

## A Synthesis of Research on the Effects of Typographical Visual Input Enhancement\*

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This synthesis aims to give a comprehensive survey of the research field of visual input enhancement. Analyses of twelve studies located through systematic and exhaustive searches revealed that this research domain is not yet fully grown, and the primary studies are truly diversified in terms of their methodological features. It is emphasized that a consistent way of reporting and including full descriptions of study designs and findings would be desirable in future studies. Effect size  $d$ -values were further calculated and averaged to examine the magnitude of effects of visual input enhancement. Learners who experienced visually enhanced texts improved considerably after the intervention ( $d=0.84$ ) and they seemed to have outperformed the others who experienced the same texts in a baseline version by a medium-size effect ( $d=0.43$ ). It was also found that learners' meaning comprehension was negatively affected by this pedagogic choice ( $d=-0.27$ ), suggesting a theoretical competition between form and meaning does exist.

### I. INTRODUCTION

No one would deny the vital role of input in successful second language acquisition (SLA). Since Krashen's (1981, 1982, 1985) inspiring work laid down stepping stones to subsequent extensive discussion on the role of input, a large consensus has arisen that L2 systems cannot be developed fully and successfully without adequate input. More emphasis should be added to the nature of input, for not all information about language contributes to success in L2 acquisition in a uniform fashion. Input that is indeed a necessary ingredient for language acquisition, as Wong recently put it, should be more than merely providing meaningless, or context-free explicit rules to L2 learners, for such information "does not represent the kind of primary linguistic data that learners need to construct an implicit

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linguistic system” (Wong, 2005, pp. 26-27). This remark reflects the prevalent distrust of the traditional grammar-oriented teaching approaches, favoring the meaning-oriented approaches where enhancing the learners’ fluent use of L2 for communicative purposes is regarded as the primary goal of any language classroom. However, many reports on the Anglophone students in French immersion programs who, even after a substantial period of study in meaning-first-programs, demonstrated deficiency in using accurate forms, triggered some suspicions about meaning-only approaches (Day & Shapson, 1991; Harley, 1993; Harley & Swain, 1985; Swain, 1985; Swain & Lapkin, 1989). Fortunately, the pendulum did not swing back to traditional ways of language learning through grammar. New understandings of grammar pedagogy instead have been offered by a number of instructed SLA researchers; for example, Long’s (1991; Long & Robinson, 1998) focus on form, VanPatten’s (1996; Lee & VanPatten, 2003) processing instruction, Wolfe-Quintero’s (2003) input analysis, and Sharwood Smith’s (1981, 1991, 1993) input enhancement, may be understood as such endeavors. The goal of these pedagogic choices is to provide learners with more comprehensible input in order to instruct grammatical items efficiently, while maintaining the meaning primacy in language classrooms.

Input enhancement refers to a pedagogic manipulation of the saliency of input with a view toward increasing the chance for encountered input to be efficiently rehearsed in a learners’ working memory and thus to be ultimately integrated into the existing L2 systems. There are many different ways to enhance the perceptual saliency of input. Instructors, for example, may try to provide learners with as many instances of input as possible within a meaningful context, either visually or orally (i.e., input flood; see Trahey & White, 1993; Williams & Evans, 1998), or they may process input in a way that learners obligatorily notice grammatical aspects to get to the accurate meaning of the input (i.e., processing instruction). The natures of these two contrasting options differ from each other in light of two dimensions of explicitness and elaboration (Sharwood Smith, 1991); in the former option (input flood) linguistic properties of the input are less elaborate and explicit, and thus, may be less obtrusive for learners’ meaning processing, while the latter option (processing instruction) involves high elaboration as well as explicit description of the target language form. Another option that comes in between these two input enhancement options is visual input enhancement (typographical input enhancement or textual enhancement), which refers to a technique of manipulating the appearance of targeted forms by employing different typographical methods such as underlining, **bold facing**, color coding, using different font sizes or **types**, *italicizing*, CAPITALIZATION, etc. The psycholinguistic rationale underpinning visual input enhancement is that learners may notice some intended linguistic aspects with more ease by being exposed to the visually enhanced parts of input, which may not be noticed and processed further without such visual aids.

