

Salient meanings: The whens and wheres¹

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1. Introduction

The bulk of research into lexical ambiguity resolution has made it clear that both lexical (e.g., degree of meaning salience) and contextual information influence the processing of lexically ambiguous words (e.g., Giora, 2003; Duffy, Morris and Rayner, 1988; Peleg, Giora and Fein, 2001, 2004, 2008; Titone, 1998). Whereas one's previous experience with one of the meanings of an ambiguous word (e.g., the monetary, institutional meaning of *bank*) may render that meaning accessible, the immediate context may bias our interpretation towards any of the meanings of the word. For example when we encounter *Bill stole from ...*, we expect a place one can steal from, and when we encounter *Bill fished from ...*, we expect a place one can fish from. However, despite decades of intensive research, the time course and the relative weight of these effects are still highly debated (for an overview, see Giora 2003; Simpson, 1984; Simpson, 1994; Small, Cottrell, and Tanenhaus, 1988).

On the one hand, interactive, direct-access models suggest that a strong biasing context can selectively activate the contextually appropriate meaning of an ambiguous word initially, regardless of degree of meaning salience (e.g., Kellas, Paul, Martin and Simpson 1991; Martin, Vu, Kellas, and Metcalf, 1999; Vu, Kellas, Metcalf and Herman 2000; Vu, Kellas, and Paul, 1998). On the other hand, modular, two-stage models argue that initially all the meanings of an ambiguous word are activated, regardless of contextual bias. At a later, post-lexical access stage, however, contextually inappropriate meanings are discarded (e.g., Onifer and Swinney, 1981; Swinney, 1979).

Between these two extremes, The Graded Salience Hypothesis (Giora, 1997, 1999, 2003; Peleg et al., 2001, 2004, 2008) proposes that comprehension involves two distinct mechanisms – lexical and contextual – that run parallel without interacting initially (as proposed by Fodor, 1983). The mechanism responsible for lexical access is sensitive only to lexical

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information. It is modular, exhaustive, and ordered so that salient meanings – coded meanings foremost on our mind due to familiarity, conventionality, frequency, or prototypicality – are activated faster than less-salient ones, coded but lower on these dimensions. Being stimulus driven, this bottom-up machinery is encapsulated and does not feed on information outside the module. Consequently, it does not conform to contextual information. It therefore allows the processor to also activate seeming contextually incompatible information.

According to The Graded Salience Hypothesis, while lexical access is impervious to context effects, contextual information can independently and immediately affect comprehension via inferential or predictive processes which do not penetrate lexical processes but run parallel. Indeed, under certain conditions, this expectation-driven mechanism may predict the contextually appropriate meaning of an upcoming ambiguous word very early on, even before the relevant stimulus is encountered. Thus, according to this parallel processing view, contextual processes may be faster than, coincidental with, or slower than lexical processes. They cannot, however, inhibit salient meanings activated automatically by the lexical mechanism responding to the relevant stimulus.

The Graded Salience Hypothesis thus makes two intriguing predictions with regard to the effects of salience and context on lexical ambiguity resolution. First, it predicts that contextually appropriate meanings may be activated immediately via predictive processes on the basis of information provided prior to the ambiguous word in question. Second, it predicts that when ambiguous words are encountered, salient meanings will always be activated, even when prior context strongly favors the less-salient meaning. In the present chapter, we summarize empirical evidence, obtained in our lab, which provide support for these predictions (Peleg et al., 2001, 2004; Peleg and Eviatar 2008, 2009).

2. Manipulating the effect of the contextual mechanism

As mentioned above, the extent to which contextual information affects ambiguity resolution has been studied for a few decades. Whether a strongly biasing context can determine lexical access so that contextually appropriate meanings are activated exclusively has been an enduring question. Although a number of experimental paradigms have been used to investigate the temporal aspects of context effects, the most compelling types of experiments are those that tap on-line processes closely. Most of these are priming experiments in which an ambiguous prime is presented in a neutral and a biasing context, and is followed by a probe which is related or unrelated to one of its meanings. Subjects are required to make a lexical decision or provide a naming response to the probe. Magnitude of priming

is calculated by subtracting reaction times to related probes from reaction times to unrelated probes. In particular, priming experiments with short prime-probe intervals seem to provide the best temporal window for activation process, given that they allow tapping early processes occurring while multiple meanings may still be active.

