# The role of phonological salience in the acquisition of past tense morphology by Greek children with Specific Language Impairment

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**Abstract**

The aim of this study is threefold: *firstly*, to describe the acquisition patterns of Greek past tense by children with Specific Language Impairment (SLI); *secondly*, to investigate the relationship between the phonological salience of past tense in Greek and its acquisition by language impaired learners; *thirdly*, to establish an account on the nature of the impairment by comparing the acquisition patterns exhibited by SLI children with those presented by language unaffected ones. The performance of 10 SLI children in elicited past tense production is compared to that of chronological age matched (CA) and language development matched (LD) controls. Based on the claim that perceptual saliency aids acquisition (or learning), it is predicted that SLI children will perform better in the production of past forms of higher salience than less salient forms. The results confirm this prediction, providing support for the claim that perceptual salience does account for better performances in tense marking in Greek SLI.

**Keywords:** *Specific Language Impairment, past tense, salience, acquisition, features*

## 1. Introduction

### *1.1 Specific Language Impairment*

Specific Language Impairment (SLI) constitutes a language-specific disorder, which appears in preschool children, affecting mainly the areas of phonology and grammar and causing seriously delayed development. Diagnosis of SLI presupposes normal intelligence as well as absence of any neurological, psychological or cognitive impairments, any articulatory abnormalities or anatomical disorders (e.g. otitis media).

### *1.2 Past Tense*

#### *1.2.1 The acquisition of past tense in English and Greek SLI*

Previous studies on past tense acquisition by English children with SLI have claimed that regular past tense causes greater difficulties to these children than irregular past does (Leonard et al. 1992; Bishop 1994; Rice et al. 1995, 1998, 2000). This discrepancy between regular and irregular past tense acquisition patterns has lead to dispute in the literature concerning the processing mechanisms responsible for the two types of past tense formation. In specific, two separate mechanisms have been claimed to control the processing and acquisition of regular and irregular past (Dual Mechanism or Dual Route models: e.g. Pinker & Prince 1988). According to these models, regular past forms are stored as roots, *trimmed* off their suffixes – which are stored separately in the lexicon – hence during the acquisition process, the rule of [root+suffix] is learnt by children.

Contrary to this process, irregular forms are stored as separate lexical items and are therefore learnt as such by young children, without requiring the acquisition of any rule.

Apart from this (ir)regularity effect on the acquisition of past tense, studies on second language acquisition have revealed an effect of phonological salience in the way past tense is learned by L2 learners. More specifically, syllabic allomorphs of English past (such as *wanted*) were found to pose fewer difficulties to learners (Solt et al. 2004).

Contrary to English findings, relevant studies in Greek have not indicated any serious problems in the acquisition of past tense by SLI children (Stavrakaki 1996; Clahsen & Dalalakis 1999).

### *1.2.2 Past tense and interpretability*

Tense (TNS) and Agreement (AGR) are both realised on the verb but cannot be morphologically distinguished from each other. They are both considered to be *uninterpretable*[1] at LF (Logical Form), in the sense that no semantic information is carried by their morpho-phonological realisation (Chomsky 1995). However, there is a striking difference in the realisation of these two features in the spell-out between English and Greek, as Greek TNS and AGR are realised both morphologically (TNS/AGR suffixation) *and* phonologically (stress shift).

### *1.2.3 Interpretability and SLI*

Previous studies in Greek SLI have revealed difficulties in the acquisition of LF-uninterpretable features, whereas no serious problems are encountered in acquiring LF interpretable features, i.e. features with rich semantic load (Tsimpli & Stavrakaki 1999; Tsimpli 2001). Furthermore, it has been observed that, in the absence of uninterpretable feature marking in impaired speech, these characteristics are marked through alteration of stress patterns on parts of the sentence. This fact indicates that phonology can function as a means of *compensation* for SLI children (Tsimpli & Stavrakaki 1999; Tsimpli 2001).

### *1.2.4 Past Tense morphology in Modern Greek (MG)*

Tense (past – non-past) and aspect (perfective – imperfective) constitute the main morphological distinctions of the MG verb (Joseph & Philippaki-Warburton 1987; Stephany 1995; Holton et al. 1999).

Aspect is realised on the verb stem, as indicated in (1) below, whereas tense is marked through suffixation (*morphologically*) and stress shift (*phonologically*) – see example (2).