According to Schmidt’s (2001) noticing hypothesis, noticing of the target (i.e., conscious attention to the target) is a necessary factor in successful L2 acquisition. That

is, input should be necessarily noticed by L2 learners in order for it to be acquired. Previous studies, however, have failed to arrive at a consensus on the extent to which visual input enhancement affects noticing and ensuing acquisition (or intake). Some primary researchers concluded that visual input enhancement might aid L2 learners' learning of targeted forms (e.g., Alanen, 1995; Doughty, 1991; Jourdenais, Ota, Stauffer, Boyson, & Doughty, 1995; Lee, in press; Leeman, Arteagoitia, Fridman, & Doughty, 1995; Shook, 1994; White, 1998). Many other researchers, however, failed to find such positive effects (Jourdenais, 1998; Izumi, 2002, 2003; Leow, 1997, 2001; Leow, Egi, Nuevo, & Tsai, 2003; Overstreet, 1998, 2002; Wong, 2003). These conflicting results make it difficult to confidently judge the effects of visual input enhancement on learning L2 grammar. The difficulty in part originated from idiosyncratic study features of each primary study. Of many such factors, for example, it should be noted that each study involved different characteristics of research participants in terms of their developmental readiness, proficiency levels, and study settings, and also different characteristics of research design in terms of the moderating variables, typographical cues, nature of the targeted forms, assessment measures, intensity of the exposure to the target, and so on.

The primary purpose of this study, therefore, is to take a bird's eye view of the visual input enhancement research domain that has shown inconsistent findings, by adopting the methodology of research synthesis (see Norris and Ortega, 2006, for different types of research review, such as the narrative review, authoritative tour, bibliographical review, vote-counting review, historiographical review, integrative review, and critical review). In addition, by adopting a systematic quantitative meta-analysis, this study aims to address the effects of visual input enhancement in light of its significant impact on L2 grammar learning. This meta-analytic research synthesis thus enables readers to critically review the visual input enhancement research domain, focusing not only on the idiosyncratic features of primary empirical studies, but also on the quantified magnitude of its effects, which might have been obscured in most of the primary studies to date. The following research questions guided the present study:

- (1) What are the specific features of interest that differ in each study design?
- (2) What is the magnitude of effects of visual input enhancement on learning of L2 form?

## II. METHOD

### 1. Literature Search

Research synthetists such as Rosenthal (1994) have argued for the value of including not only published studies, but also so-called "fugitive literature," unpublished studies

such as papers in conference proceedings, unpublished manuscripts, in-house working papers, and dissertations. It is warned that the risk of publication bias would limit the generalizability of any research syntheses, if fugitive literature, which could contribute to the completeness of such an endeavor, were ignored (see Norris & Ortega, 2000, for more discussion on this issue). Nevertheless, in the current study, it was decided to consult only published studies, based on several reasons. First, existing narrative reviews of the visual input enhancement domain typically have adopted a vote-counting manner of review of mostly, if not exclusively, published research. Therefore, a research synthesis focused on the same band of research was expected to enable readers to compare findings and discussions of previous reviews with those of the present study. Second, logistical problems are inherent in retrieving all the eligible unpublished studies. Extending the search to the entire body of fugitive literature would involve a laborious, and sometimes unpromising, process of contacting individual researchers for their works that could be accessed neither by the Internet nor by manual library search. The hard-to-access characteristics of these studies would make the present synthesis less likely to be replicable. It should therefore be noted that some variables related to the nature of the study pool to be synthesized and meta-analyzed might limit the implications of findings reported here.

With an aim of tracing all relevant SLA studies, a principled and exhaustive search with electronic databases for empirical studies of the effects of visual input enhancement on grammar learning was undertaken. Databases searched are Educational Resources Information Center (ERIC), Linguistic and Language Behavior Abstracts, PsychInfo, and PsycARTICLES. Combinations of the following terms were used in the search for abstracts in the databases: (1) OR search terms, such as ‘input enhancement,’ ‘enhanc\*,’ ‘typographical,’ ‘textual,’ ‘focus on form,’ ‘implicit,’ ‘unobtrusive,’ ‘incidental,’ ‘attention,’ ‘attend,’ and ‘notic\*’ and (2) AND search terms, such as ‘reading,’ ‘grammar,’ and ‘linguistic.’ A further step for the exhaustiveness of the literature search was the manual scanning of the tables of contents of five journals identified as having published at least one relevant article. The journals checked were *Applied Language Learning*, *Hispania*, *Language Learning*, *Spanish Applied Linguistics*, and *Studies in Second Language Acquisition*. In these five journals, issues from 1981 up to the time the meta-analysis was conducted, February 2006, were searched. The starting year 1981 was chosen because the seminal discussion of Sharwood Smith (1981) was published that year.<sup>1</sup> Finally, the reference section of Doughty and Williams (1998), which is acknowledged as an important work in the focus on form research,<sup>2</sup> was crosschecked, together with the reference lists and footnotes of each retrieved study. This laborious process yielded a total of 12 studies that were considered eligible for the present research

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<sup>1</sup> Sharwood Smith (1981) used “consciousness raising,” which is his original term for “input enhancement.”