For the last two decades or so, Kellas and colleagues have advanced a context-sensitive account of lexical access, according to which if context is sufficiently constraining and supportive of the less-salient meaning, that meaning will be activated exclusively, with no recourse to salient meanings (e.g., Kellas et al., 1991; Vu et al., 1998, 2000). According to this view, contexts can be made strongly constraining by manipulating the level of specificity of the lexical constituents (e.g., the subject noun and/or the verb). For example, in one of their studies (Vu et al., 1998), three sentences were created, for each target homograph (*arms*) – one biasing it toward the salient meaning (*The physician massaged his arms*), another biasing it toward the less-salient meaning (*The marksman discharged his arms*), and another nonbiasing sentence compatible with both meanings (*The man cleaned his arms*). Probe words related or unrelated to one of the meanings of the ambiguous targets (“hands”/“weapons”) were presented immediately following the ambiguous prime (*arms*). Results obtained from a naming task showed priming for both salient and less-salient meanings following nonbiasing contexts, but exclusive priming of the contextually appropriate meaning (“hands”/“weapons”) following biasing contexts, regardless of degree of salience. On the basis of these results, Kellas and colleagues concluded that context can constrain lexical access.

It is quite possible, however, that these results may have an alternative explanation and need not be attributed to early context effects interacting with lexical processes. Rather, they could be induced by a mechanism that does not involve interaction with lexical access. According to The Graded Salience Hypothesis, it is the central expectation mechanism operating alongside lexical processes that is responsible for the results obtained by Vu et al. (1998). Specifically, because the homograph was placed at the end of a strong sentential context, that context made available the intended meaning even before the lexical stimulus was encountered and accessed.

Indeed, in Peleg et al. (2001) we used the same materials used by Vu et al. (1998) (e.g., *The marksman discharged his arms*). However, in our study, probes related to the salient (“hands”) or the less-salient (“weapons”) meaning of the sentence-final homographs (*arms*) were presented immediately **before** the homograph was displayed. Results indicated that the context preceding the homograph (e.g., *The marksman discharged his...*) primed the contextually compatible probe (“weapons”) even before the homograph was encountered. Replication of Vu et al.'s (1998) findings

under conditions that disallow lexical access shows that contextual information can be strong enough to predict the appropriate meaning on its own accord, with no recourse to lexical processes.

This notwithstanding, it can still be argued that the predictive processes assumed by The Graded Salience Hypothesis do not just run parallel but also eventually penetrate lexical access when allowed. In order to reduce the possibility that strong contexts such as used by Kellas and colleagues can be constraining rather than merely predictive, a second study was designed (Peleg et al., 2004, 2008). In that study, we aimed to manipulate degree of predictability without changing “constraining” information.

Review of the literature indicates that often a selective access of the less-salient (but contextually compatible) meaning was obtained when an ambiguous word was embedded in sentence final position (e.g. Van Petten and Kutas 1987; Vu et al., 1998, 2000). In contrast, when the critical ambiguous word was introduced in sentence or in clause initial position, salient but incompatible meanings immediately surfaced despite prior contextual information to the contrary (e.g. Duffy et al., 1988; Gibbs 1990). We therefore assumed that the expectation-driven mechanism would operate most efficiently toward the end rather than at the beginning of sentences or clauses.

To test this hypothesis, we used the materials used by Vu et al. (2000), but manipulated the sentential position of the critical homograph (Peleg et al., 2004, 2008). In Vu et al. (2000), two-sentence passages were composed, which were either biased toward the salient or less-salient meaning of their final homograph (e.g., *The gardener dug a hole. He inserted the **bulb***). Probes related to the salient (“light”) or less-salient (“flowers”) meaning of the final homographs (*bulb*) were presented immediately after the ambiguous prime. Vu et al.’s (2000) results indicated that under these conditions, only the contextually appropriate probe was immediately primed.

To provide for an alternative explanation based on The Graded Salience Hypothesis, we attempted to replicate Vu et al.’s (2000) results with the same homographs presented in similarly constraining contexts, but introduced in sentence initial position. Since there is no controversy regarding the (apparently) selective activation of salient, contextually appropriate meanings, only passages biased toward the less-salient meaning were used. To manipulate sentence (initial/final) position, the second sentence of Vu et al.’s (2000) (e.g., *He inserted the **bulb***) was subjected to passivization (*The gardener dug a hole. The **bulb** was inserted*). Participants were asked to silently read the passages and to perform a lexical decision task on probes displayed immediately after homograph presentation. The

probes were related to the salient (“light”) or the less-salient (“flower”) meaning of the ambiguous word (*bulb*), or unrelated to it.