(1) imperfective stem: e.g. γra**f-**
perfective stem: e.g. γra**ps-** (f+s)

[1] Although Tense is considered an *interpretable* feature under Chomsky's initial formulation of the Minimalist Programme, more recent analyses have been put forward by a number of researchers (Adger 2003; Pesetsky & Torrego 2004: 6; Von Stechow 2005). According to these analyses, the interpretable feature of [tense] – [*i*-tense] – is hosted in a distinct *Tns* node and not on the finite verb, while, the [tense] feature on the finite verb (*v*) is *uninterpretable* (*u*-tense) and *unvalued* and obtains a value via agreement with the [*i*-tense] feature on Tns. In that sense, the morphophonological component of tense is differentiated from the semantically interpretable tense feature, and is, thus, considered *uninterpretable*.

(2) non-past imperfective: e.g. γra**f-*o***
past perfective: e.g. **é**-γra**ps-*a***

Past tense formation typically involves stress shift to the antepenultimate syllable, a phenomenon referred to as the *antepenultimate rule* in MG grammars.

(3) χor**é**vo – χ**ó**repsa (dance) [rule: stress shift]

Verbs with two syllables are forced by the antepenultimate rule to add a prefixed, syllabic augment, which will carry the stress:

(4) v**á**fo – **é**-vapsa (paint) [rule: stress shift +augment]

Therefore, as it is shown in examples (3) and (4), the past tense rule involves two levels of phonological realisation:

a. +stress shift, +augment
b. +stress shift, -augment

The syllabic augment is considered the strongest phonological cue in the past tense formation process. This claim is supported by the results of a judgement task, administered to 55 adult native speakers of Greek and 11 children aged 10-16, asked to evaluate the acoustic difference (salience) between the present and past forms.

Only forms that do not involve application of the above rule (i.e. fully irregular stems, suppletives) are considered irregular – not rule-based – under the scope of this study. Therefore, verbs like *pino-ipja* (drink-drank), and *léo-ípa* (say-said) are seen as irregular, whereas verbs with stem-internal irregularities, such as *févγo- éfiγa* (leave-left) are classified under the rule-based category.

### *1.3 The present study*

The basic aim of the study is the investigation of the effect of phonological salience of past tense marking on acquisition as well as the differentiation of this effect from that of regularity. Additionally, the question whether SLI differs qualitatively from normal acquisition in this area, indicating a deficit rather than a delay, is also addressed.

#### *1.3.1 Verb categories and the present study*

Modern Greek verbs were categorised based on the two test factors. Therefore, two categorisations were made for the purposes of the study: one based on salience, and one based on regularity. The categories created are described below.

a) Categorisation based on ***salience***:
**+S:** [=low salience] -augment, regular or partly irregular stem
3-syllable verbs e.g. aγapáo - aγápisa (love)
**++S:** [=high salience] +augment, regular or partly irregular stem
2-syllable verbs e.g. γráfo - éγrapsa (write)

b) Categorisation based on ***regularity***:

**REG:** rule-based, regular or partially irregular stems
e.g. γráfo - égrapsa (write)
aγapáo - aγápisa (love)
δíno - éδosa (give)

**IRR:** fully irregular past forms (suppletives), not rule-based formation
e.g. léo - ípa (say)

*1.3.2 Predictions, hypotheses and expectations*

Based on the theoretical information provided above, if SLI children have general difficulties in applying grammatical rules and depend more on phonology to compensate for this deficit, it is predicted that:

a. verbs of lower salience (+S) as well as regular past forms should cause greater difficulties to the SLI children than verbs of high salience (++S) and irregulars,
b. the categories +S and REG will cause greater difficulties to the SLI children than to the control groups, and
c. a stronger discrepancy between the groups' performance – SLI and controls – will be evident in these two categories.

2. Method

*2.1 Subjects*[2]

Three groups of children participated in the study: the *SLI* group, the *chronological age matched* controls (CA) and the *language development matched* controls (LD). Information about the subjects of the study is presented in Table 1.