<sup>2</sup> Visual input enhancement is commonly regarded as an implicit focus on form technique.

synthesis.

## 2. Inclusion and Exclusion Criteria

The primary studies retrieved for the current research synthesis have the following shared features:

- (1) Studies included are experimental or quasi-experimental in design having visual input enhancement as one of the independent variables. First language studies were excluded from the current synthesis (e.g., Lorch, Lorch & Klusewitz, 1995).
- (2) The studies examined the effect of visual input enhancement on learning of grammatical items targeted by study design through reading tasks and the effect was investigated by posttest measure(s). Visual input enhancement studies that examined the acquisition of vocabulary were therefore excluded (e.g., Youngkyu Kim, 2004).
- (3) The studies were published in English. Thus, studies written in other than English were excluded (e.g., Simard, 2001, 2002).
- (4) The studies were published in refereed journals between the years of 1981-2006. Fugitive literature was excluded (e.g., Izumi, 2003; Jourdenais, 1998; Overstreet, 2002). Again, this was mainly to avoid a biased sampling of fugitive literature.
- (5) Studies included involved learners with natural reading tasks. Studies with sentence-level reading tasks were excluded (e.g., Robinson, 1997; Williams, 1999).
- (6) Shook's (1994, 1999) two studies report on the same study and sample. Only his 1994 study was included in the current study.

## 3. Coding Procedures

Both substantive and methodological features of the 12 studies were coded for the current research synthesis. An initial draft of a coding sheet was developed and revised based on piloting on several studies, which was to ensure that the final coding sheet could include all necessary information for further analysis. Table 1 summarizes the major coding categories.

The 12 studies were coded with the help of a doctoral student who is knowledgeable in the rationales and practices of research synthesis. The doctoral student and this researcher coded all the studies independently using the final version of the coding sheet. Reliability of coding between the two researchers was 92.9%. The differences in coding were resolved through iterative and intensive discussion until a 100% agreement rate was obtained.

**TABLE 1**  
**Major Coding Categories for the Current Research Synthesis**

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1. Basic information of the studies
    - 1) Author(s)
    - 2) Publication year
    - 3) Publication source (e.g., journal article, book chapter)
  
  2. Characteristics of participants
    - 1) Sample size
    - 2) First language
    - 3) Target language
    - 4) Proficiency level
    - 5) The way proficiency level was defined (e.g., impressionist judgment, institutional status, in-house assessment, standardized test)
    - 6) Length of L2 study
    - 7) Study setting (e.g., FL, SL)
  
  3. Methodological features
    - 1) Typographical cue(s)
    - 2) Target form(s)
      - i. Number of types, ii. Number of tokens
    - 3) Measure(s)-form processing (e.g., receptive vs. productive)
    - 4) Measure(s)-meaning processing (e.g., receptive vs. productive)
    - 5) Material(s)
      - i. Text type, ii. Text length (total number of words used for the treatment(s))
    - 6) Study procedures
      - i. Interval between the pretest and the first treatment
      - ii. Interval between the last treatment and the posttest
      - iii. Delayed posttest
    - 7) Intensity of the exposure to the target
      - i. Number of treatment session(s)
      - ii. Duration of the treatment(s)
      - iii. Total amount of treatment time
      - iv. Total amount of reading time
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### III. RESEARCH SYNTHESIS

The first visual input enhancement study was published in a refereed journal in 1991 (Doughty, 1991). Since then, 10 more studies have been published and one is under publication. This suggests that the domain of the visual input enhancement studies is still a young area of research. Despite its potential effects on L2 acquisition, the total number of 12 studies during the past 16 years also suggests that this research domain has been rarely spotlighted. Of the 12 studies, 9 were journal articles, whereas 3 appeared as book chapters.

