a verbal morphology feature (*-ed* for regular past simple tense) of the English grammatical system, which is affected by a combination of processing principles. Overall, the results from the present study provide further evidence for the *Age Hypothesis* (Benati and Lee 2008; Lee and Benati 2009) as Processing Instruction is equally effective with primary school age learners as well as with adult learners with German as L1. The findings from the second sentence-level interpretation task where learners were asked to identify the correct temporal frameworks for Past Simple versus Present perfect seem to suggest that there are maturational constraints on the *Age Hypothesis* especially if the tasks are cognitively more demanding. The result from this study seems to lend support to the view that the more cognitively complex a task is, the less likely a learner will have attentional resources to use for language processing (Skehan 1998; VanPatten 2004).

Our results are in line with the results obtained by Revesz et al (2014) which indicate that under less complex cognitive demands conditions (first interpretation task), both groups perform equally well. This is in contrast with more complex task cognitive demands conditions (second interpretation task) where the adults made greater gains than the school-age learners.
More research is needed to confirm a reformulation of the *Age Hypothesis* in the form of: Processing instruction will be just as effective as an intervention with younger learners as it is with adult learners for grammatical structures and concepts within their cognitive maturational level.

Despite the positive outcomes, there are a number of limitations. The first one is the limited number of participants in the present study (13 adult learners and 36 school-age learners). Therefore, this study would need to be replicated before its findings can be generalized. It must be said, however, that the similarities between the results of this study and previous empirical research measuring the relative effects of Processing Instruction in learners of different ages lend validity to the findings presented in this paper. The second limitation of the present study is that the long-term effects of the variables under investigation should be re-examined as long-lasting effects of instruction in this study were measured only over a period of two weeks.

Further research is needed in order to compare the effects of Processing Instruction between school-age learners and adults on a number of linguistic features and in relation to Processing Instruction activities with different cognitive demands. This research should include native speakers from a variety of L1s. Further research is also needed to examine learners' performance on a cognitively more demanding task to further test the *Age Hypothesis*. There is still much work left to do in the area of the role of individual differences in the effects of Processing Instruction.

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Figure 1. Overview of the experiment