According to The Graded Salience Hypothesis, the same lexical constraints, used by Vu et al. (2000) to bias their contexts toward the less-salient meaning of the critical ambiguous word, will neither inhibit nor precede activation of salient but inappropriate meanings of ambiguous words presented at the beginning of sentences. Indeed, consistent with this prediction, our results demonstrated that when the ambiguous stimulus was placed in initial position, probes related to the contextually compatible meaning were not exclusively primed as would be predicted by context sensitive/selective access models. Instead, both the less-salient compatible meaning and the salient but incompatible meaning were activated simultaneously (Peleg et al., 2004, 2008).

These results support our view that language comprehension involves independent mechanisms that run parallel. Since sentence position (initial/final) affects the speed of the top-down, contextual mechanism, manipulating it helps tease apart their respective independent effects. The expectation-driven mechanism is faster toward the end than at the beginning of sentences, where different types of constraints (pragmatic, semantic, and syntactic) enable it to better predict an upcoming concept and thus activate compatible meanings even before the relevant lexical stimulus is encountered (as shown by Peleg et al., 2001).

However, the findings obtained in sentence initial position cannot be accounted for by a context-sensitive, interactive model, which predicts that, given enough constraints, only the compatible meaning of an ambiguous word will be activated. In our study, subjects read the first sentence (*The gardener dug a hole*) and the homograph (*The bulb...*) before the probe (“light”/“flower”) was displayed, thus adding more constraints to those found in Vu et al. (1998). According to the context-sensitive model, the entire preceding sentence plus the ambiguous word (e.g., *The gardener dug a hole. The bulb...*) should have been more than enough to prime the contextually appropriate meaning (“flower”) exclusively. Nevertheless, our findings demonstrate that, in initial position, the less-salient compatible meaning was not accessed exclusively. Instead, incompatible but salient meaning (“light”) was primed as well (Peleg et al., 2004, 2008).

In sum, using Vu et al.’s (1998, 2000) materials, our studies show that the sentential position of the homograph (initial vs final) is crucial for the operation of the global, predictive mechanism, whose effects, accumulated in prior discourse, mask lexical effects in final, but not in initial position. Our more recent experiments (see below) further show that even in a sentential position that favors contextual effects (i.e., sentence final position), lexical access is not affected by biasing contextual information:

Salient meanings are activated upon encounter of the lexical stimulus, regardless of contextual information to the contrary.

3. Manipulating the effects of the lexical mechanism

In our more recent studies we investigated the hemispheres' involvement in ambiguity resolution. A widespread experimental method for assessing hemispheric contributions to language processing, in general, and ambiguity resolution, in particular, is the divided visual-field (DVF) priming paradigm. This technique takes advantage of the fact that stimuli presented in the left side of the visual field are initially processed exclusively by the right hemisphere and vice versa. Although information presented in this manner can be later transmitted to both hemispheres, the interpretation of DVF paradigms rests on the assumption that responses to stimuli presented briefly to one visual field reflect mainly the processing of that stimulus by the contralateral hemisphere. Thus, responses to targets in the right visual field (RVF) reflect left hemisphere (LH) processes and responses to targets in the left visual field (LVF) reflect processes in the right hemisphere (RH) (for theoretical and electrophysiological support for this assumption, see Banich, 2003; Berardi and Fiorentini, 1997; Coulson, Federmeier, Van Petten, and Kutas, 2005).

Research using the DVF technique has led to the conclusion that the hemispheres differ in the way they deal with lexical and contextual factors during ambiguity resolution (e.g., Burgess and Simpson, 1988; Faust and Chiarello 1998; Faust and Gernsbacher, 1996). According to the received view, when readers encounter an ambiguous word, multiple meanings are available immediately in the LH, but shortly afterwards, one meaning is selected on the basis of relative salience and/or contextual information. The RH, on the other hand, activates all meanings more slowly and maintains these meanings irrespective of context or salience. On the basis of such findings, current hemispheric models have converged on the proposal that processes related to meaning activation and selection are faster in the LH than in the RH (for a review, see Peleg and Eviatar 2008).