Table 2 shows that the number of participants in each study was highly divergent, ranging from 10 to 256, with the mean and median number of participants being 76.6 and 66.5, respectively. Table 3 demonstrates further the characteristics of participants of each

study. Research participants of the 12 primary studies had mostly the same L1 background ( $n=10$ , 83%); the majority of participants were English native speakers ( $n=8$ , 67%). More studies were conducted in foreign language educational settings ( $n=9$ , 75%) than in second language settings ( $n=3$ , 25%). Although the length of L2 study may be a critical factor affecting the role of visual input enhancement, nearly a half of the primary studies ( $n=5$ , 42%) failed to report the exact information. Of the 6 studies that reported the L2 study length, half ( $n=3$ ) were involved with learners who had been learning the target language for less than two years. In one study (Alanen, 1995), since the target form was semi-artificial Finnish, it was reasonable for the researcher to assume that her participants did not have a prior knowledge of L2 (participants' L2 proficiency levels were also not assessed).

**TABLE 2**  
**Number of Participants of Primary Studies**

Study	<i>n</i>
Alanen (1995)	36
Doughty (1991)	20
Izumi (2002)	61
Jourdenais et al. (1995)	10
Lee (in press)	256
Leow (1997)	84
Leow (2001)	38
Leow et al. (2003)	72
Overstreet (1998)	50
Shook (1994)	125
White (1998)	86
Wong (2003)	81

It was worthy of note that all of the primary studies, except Alanen (1995), heavily relied on the institutional status of the participants to determine their L2 proficiency levels. That is, primary studies in this research domain tended to carry out the assessment of the target language proficiency of participants through their membership in a particular group, i.e., academic courses in this case (e.g., 2<sup>nd</sup> semester Spanish). This is contrasting with the reports of Thomas (2006; see also Thomas, 1993), who, based on a comparative analysis of empirical research published in four journals (*Applied Linguistics*, *Language Learning*, *Second Language Research*, and *Studies in Second Language Acquisition*) during two periods of 1988-1992 and 2000-2004, demonstrated that only 63 studies out of 157 study corpora (40.1%) and 70 studies out of 211 study corpora (33.2%) consulted institutional status, in each period of time, to assess the research participants' L2 proficiency levels.

**TABLE 3**  
**Characteristics of Participants of Primary Studies**

L1	<i>n</i>	Setting	<i>n</i>	Length of L2 study	<i>n</i>	Proficiency assessment	<i>n</i>
English	8	Foreign Language	9	Less than One year	2	Impressionist judgment	0
Korean	1	Second Language	3	One ~ two years	1	Institutional status	11
French	1			Two ~ three years	0	In-house assessment	0
Diverse L1 background	2			More than three years	3	Standardized test	0
				Not reported	5	n.a.	1
				n.a.	1		

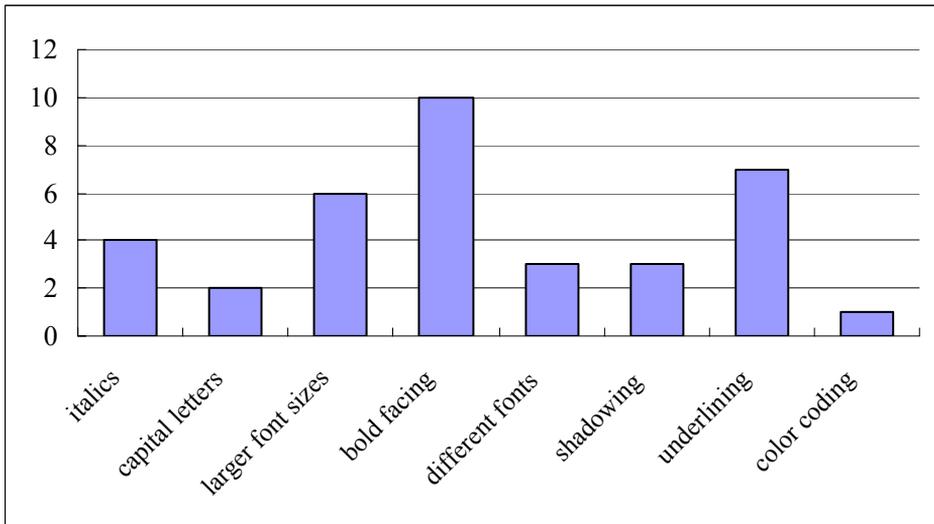
Table 4 summarizes descriptive statistics of the characteristics of L2 targets of the 12 primary studies. One half of the studies had Spanish as their target language ( $n=6$ , 50%), while four studies (33%) targeted English as L2. Different studies employed different length of reading texts, ranging from 185 words (Alanen, 1995) to 1508 words (Wong, 2003). Unfortunately, one-quarter of the studies ( $n=3$ , 25%) failed to report the exact number of words used for their studies. Seven out of 12 studies had one target type (58%), while the rest of the studies had two targets ( $n=5$ ). A half of the studies had less than 30 instances of the target form(s) ( $n=6$ , 50%). Again, two studies failed to report the exact number of tokens of the target (17%), which may be indispensable to understanding the contradictory results of individual studies.