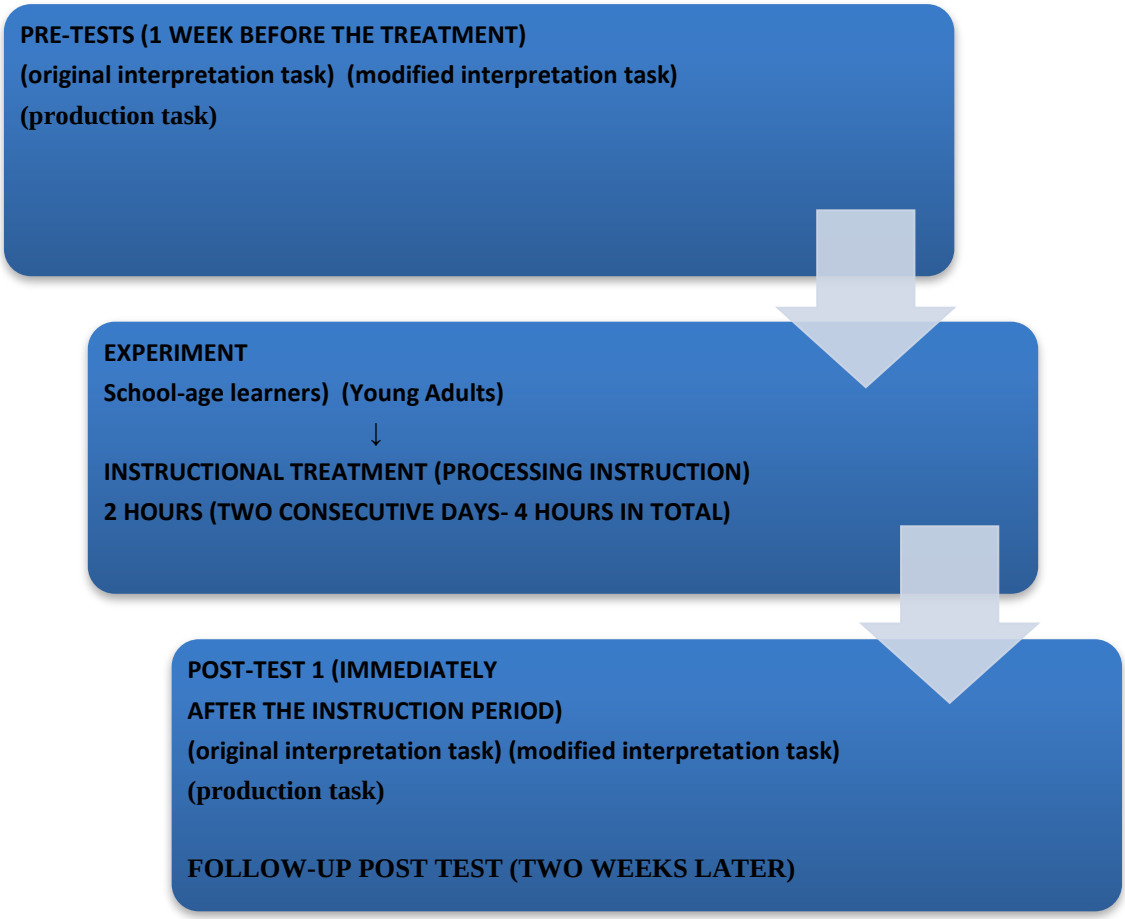
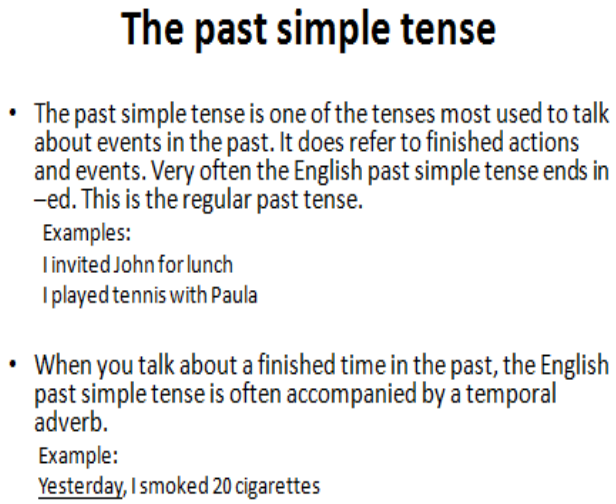


Figure 2. Explicit information component of processing instruction



Attention

- DO NOT RELY ON THE TEMPORAL ADVERB (e.g. Yesterday) TO UNDERSTAND WHEN THE ACTION TAKES PLACE AS SOMETIME YOU CAN HEAR A SENTENCE WITHOUT THE TEMPORAL ADVERB.
- You must pay attention to the form of the verb (e.g. ***–ed***) to understand when the action takes place.
- In the case of describing past events pay attention to the ending of the verb: ***-ed***.
- However, you may see an auxiliary "have/has" in front of a verb form ending with ***–ed***. In that case the action expressed is not past and has not finished.

Figure 3. Referential activities sample

Things people did now and last summer

Listen to the following statements and decide whether each statement refers to an activity that takes place now or took place last summer in London.

	LAST SUMMER	NOW
1)	™	™
2)	™	™
3)	™	™

(continue in similar fashion)

Sentences heard:

1. People worked overtime at work
2. People have practiced all day
3. People celebrated different festivals

Figure 4. Affective activities sample

David Beckham: Now and after

Step 1

Listen to the following statements made by a journalist about the life of the footballer David Beckham and decide whether each statement is referring to his past life as a Manchester United Player in England or his life now as Real Madrid Player in Spain.

	MANCHESTER UNITED PLAYER (PAST)	REAL MADRID PLAYER (NOW)
1)	™	™
2)	™	™
3)	™	™

(continue in similar fashion)

Sentences heard:

David Beckham……

1) … receives a lot of money from advertising
2) …donated money to charities
3) …has dedicated more of his spare time for his family

Step 2

Now read the sentences you have just listened to and decide (in pairs) if David Beckham was more famous when he was a Manchester United Player or a Real Madrid Player.