One possible explanation for this LH advantage relates to the different ways in which meanings are accessed in the two hemispheres. Generally speaking, there are two ways to access meaning from print: The visual route (from orthography directly to meaning), and the phonological route (from orthography to phonology and then to meaning). The visual route is believed to be available in both hemispheres. The phonological route, however, is available only to the left hemisphere (e.g., Halderman and Chiarello, 2005; Lavidor and Ellis, 2003; Marsolek, Kosslyn and Squire, 1992; Marsolek, Schacter and Nicholas, 1996; Zaidel 1982; Zaidel and

Peters 1981). In principle, two are better than one; since in the LH words can be “read” both visually and phonologically, it is usually faster.

Because an orthographic representation of an English word (as well as other Latin orthographies) is usually associated with one phonological representation, most studies of lexical ambiguity used homophonic homographs – a single orthographic and phonological representation associated with multiple meanings (e.g., *bank*). Unlike English, for example, the unvoiced Hebrew offers an opportunity to examine other types of homographs as well. In Hebrew, letters represent mostly consonants; vowels can optionally be superimposed on consonants as diacritical marks. Since the vowel marks are usually omitted, Hebrew readers frequently encounter not only homophonic homographs (such as *bank*), but also heterophonic homographs – a single orthographic representation associated with multiple phonological codes, each associated with a distinct meaning (e.g., *tear*).

Both types of homographs have one orthographic representation associated with multiple meanings. They differ, however, in terms of the relationship between orthography and phonology. When orthographic and phonological representations are unambiguously related (as in the case of homophonic homographs such as *bank*), lexical access should be faster in the LH than in the RH, because all the related meanings are immediately boosted by both orthographic and phonological sources of information. However, when a single orthographic representation is associated with multiple phonological representations (as in the case of heterophonic homographs such as *tear*), meanings may be activated more slowly in LH than in the RH, due to the competition between the different phonological alternatives.

To test these predictions we devised a number of studies (Peleg and Eviatar 2008, 2009), in which a divided visual field technique was employed in conjunction with the lexical-priming paradigm. Participants silently read sentences that ended in either a homophonic or a heterophonic homograph and performed a lexical decision task on probes presented laterally (either to the left visual field, i.e., the RH or to the right visual field, i.e., the LH) 150 ms or 250 ms after onset of the final homograph (SOA). Sentential contexts were either biased towards the less-salient meaning of the final homograph or unbiased (see Table 1). Probes were either related to one of the meanings of the ambiguous prime, or unrelated. The two types of homographs were equated in terms of length, degree of salience, degree of polarization, degree of relatedness to the different sentential contexts, and degree of relatedness to the different probes (for details, see Peleg and Eviatar 2008, 2009). Translated examples are presented in Table 1.

Table 1: Sample items

Homograph Type	Sentence Context	Homograph	Pronunciation	Probes
Homophonic	Nonbiased: They looked at the...	חוזה Contract	/xoze/	Salient: Document
	Biased toward the less-salient meaning: The children of Israel listened to the...	Seer		Less-salient: Prophet
Heterophonic	Nonbiased: The young man looked for the...	ספר Book	/sefer/	Salient: Reading
	Biased toward the less-salient meaning: The bride made an appointment with the...	Barber	/sapar/	Less-salient: Hair

Given the phonological asymmetries described above (direct orthographic-phonological connections in the LH versus no such connections in the RH), and our rapid presentation rates (150-250 ms SOAs), which tap automatic semantic activation, we predicted that differences between heterophonic and homophonic homographs will be more pronounced in the LH than in the RH. Thus, we mainly focus here on processes occurring in the LH. Specifically, we predicted that direct connections between orthographic and phonological representations in the LH should speed up (bottom-up, stimulus driven) lexical processes in the case of homophonic homographs (*bank*), but slow down lexical processes in the case of heterophonic homographs (*tear*). Whereas for homophonic homographs, lexical access may be faster in the LH, for heterophonic homographs, meanings may be activated more slowly in the LH.