**TABLE 4**  
**Characteristics of L2 Targets**

Target language	<i>n</i>	Text length	<i>n</i>	Number of target types	<i>n</i>	Number of tokens	<i>n</i>
Spanish FL	6	0 ~ 300	4	1	7	0 ~ 10	0
English	4	301 ~ 600	2	2	5	11 ~ 20	4
		(ESL: 3 / EFL: 1)					
French FL	1	601 ~ 900	2			21 ~ 30	2
Semi-artificial Finnish FL	1	901 ~ 1200	1			31 ~ 40	1
		1201 ~	1			41 ~ 50	2
		Not reported	3			50 ~	1
						Not reported	2

One study (Alanen, 1995) employed only one typographical cue (i.e., italicization), while the other studies adopted more than two, up to four cues at the same time. The following Figure 1 depicts that the most frequently used cue was a boldfacing method ( $n=10$ , 28%). Underlining and using larger font sizes are the second and third most frequently used cues (19% and 17%).

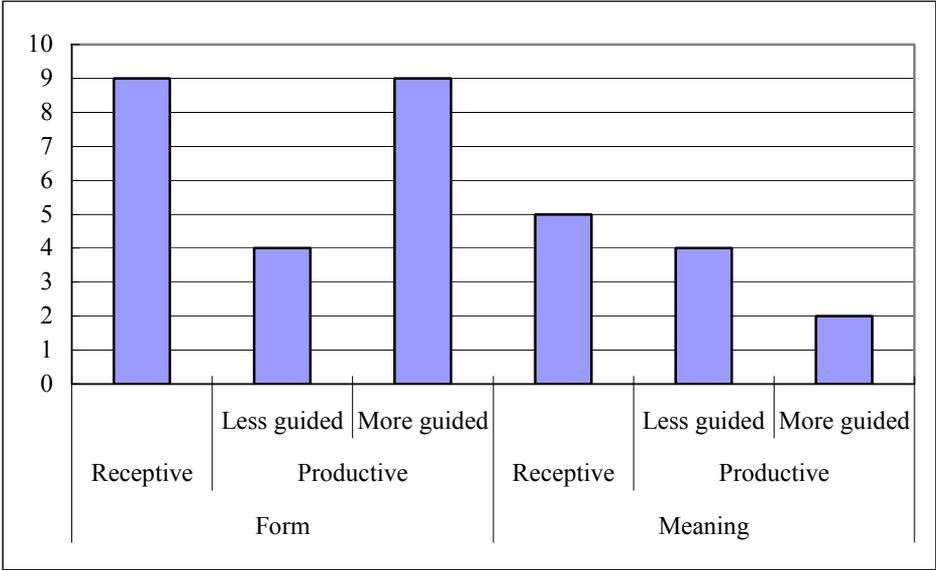
**FIGURE 1**  
Number of Typographical Cues Used in The Primary Studies



One half of the primary studies ( $n=6$ ) used only one measure of form processing (50%), while in the Izumi's (2002) study four different measures were used concurrently. Figure 2 shows that 41% of measures ( $n=9$ ) used to assess the degree of learners' form processing (i.e., form intake or form acquisition) were to tap the receptive side of language use (e.g., grammaticality judgment task, form recognition task, multiple-choice test). It was found that a majority of the measures ( $n=13$ , 59%) addressed the participants' productive use of the targeted form. Of them, 69% of the measures ( $n=9$ ) were in a more guided format (e.g., guided format of sentence completion task, sentence completion task, fill-in-the-blank production task, correction task), while the rest of the measures ( $n=4$ ) were provided in a less guided format (e.g., writing task, written narration task, oral picture description task).