**Table 1.** The subjects

| *Group* | *Experimental SLI* | *Control I CA* | *Control II LD* |
|---|---|---|---|
| N of children | 10 | 10 | 10 |
| Age | 4 – 6;5 | 4 – 6;7 | 3 – 3;7 |
| Matching criteria | | Chronological age | LD – DVIQ scores |
| Access | Speech/Language centres - Athens | Kindergartens - Piraeus | Kindergartens - Piraeus |

*2.2 The data*

The data consist of elicited production of past forms, obtained through speech elicitation tests especially constructed for the purposes of the study.

[2] Special thanks to the speech and language therapists Maria Vlassopoulou, Chara Karamitsou and Maria Diamanti for their valuable help during the data collection process.

*2.3 The test items*

Forty-four (44) activity sentences (four trial and forty test sentences) including a non past verb form were constructed. Each sentence was followed by the time adverbial *'χthes'* (yesterday), aiming to elicit the past form of the verb provided. The task contained two experimental conditions – with real and pseudo verbs, which were presented at random order (Ullman & Gopnik 1994). More specific information on the test items of the two conditions is provided in Tables 2a and 2b below.

**Table 2a.** Real verbs (22 items)

| *Condition* | | *Items* | *Examples* | |
|---|---|---|---|---|
| Training | | 2 trials | | |
| **REG** | **+S** | 8 sentences | *O Jannis **zoγrafízi**.*<br>*Xthes o Jannis…?*<br>*[**zoγráfise**]* | *Jannis is drawing.*<br>*Yesterday Jannis…?*<br>*[drew]* |
| | **++S** | 4 sentences | *I Anna **pézi** skaki.*<br>*Xthes i Anna…?*<br>*[**épekse** skaki]* | *Anna is playing chess.*<br>*Yesterday Anna…?*<br>*[played chess]* |
| **IRR** | | 8 sentences | *O Nikos **píni** γala.*<br>*Xthes o Nikos…?*<br>*[**ípje** γala]* | *Nikos is drinking milk.*<br>*Yesterday Nikos…?*<br>*[drank milk]* |

**Table 2b.** Pseudo verbs (22 items)[3]

| *Condition* | *Items* | *Examples* | |
|---|---|---|---|
| Training | 2 trials | | |
| **+S** | 12 sentences | *O Jannis **trenízi**.*<br>*Xthes o Jannis…?*<br>*[target: **trénise**]* | *Jannis is X-ing.*<br>*Yesterday Jannis…?* |
| **++S** | 8 sentences | *To koritsi **krávi** to krevati.*<br>*Xthes to koritsi…?*<br>*[target: **ékrase/ékrapse**]* | *The girl is X-ing the bed.*<br>*Yesterday the girl…?* |

All verbs included in the elicitation tasks were carefully selected so that they were familiar to the children. Additionally, they were checked for frequency[4] so that it remained constant through the testing conditions. Finally, all verbs included in the tasks were 3rd person singular, in order to prevent effects of agreement or person frequencies.

*2.4 Procedure*

Each child was presented auditorily with the stimulus sentence, followed by the time adverbial '*xthes*' (yesterday) and was asked to complete the sentence, using the past form of the verb given. The training condition ensured understanding of the task. A sample stimulus question and target response is provided in (5) below.

[3] Due to the verb classification adopted in this study (only suppletives are considered irregular), the creation of pseudo-verbs that would belong to the *Irregular* category was not possible.

[4] Verb frequencies were obtained through the electronic database of the Institute for Language and Speech Processing (ILSP), available online in http://hnc.ilsp.gr/statistics.asp.

(5) **Question:** Tora o Janis **trenízi**. Xθes o Janis…?
Now Janis X.$_{\text{NONPAST.IMPRF.3S}}$ Yesterday Janis…?
**Target:** trénise / trénize.
X-ed.$_{\text{PRF}}$ / X-ed.$_{\text{IMPRF}}$

*2.5 Measurements and analyses*

Application of the past formation rules (stress shift in +S category and syllabic augment in ++S category) was considered correct past tense production in all tasks. In the pseudo verbs condition, indications of the rule application were enough to qualify as correct responses, whereas any stem-internal, vowel or consonant alterations were not counted as errors.

Two types of analyses were carried out for the better understanding of the results: *within-group analyses* were tested statistically through the Wilcoxon Signed Ranks test (non-parametric, paired samples), so that the effect of salience and regularity could be described for each group separately, and *between-groups differences* were checked for significant through the Mann-Whitney non parametric test, so that the effects found could be compared and contrasted among the groups of the study.