Clearly, the direct connections between orthography and phonology in the LH have implications for salience effects. In principle, when homographs are polarized (i.e., when one meaning is more salient than the other), salient meanings are activated before less-salient meanings (Giora, 1997, 2003; Peleg et al., 2001, 2004, 2008). Salience effects, however, can be the result of both semantic and phonological representations of words. Therefore, for homophonic homographs, salience differences reflect relative exposure to different meanings only. For heterophonic homographs, however, salience differences reflect both relative exposure to different meanings as well as to different pronunciations.

Given that heterophonic homographs are both phonologically and semantically ambiguous, whereas, homophonic homographs are only semantically ambiguous, we expected that in the LH, polarization (i.e., the difference in degree of salience between the salient and the less-salient meanings) should be more pronounced for heterophonic homographs than for homophonic homographs.

Thus, when homographs are embedded in a nonbiased neutral context and presented to the LH, salient meanings are expected to be more highly activated compared to less-salient meanings in the case of heterophonic homographs than in the case of homophonic homographs, in which this difference should be less pronounced. Specifically, when contextual information is kept neutral, this large difference in the case of heterophonic homographs may speed activation of salient meanings, but slow down activation for the less-salient meaning. Given our short SOAs, we anticipated that in the LH, less-salient meanings will be activated in the case of homophonic homographs but not in the case of heterophonic homographs.

However, according to The Graded Salience Hypothesis, when contextual information strongly favors the less-salient meaning, contextually appropriate meanings will be boosted via the contextual predictive mechanism, whereas salient but contextually inappropriate meanings will be activated only via bottom-up lexical processes. When bottom-up lexical processes are fast, as in the case of homophonic homographs, salient, contextually inappropriate meanings are likely to be immediately activated via the lexical mechanism, resulting in simultaneous activation of multiple (appropriate and inappropriate) meanings. In contrast, when bottom-up lexical processes are slowed down, as in the case of heterophonic homographs, contextual processes can have faster effects than lexical processes. As a result, contextually appropriate meanings are more likely to be activated before salient but contextually inappropriate meanings, without inhibiting it, though.

Specifically, when context is strongly biased in favor of the less-salient meaning of the homograph, salient but contextually inappropriate meanings of homophonic homographs (*bank*), which prompt fast lexical processes in the LH, will be speedy. However, in the case of heterophonic homographs (*tear*), which slow down lexical processes in the LH, salient but contextually inappropriate meanings may be activated slowly in the LH, resulting in an ordered access, where the less-salient contextually appropriate meaning is activated before a salient but contextually inappropriate meaning. We anticipated then that, in the LH, given a context biased toward the less salient meaning of the homograph, salient but contextually incompatible meanings of homophonic homographs will be activated faster than salient contextually incompatible meanings of heterophonic homographs.

As predicted, our results show that homophonic and heterophonic homographs, which diverge on how their meanings are related to phonology, were processed differently in the LH. Our results also demonstrate that, in the RH, similar patterns (in terms of significant priming effects) were obtained for both types of homographs. These results converge

with previous studies showing that the LH is more strongly influenced by the phonological aspects of a written word (e.g., Halderman and Chiarello 2005; Lavidor and Ellis, 2003; Zaidel, 1982; Zaidel and Peters, 1981), whereas lexical processing in the RH is more sensitive to the visual form of a written word (e.g., Halderman and Chiarello 2005; Lavidor and Ellis, 2003; Marsolek, Kosslyn and Squire, 1992; Marsolek, Schacter and Nicholas, 1996; Smolka and Eviatar, 2006). Overall, we show that in the case of homophonic homographs, lexical access was faster in the LH than in the RH. In contrast, the opposite pattern was found for heterophonic homographs: Lexical processes were faster in the RH than in the LH. In what follows, we report the time course of ambiguity resolution for each context condition separately.

3.1 Results obtained in a neutral, nonbiasing context

In a neutral, nonbiasing context our results regarding homophonic homographs replicated previous results reported in studies run in English (e.g., Burgess and Simpson, 1988; Faust and Gernsbacher, 1996). In the RVF/LH both meanings were available early on at 150 ms SOA. However, 100 ms. later, only the salient meaning remained active. In the LVF/RH, the less-salient meaning was activated more slowly, so that 150 ms following the onset of the ambiguous prime, only salient meanings were significantly activated. Shortly afterwards (at 250 ms SOA), the less-salient meaning was activated alongside the salient one. Thus, consistent with previous proposals, in the case of homophonic homographs, both activation and selection processes were faster in the LH.