Eight studies employed one or more than one measure to assess the degree of learners' comprehension of reading texts (67%). Of 11 measures from the 8 studies, 5 were categorized into receptive measures (e.g., multiple-choice comprehension questions) (45%). The four instances under less guided measures of production were all L1 free recall tasks, and the two instances of more guided measures of production were short-answer type comprehension tasks.

**FIGURE 2**  
**Measure of Form and Meaning Processing**



Following the criteria in Table 5, procedures of each primary study were coded in more detail. Table 6 shows numerical values assigned to individual studies for each coding category. Half of the studies had pretests more than five days before the first treatment session ( $n=6$ , 50%) and the majority of the studies ( $n=10$ , 83%) had posttests on the same day with the last treatment session. Interestingly, only two studies (Leow, 2001; White, 1998) administered delayed posttests, suggesting that it might be hard to tell the extent to which reading visually enhanced parts for learning form led to durable effects on the learners' L2 systems. Variables from D through G reflect the intensity of the exposure to the targeted form. The majority of the studies featured only one treatment session ( $n=5$ , 42%) in one day ( $n=5$ , 42%), and the treatment session(s) lasted less than two hours ( $n=6$ , 50%). Although 42% of the studies ( $n=5$ ) did not report the total amount of reading time (i.e., amount of exposure to the targets), it could be ascertained that in the majority of studies (6 out of 7 studies that reported reading time) students were exposed to the target form for less than 60 minutes in total. This suggests that the study designs with visual input enhancement have to date been fairly short-term in nature. It is thus difficult to assert that the observed effects reported by individual researchers, albeit both statistically significant and large, entailed changes of acquired L2 systems of participants.

**TABLE 5**  
**Characteristics of Study Procedures—Variables and Codes**

Variables	Codes
A. Interval between the pretest and the first treatment	1- both on the same day 2- one to two days 3- three to four days 4- five days or more
B. Interval between the last treatment and the posttest	1- both on the same day 2- one to two days 3- three to four days 4- five days or more
C. Delayed posttest	1- yes; 2- no
Intensity of the exposure to the L2 form of each study	
D. Number of treatment session(s)	1- one 2- two 3- three 4- four or more
E. Duration of the treatment(s)	1- one day 2- two days to less than one week 3- one week to less than two weeks 4- two weeks to less than three weeks 5- three weeks or more
F. Total amount of treatment time	1- less than 30 minutes 2- 30 to less than 60 minutes 3- one hour to less than two hours 4- two hours to less than three hours 5- three hours or more
G. Total amount of reading time	1- less than 30 minutes 2- 30 to less than 60 minutes 3- one hour to less than two hours 4- two hours to less than three hours 5- three hours or more

**TABLE 6**  
**Characteristics of Study Procedures—Coding Outcomes**

Study	A	B	C	D	E	F	G
Alanen (1995)	0	1	2	2	3	0	2
Doughty (1991)	0	1	2	4	3	5	0
Izumi (2002)	4	3	2	4	4	5	0
Jourdenais et al. (1995)	0	1	2	1	1	1	1
Lee (in press)	0	1	2	3	3	3	3
Leow (1997)	4	1	2	1	1	0	0
Leow (2001)	4	1	1	1	1	1	1
Leow et al. (2003)	4	1	2	1	1	0	0
Overstreet (1998)	4	1	2	1	1	1	1
Shook (1994)	2	1	2	2	2	3	1
White (1998)	2	2	1	4	4	5	0
Wong (2003)	4	1	2	3	2	3	2

*Note.* Every 0 value means that the necessary information was not provided in the primary study.

## IV. QUANTITATIVE META-ANALYSIS

Effect sizes of Cohen's  $d$  were calculated to examine the magnitude of effects of each primary study. Of the 12-study pool, 8 studies provided sufficient data for calculating  $d$ -values for group contrasts. Although group contrasts should be made with one experimental group versus one control group (Norris & Ortega, 2000), not a single study utilized a true control group; therefore, the  $d$ -values were calculated from contrasting an experimental group (i.e., enhanced text group) and a comparison group (i.e., baseline text group). Thus, it should be noted that the  $d$ -values from the group contrasts suggest the relative effects of visual input enhancement over input flood (i.e., simple provision of many instances of input without enhancement). Effect sizes of pre-post contrasts were also calculated to examine the magnitude of difference in the performance of students with enhanced conditions before and after the treatment(s). Half of the studies ( $n=6$ ) contributed to the calculation of the pre-to-post  $d$  effect sizes (50%). It is often the case that one single study produces more than one effect size, contingent on the number of dependent as well as independent variables. Following Light and Pillemer's (1984; see also Lipsey & Wilson, 2001) suggestion, effect sizes derived from one study were combined to have one  $d$ -value for each primary study. This was to ensure that each study contributed to the calculation of averaged effect sizes with equal weight. In addition, in order to test the trustworthiness of the observed combined effect sizes, 95% confidence intervals were also calculated.