## 3. Results

This section presents the results obtained in this study, beginning with within-group analyses for each condition separately. Between-groups comparisons follow and error analyses are provided at the end of this chapter.

*3.1 Within group analyses*

*3.1.1 Condition I – real verbs*

Beginning with phonological salience, a comparison of the number of correct responses in each verb category (+S and ++S) for each group was performed. Successful performance rates of the three groups in verbs of high and low salience are presented in Figure 1.

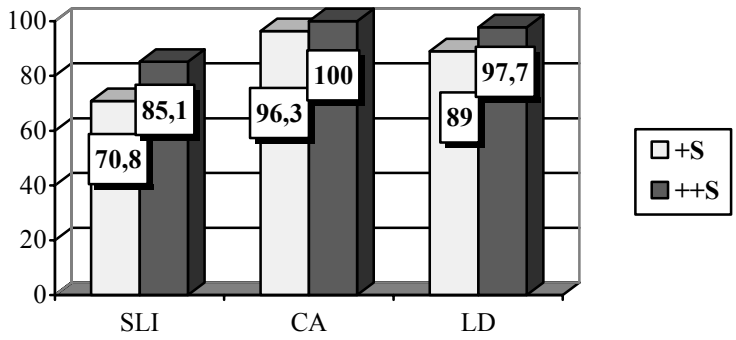


**Figure 1.** Condition I, successful production – ***phonological salience***

As Figure 1 shows, there is an effect of salience in all three groups' performance, as all groups performed better in the ++S than in the +S category. More specifically, the SLI group performed above chance in both categories, but the difference between mean

scores in the two categories is 14.3% as opposed to 3.7% for the CA group and 8.7% for the LD group. Statistical analyses revealed significant differences between the two categories for the SLI group (p = .055) and the LD group (p = .050), whereas the effect was not significant for the CA group (p = .343).

Moving to regularity, correct responses of the three groups in REG and IRR verbs are presented in Figure 2.

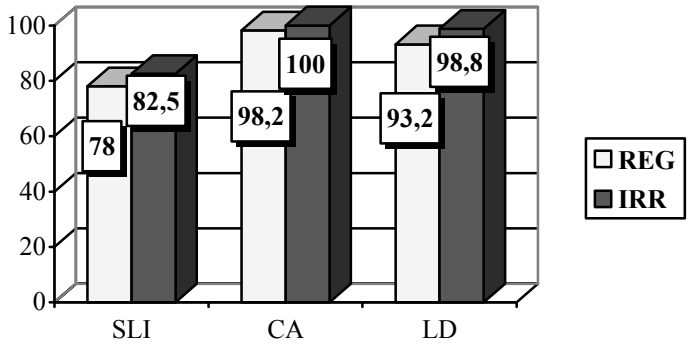


**Figure 2.** Condition I, successful production – ***regularity***

What one can observe in the above graph is that there is an effect of regularity in all groups, as they all performed better in the production of irregular verbs than in regulars. However, the effect here seems to be weak as the differences between the two categories (REG-IRR) are not substantial. In fact, only the LD group's performance in IRR verbs is significantly higher than that in REG verbs (p= .018), whereas the differences for the other two groups are not significant (p = .401 for the SLI and p = .343 for the CA group). This could be an indication that the younger controls are going through a phase in which irregular past is still processed quite differently from rule-based formation, a phase which the SLI children have possibly grown out of.

*3.1.2 Condition II – pseudo verbs*

As stated above, the second condition consisted of pseudo verbs, which were presented along with the existing ones at random order. The children's performance analysed based on salience is presented in Figure 3 below.