Importantly, however, heterophonic homographs revealed a different pattern of results. In contrast to the received view, our results suggest that, in the case of heterophonic homographs, it may be harder for the LH to activate the less-salient meaning, so that initially, 150 ms after encountering the homograph, the LH activated only the salient meaning; the same pattern of results obtained even 100 ms later (at 250 ms SOA). In the LVF/RH, salient meanings were activated before less-salient meanings. Thus, 150 ms after encountering the ambiguous word, only the salient meaning was significantly activated for both types of homographs and 100 ms later (at 250 ms SOA), both meanings were activated for both types of homographs.

3.2 Results obtained in a context biased toward the less-salient meaning

In a context biasing the ambiguous word toward the less-salient meaning, a different pattern of results is obtained in the two visual fields and for the two types of homographs. For homophonic homographs, both meanings, the less-salient contextually compatible meaning as well as the salient

contextually incompatible meaning, were activated at 150 ms SOA and remained active at 250 ms SOA, regardless of probe location (RVF/LH or LVF/RH).

Heterophonic homographs, however, were processed differently: In the LVF/RH, both meanings were immediately activated (150 ms SOA) and remained active at 250 ms SOA. In contrast, in the RVF/LH, at 150 ms SOA, the less-salient contextually appropriate meaning was activated exclusively. Shortly afterwards, however, at 250 ms SOA, the salient inappropriate meaning was also activated.

3.3. Discussion

According to The Graded Salience Hypothesis (Giora, 1997, 1999, 2003; Peleg et al., 2001, 2004, 2008), language comprehension involves independent lexical and contextual mechanisms that run parallel without interacting initially. The lexical mechanism responsible for lexical access is modular, exhaustive, and ordered so that salient meanings are activated faster than less-salient ones. While lexical access is impervious to context effects, contextual information can independently and immediately affect comprehension via predictive processes which do not penetrate lexical processes.

Type of homograph (homophonic/heterophonic) may also affect the speed of the bottom-up, lexical mechanism in the LH, where orthographic, phonological, and semantic representations are available (e.g., Halderman and Chiarello 2005). First, when orthographic and phonological representations are unambiguously related (as in the case of homophonic homographs such as *bank*), both salient and less salient meanings are activated faster in the LH than in the RH, because both meanings are immediately boosted by both orthographic and phonological sources of information. However, when a single orthographic representation is associated with multiple phonological representations (as in the case of heterophonic homographs such as *tear*), meanings are activated more slowly in LH than in the RH, due to the competition between the different phonological alternatives.

Specifically, The Graded Salience Hypothesis assumes that when contexts are strongly biased toward the less-salient meanings, this meaning is immediately activated by the contextual predictive mechanism. Nevertheless salient but contextually incompatible meanings are activated independently by the lexical mechanism. Since type of homograph (homophonic/heterophonic) affects the speed of the lexical mechanism in the LH, it helps tease apart the independent effects of these two mechanisms in that hemisphere. In the case of heterophonic homographs, where lexical processes are slower, top-down contextual/predictive processes activate

less-salient compatible meanings (at 150 ms SOA) even before lexical bottom-up processes activate salient but contextually incompatible meanings (at 250 ms SOA). Alternatively, in the case of homophonic homographs, where lexical processes are faster, both salient and less-salient meanings are activated simultaneously very early on (at 150 ms SOA).

Independent contributions of lexical and contextual processes are emphasized when the results described above are compared with results obtained in neutral unbiased contexts, where contextual effects are hardly operative. Given that heterophonic homographs are both phonologically and semantically ambiguous, whereas homophonic homographs are only semantically ambiguous, polarization in the LH (i.e., the difference in degree of salience between the salient and the less-salient meanings) is more pronounced for heterophonic homographs than for homophonic homographs. Thus, when homographs are embedded in neutral contexts, only salient meanings are activated in the case of heterophonic homographs (between 150-250 ms SOA). However, in the case of homophonic homographs, both salient and less-salient meanings are both activated quite early on (at 150 ms SOA). Given this pattern of results, it is clear that the immediate activation of less-salient meanings of heterophonic homographs, embedded in contexts biased toward the less-salient meaning, reflects contextual predictive processes rather than lexical access.