As shown in Table 7, the average magnitude of the effects of visual input enhancement was  $d=0.43$ , meaning that groups given visually enhanced texts outperformed groups given baseline texts by 0.43 standard deviation units. If following Cohen's (1988) rules of thumb for interpreting the  $d$ -values (i.e., interpreting  $d$ -values around 0.20 as small, around 0.50 as medium, and more than 0.80 as large effects), this averaged experimental-versus-comparison effect size is medium sized. When compared with the findings by Norris and Ortega (2000), who reported  $d=0.96$  for the averaged effects of L2 instruction studies, the technique of visual input enhancement does not seem very effective, which is further evidenced by the lower tail of the confidence interval that is below zero. In addition, the wide range of the 95% confidence interval (-0.07~0.93), which was largely due to the small number of study samples ( $n=8$ ), suggests that the observed magnitude of effect sizes should be interpreted with great caution.

Table 7 also demonstrates that grammatical knowledge of the students provided with visually enhanced texts improved from pretest to posttest by 0.84 standard deviation units. The confidence interval shows that the magnitude of effects ranged from medium to large sized (0.20~1.48). In spite of the small number of observations ( $n=6$ ) and thus the wide range of the confidence interval, it is reasonable to say that visual input enhancement techniques are effective tools to improve learners' performance.

**TABLE 7**  
**Summary of Effect Size  $d$ -values**

Study	Effect size ( $d$ )		
	Form processing		Meaning processing
	Group contrast	Pre-post contrast	Group contrast
Alanen (1995)	.08	n.t.	n.t.
Doughty (1991)	.46	1.85	n.r.
Izumi (2002)	.02	.67	n.t.
Jourdenais et al. (1995)	1.61	n.t.	n.t.
Lee (in press)	1.05	1.11	-.73
Leow (1997)	-.06	.86	.28
Leow (2001)	n.r.	n.r.	n.r.
Leow et al. (2003)	n.r.	n.r.	n.r.
Overstreet (1998)	.07	.07	-.94
Shook (1994)	n.r.	n.r.	-.30 <sup>a</sup>
White (1998)	n.r.	n.r.	n.t.
Wong (2003)	.23	.45	.36
Average effect size	.43	.84	-.27
95% CI upper	.93	1.48	.45
95% CI lower	-.07	.20	-.99
$n$	8	6	5
$SD$	.60	.61	.58

Note. <sup>a</sup>This value was calculated from Shook (1999).

n.r.: The effect size was not retrievable, for the study did not provide sufficient information for the effect size calculation.

n.t.: Not tested

The current research investigated further the effects of visual input enhancement on learners' meaning comprehension. It was quite worthy of note that the magnitude of effects on meaning processing was, although small sized, negative in its direction ( $d=-.27$ ). This part of the results might be accounted for by the competition between form and meaning (VanPatten, 1996; Skehan & Foster, 2001). However, the wide confidence interval (-.99-.45) suggests that the small number of comparisons ( $n=5$ ) may lead to a large number of errors, and thus, great care should be employed in interpreting this part of the results.

## V. CONCLUSION AND FUTURE RESEARCH

The present study aimed to make an overview of the visual input enhancement research domain by adopting a methodology of research synthesis and to investigate the magnitude of effects of such pedagogic intervention by calculating and averaging the effect size  $d$ -values. The findings of this study, however, should be interpreted with caution, largely due

to the small number of studies included. It should thus be emphasized that not only the findings reported so far but also the discussion below is not to give a final, definitive answer to the questions related to the effects of visual input enhancement. Moreover, many of the primary studies did not provide sufficient data for the present synthesis to have clearer answers. As Norris and Ortega (2006) put it, “it is, quite simply, impossible to take full advantage of research synthesis, when the primary studies that define a domain provide impoverished accounts of their research methods and study findings” (p. 61). More studies as well as accurate provision of information indeed would have enabled us to have clearer, more insightful pictures of this research domain. It would have also been of great interest to subcategorize each primary study to examine the relative effects according to different moderating variables. For example, the relative effects of the length of reading texts would be one intriguing question to be answered, which, due to the small number of the study pool, was not possible in the current study.