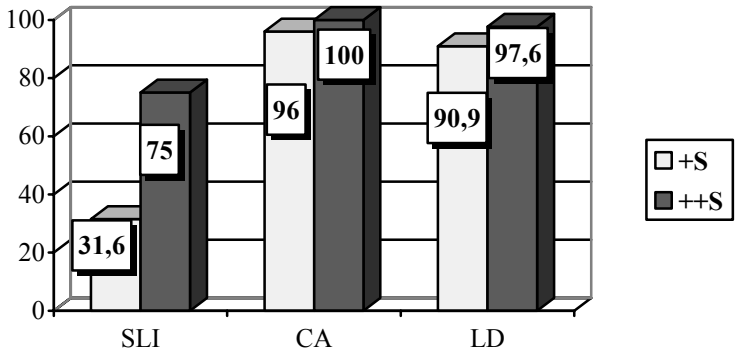


**Figure 3.** Condition II, successful production – ***phonological salience***

What is striking in Figure 3 is the particularly low performance of the SLI group in the low salience category (only 31.6%). In contrast, SLI mean successful production in the ++S category was as high as 75%, indicating a significantly better performance compared to that in +S verbs (p = .005). What is interesting is that a significant effect of salience is evident across all groups' performances (LA: p = .017, CA: p = .008), indicating that phonological salience *does* play a facilitative role in the acquisition process, since its absence drops children's performance.

*3.2 Between-groups comparisons*

The results presented in the previous section indicated a significant effect of phonological salience in the production of past forms for all three groups, which was particularly strong in the pseudo verbs task. Therefore, a comparison of this effect across the three groups of the study will provide a clear image in the way SLI children learn past tense in comparison to unaffected children.

Figure 4 below presents the performance of the three groups in the two categories of pseudo verbs (+S and ++S) in such a way that a visual comparison of the differences is possible.

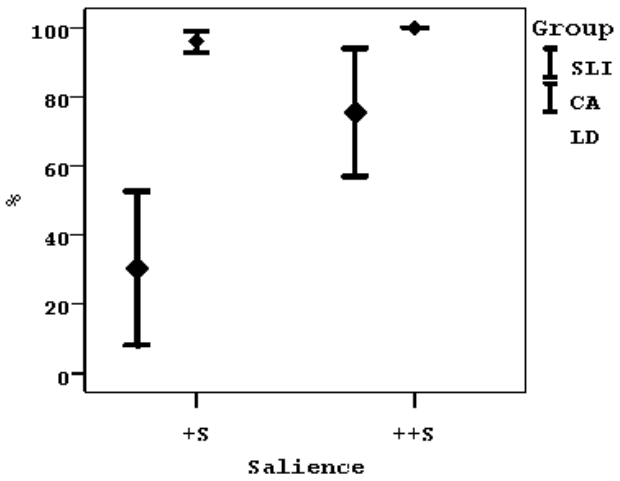


**Figure 4.** Correct production of the 3 groups in pseudo verbs – ***salience***

Notice that there is a notable difference between SLI and control performance in both +S and ++S verbs. In fact, this difference is statistically significant (**+S:** SLI-CA: p = .000, SLI-LD: p=.000; **++S:** SLI-CA: p = .003, SLI-LD: p = .008), and what is also interesting is that the SLI children differ significantly from the language matched controls as well. Furthermore, one can easily notice in the graph that the SLI group differs greatly from the control groups in the low salience category, whereas in the high salience category this difference is less significant. This indicates that reduced salience has a stronger effect on SLI performance than it does to the controls, meaning that SLI children are possibly more dependent on phonology than unaffected children are.

*3.3 Error analyses*

In the previous section, successful performance of all groups was presented, without analysing error types. However, the types of errors that the children made could be revealing of the acquisition process they go through.

Beginning with Condition I (real verbs), the errors the children made do not bear any interest as they all involved use of the non-past form instead of the past. In the pseudo verbs task however, error patterns are worthy of note.

The errors that were made in the pseudo verbs task were of the following three types: *repetition* of the present form instead of production of the past (see example (6)), *formation* of the present perfective (dependent) equivalent of the form provided (example (7)) and *application* of the [+augment] rule on verbs of the +S category (example (8)).

(6) ***Non-past (imperfective) instead of past:***
**(++S)** stimulus: *krávi*
target: *ékrapse*
acceptable: *ékrave*
error: *krávi*

(7) ***Non-past perfective instead of past perfective:***
**(+S)** stimulus: *trenízi*
target: *trénise*,
acceptable: *trénize*
errors: *tenítsi* (SLI)
*trenísi* (SLI, LD)

(8) ***Wrong application of rule – [+augment] in +S category***
**(+S)** stimulus: *spetá*
target: *spétakse*
acceptable: *stépase*, *stépatse*, *stépikse*, *stépakse*.
errors: *éstekse*, *éstapse* (CA)
*étatse* (SLI)
*éstije* (SLI, LD)

Table 3 presents the distribution of the above error types in the production of the three groups.