Figure 5. Interpretation task adopted from Benati (2005)

Sentence-level interpretation task

Listen to the sentences and decide what is more appropriate answer for it. You will hear the sentences only once and you have 5 seconds to make the correct choice.

	LAST YEAR	RIGHT NOW	CAN'T TELL
1)	_____	_____	_____
	LAST YEAR	RIGHT NOW	CAN'T TELL
2)	_____	_____	_____
	LAST YEAR	RIGHT NOW	CAN'T TELL
3)	_____	_____	_____

Sample sentences heard by the students:

1) I have traveled to Bristol.
2) I watch videos on my i-phone.
3) I ordered Chinese.

Figure 6. Second interpretation task

New/modified sentence-level interpretation task

Read the questions before you listen to each of the sentences and then choose the correct answer. Try to choose the most suitable answer. You will hear the sentences only once. You have 5 seconds to read the question for each sentence and 5 seconds to make the correct choice.

[Sample sentence heard by the students: John chopped his finger with a knife.]

1) What do you think, is John still in pain?

YES ( ) NO ( ) CAN'T TELL ( )

[Sample sentence heard by the students: Doe Bill still go to high school?]

1) 2) Decide whether Bill still goes to high school:

YES **( )** NO **( )** CAN'T TELL ( )

[Sample sentence heard by the students: **John** lived in the States **for 3 months.**]

3) **Is John still in the States?**

YES ( ) NO ( ) CAN'T TELL ( )

Figure 7. Production task (fill-in-the-gap)

Fill in the gap with the appropriate verb form (20 gaps)

John and Mary are in a relationship. They have known each other for a very long time. Even, their parents know each other. They live in the same neighbourhood and they even go to the same school. They [1]_____(to be) together for 3 years. They are a very nice couple. They [2]_____(like) doing lots of interesting things together. But, John also [3] _____(like) spending time alone. John loves sports. Cooking is his passion. He loves cooking for friends. Mary loves spending time with her friends, listening to music and watching nice movies. Her hobby [4]_____(to be) playing tennis. John [5] _____ (phone) his girlfriend Mary and they [6] _____ (talk) together for about an hour. Mary [7] _____ (want) to play tennis later that day. She [8]_____(play) tennis for a while. Her dream [9] ____(to be) to become a very famous tennis player. So, she [10]_____ (use) every single free hour to practice. When Mary suggested playing tennis, John quickly [11]_ _____ (brush) his teeth and [12] _____ (dress) in his white t-shirt and shorts. At 1pm he [13] _____ (walk) to the tennis courts to meet Mary. They [14] _____ (play) together for about two hours and [15] _____ (enjoy) themselves a lot. Afterwards, they [16] _____(watch) a movie together. Later at John's house he [17] _____ (cook) a meal for Mary. Unfortunately, the food *was* terrible and Mary *was* sick!

Now, John [18]_____ (take) Mary to the best restaurant, because he [19]_____ (want) to make up for the awful food he prepared for her last week. Hopefully, Mary[20] _____ (agree).

Table 1. Descriptive statistics for first sentence-level interpretation task

Groups	Pretest		Posttest		Delayed Posttest	
	M	*SD*	*M*	*SD*	*M*	*SD*
PI (school age) (*n*=36)	3.33	1.95	5.80	2.20	5.41	1.85
PI (adult) (*n*=13)	4.15	2.03	5.92	2.53	5.53	2.66

Table 2. Descriptive statistics for second sentence-level interpretation task

Groups	Pretest		Posttest		Delayed Posttest	
	M	*SD*	*M*	*SD*	*M*	*SD*
PI school age (*n*=36)	2.97	1.94	3.66	1.60	3.55	1.59
PI adult (*n*=13)	3.76	2.08	6.07	2.43	6.06	1.03

Table 3. Descriptive statistics for production task

Groups	Pretest		Posttest		Delayed Posttest	
	M	*SD*	*M*	*SD*	*M*	*SD*
Pi school-age (*n*=36)	.91	.96	2.36	1.79	2.31	1.85
PI adult (*n*=13)	.84	.83	3.23	1.83	3.09	2.66