Visual input enhancement studies, which have an aim of manipulating the perceptual saliency of input, are not fully-grown areas of research. It has been about one and a half decade since the first study was published in 1991 (Doughty, 1991). Although the 12 studies included in the present research have really diverged in terms of their study design (i.e., number of research participants, L1 backgrounds, L2 targets, educational settings, typographical cues used, measures of form and meaning processing, etc.), some general tendencies were observed. Of many of them, it was verified that this research domain has been quite short-term in nature, 42% of the studies investigated having a single treatment session ( $n=5$ ). This tendency was further corroborated by the findings that the majority of the studies involved only one immediate posttest on the same day with the last treatment ( $n=10$ , 83%), the treatment session(s) in general lasted less than two hours ( $n=6$ , 50%), and the actual exposure to the target was less than one hour in total ( $n=6$ , 50%). Given that language learning is a longitudinal process with many intervening factors, longitudinal investigations should be invited to understand in depth the impact of visual input enhancement on learners’ L2 development.

Notably, most of the primary studies were biased in assessing the participants’ L2 proficiency levels, which is contrasted with the findings by Thomas (1993, 2006). As for the SLA research domain in general, three other assessment measures (i.e., impressionistic judgment, in-house assessment, and standardized test) have also been used fairly often by primary researchers. However, researchers in the current research domain tended to rely exclusively on the participants’ academic status in their institutions. Most of the primary researchers with visual input enhancement seemed to prefer participants having minimal knowledge of the target form, or even no prior knowledge at all (Alanen, 1995). Jourdenais (1998) noted, however, “the implicit nature of the enhancement ... was more likely to be beneficial to learners who already had some initial awareness of the forms and their use” (p. 92). Thus, although learner proficiency level may be one decisive factor in determining the actual impact of visual input enhancement, it has not been resolved yet how much prior

knowledge learners should have to witness the desired effects of the technique. More future studies are needed to address the moderating role of learner proficiency; in doing so, primary researchers should try to have more rationalized and diversified L2 proficiency measures.

Overall, students who experienced visually enhanced texts performed better than those who experienced the same texts in a baseline version ( $d=.43$ ). The observed effects, however, were not trustworthy, for the lower limit of the confidence interval includes zero. Again, more studies should be invited in order to have a clearer understanding of the effects of enhancement. Meanwhile, it should be noted that not a single study used a true control group to be compared with the students in the enhancement conditions. Thus, the medium-sized effects of  $d=.43$  should be understood as relative effects of visual input enhancement over another type of input enhancement, i.e., input flood. It is plausible to reason that input flood, as another implicit pedagogic intervention, might also have affected learners' L2 knowledge systems. This can be a partial explanation for the medium-sized magnitude of effects, which is a comparatively smaller value than what Norris and Ortega (2000) reported (i.e., the mean effect size of  $d=.96$  for the effectiveness of L2 instruction). More future studies with true control groups are needed to measure the accurate effects of visual input enhancement. Meanwhile, it was also insightful to examine the pre-to-posttest effect sizes in understanding the effects of visual input enhancement from a different angle. That is, a large mean effect size ( $d=.84$ ) obtained from pretest-versus-posttest contrasts suggests that enhancement conditions affected the students' knowledge systems in a significant way. Although further studies with more precise design should be added to gain a deeper understanding, this indicates that visual input enhancement could be a technique with high potential in changing learners' developing L2 systems.

The negative value of mean effect size for the impact of visual input enhancement on meaning comprehension ( $d=-.27$ ) suggests that there might be a competition between learners' form processing and meaning processing. This tension between form and meaning has been reported by a number of empirical studies to date (VanPatten, 1990; Bransdorfer, 1991; Greenslade, Bouden, & Sanz, 1999; Lee, in press; Wong, 2001). VanPatten's (1996, 2002) theory of input processing, in particular, predicts that human attentional resources are limited resources, and thus, beginning-level learners tended to direct their attention first to meaning rather than to form. Future studies that deliberately test the relationship between form and meaning by design are expected to be able to shed more light on this theoretical issue.

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