**Table 3.** Errors made by the three groups in the pseudo verbs task

| | | *non-past* | | *rule overuse* | | *non-past perfective* | | *total* |
|---|---|---|---|---|---|---|---|---|
| | | %/errors | %/ctxs | %/errors | %/ctxs | %/errors | %/ctxs | %/ctxs |
| SLI | **+S** | 53% | 36% | 15% | 10% | 32% | 22% | 68% |
| | **++S** | 100% | 35% | 0% | 0% | 0% | 0% | 35% |
| CA | **+S** | 0% | 0% | 100% | 4% | 0% | 0% | 4% |
| | **++S** | - | - | - | - | - | - | 0% |
| LD | **+S** | 18% | 1% | 73% | 7% | 9% | 1% | 9% |
| | **++S** | 100% | 2% | 0% | 0% | 0% | 0% | 2% |

Notice a very striking difference in the error patterns made by the SLI group compared to those made by the controls: the most common error made in the low salience category by the unaffected children was misapplication of the [+augment] rule, that is

adding an extra syllable to a pseudo verb that would only require a stress shift. However, this was *not* the case in SLI performance (rule overuse formed only 15% of their errors). Instead, the SLI children mainly repeated the stimulus verb (non-past), while non past perfective forms were also quite frequent. This difference indicates distinct processes in handling low-salience forms between SLI and unaffected controls.

## 4. Discussion

As it was described in the introductory section, the main aim of this study was to investigate the acquisition processes of Greek past tense morphology by SLI and typically developing children. Specifically, the effect of phonological salience was the main focus, while processes responsible for the acquisition of regular versus irregular past was under investigation as well.

Firstly, it was shown that regularity did *not* have a significant effect on SLI performance, although it was evident in the production of the younger controls. At first sight, this fact could be interpreted as an indication that SLI children did not face difficulties with rule-based formation as language matched unaffected children did. However, looking at the results on salience can lead to different assumptions. Specifically, it was shown that SLI children *did* face difficulties with rule-based formation, but these difficulties were specific to low salience verbs. This means that rule formation difficulties were minimised in high salience forms, suggesting that phonology constitutes a means of compensation for these children.

Concerning the types of errors made by the children of the study, it was exhibited that the children of the control groups mainly performed rule misapplication by adding the syllabic augment to verbs of the +S type. This suggests that the rule *has* been acquired even by the younger controls and is overused in its *default* form, that is, [+augment].

In the case of the SLI children, on the other hand, a morphological deficit leads to two directions: One possibility is that of inappropriate verb segmentation, in other words unsuccessful identification of the verb stem, which leads to misapplication of the rule in the same way that the controls do. This would indicate that the rule is present but overused. However, this is not the most likely option since rule overuse was not frequent in the SLI production.

A second possibility is that the rule *is* present but fails to apply at the spell-out. This option suggests an online production problem, attributable to difficulties with the morphological component of [tense] as a feature, leading the children to mere repetition of the non-past form in the pseudo verbs task. In other words, it seems that the difficulties these children face mainly involve morphophonological realisation of Greek past tense rather than the feature of tense as such.

Finally, the use of the non-past perfective equivalent of the pseudo verbs given could lead to a different explanation. The non-past perfective is a form that cannot stand on its own in Modern Greek, but is always accompanied by particles like *na* (to) or *tha* (will). It is, however, used 'independently' only in early stages of normal acquisition (Tsimpli 1996; Varlokosta et al. 1998). Its use by the SLI children in the pseudo-verbs task could be a sign of inability to apply all its morphosyntactic constraints at once.

## 5. Conclusion

To sum up, based on the results presented in this paper, [TNS] *does* seem to be underspecified for SLI children. Phonology plays a facilitatory role in the acquisition

process of uninterpretable features, as well as a compensatory role in attempting to mark those features at the spell-out. Furthermore, error analyses exhibited that SLI differs from normal acquisition not only quantitatively but qualitatively as well, suggesting distinct acquisition processes: SLI children seem to require longer – and possibly systematic – exposure to relevant input in order to achieve linguistic success similar to that of their peers.

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