Moreover, contrary to the predictions of the context-sensitive models (e.g., Kellas et al., 1991; Vu et al., 1998, 2000), suggesting that a strong context can selectively activate the contextually appropriate meaning, regardless of degree of salience, we show that both context and salience influence the retrieval of word meanings. Importantly, consistent with The Graded Salience Hypothesis (e.g., Giora, 1997, 2003, Peleg et al., 2001, 2004, 2008), our results show that context can enhance activation of the contextually appropriate meaning, but it cannot inhibit salient meanings even when contextually inappropriate.

Thus, even when contexts strongly favored the less-salient meaning, salient meanings were nonetheless activated. In the case of homophonic homographs, both meanings were activated immediately (at 150 ms SOA) and remained active 100 ms later, regardless of visual field. Importantly, even when contextual processes preceded lexical processes, as in the case of heterophonic homographs, in which the contextually appropriate meaning was activated exclusively in the LH (at 150 ms SOA), 100 ms later (at 250 ms SOA), the salient but contextually inappropriate meaning also became available, regardless of context.

4. Summary and conclusions

It is uncontroversial that both lexical (e.g., degree of meaning salience) and contextual information influence the processing of lexically ambiguous words (e.g., Duffy, Morris and Rayner, 1988; Peleg, Giora and Fein, 2001, 2004, 2008; Titone, 1998; for a review see Giora 2003 Chapter 3). However, the temporal locus of these effects and their relative weight are still debated. The issue is whether top-down contextual cues can override the strong relationship between the word form of an ambiguous word and its salient – coded and prominent – meaning. According to interactive, direct access models (e.g., Kellas et al., 1991, Vu et al., 1998), sufficiently constraining contextual information biased toward the less-salient meaning can inhibit activation of the salient (but contextually incompatible) meanings. In contrast, The Graded Salience Hypothesis (Giora, 1997, 1999, 2003; Peleg et al., 2001, 2004, 2008) maintains that salient meanings are accessed automatically, regardless of context. Specifically, we suggest that degree of salience and prior contextual information affect meaning activation via distinct mechanisms that operate simultaneously without interacting initially. Thus, although contextual processes may, under some conditions, be even faster than lexical processes, they cannot inhibit salient meanings activated automatically by the lexical mechanism. In this chapter, we have provided a brief review of empirical evidence supporting this hypothesis.

First, in Peleg et al. (2001) we demonstrated that contextual facilitation of the compatible meaning of an ambiguous word can occur even before the homograph is encountered, that is, before lexical access takes place, fostering an impression of a selective process. Importantly, however, sentential position (initial vs final) may be crucial for the operation of the predictive mechanism. When homographs are placed in sentence-final position, a strong disambiguating prior context can make available the contextually compatible meaning even before lexical access occurs. In contrast, we would not expect contextual effects to temporally outweigh salient meanings in the beginning of sentences. Thus, given the same contextual constraints but placed in initial position, homographs' salient meanings were activated immediately, regardless of contextual information to the contrary (Peleg et al., 2004, 2008).

Assuming two different, independent mechanisms as opposed to a single, interactionist mechanism, may account not just for our findings (Peleg et al., 2001, 2004, 2008), but even more so for conflicting findings prevalent in the literature. For instance, findings demonstrating that a strong context can make accessible the appropriate meaning immediately, regardless of salience (e.g., Vu et al., 1998, 2000), can also be viewed as induced by the contextual mechanism alone, without postulating that it interacts with

lexical processes. Indeed, in Vu et al., in which probes were placed in sentence final position, context effects preceded lexical access, suggesting that findings compatible with an interactionist account may very well be the product of contextual processes that do not interact with lexical processes. In contrast, findings showing that contextually incompatible meanings slow down processes may be due to the lexical mechanism, particularly if probes are placed in sentence/clause initial position (e.g., Duffy et al., 1988). In spite of a strongly biasing prior context, context effects in such a position are expected to neither inhibit nor supersede salient though contextually incompatible meanings.

Furthermore, we have also demonstrated that salient but contextually incompatible meanings are not inhibited even where context may be most effective (i.e., in sentence final position). Specifically, the type of homograph (e.g., homophonic vs. heterophonic) was found to be crucial for bottom-up lexical processes in the LH. Previous studies have shown that both hemispheres can recognize words visually via orthographic-semantic connections, but orthographic-phonological connections are available only to the LH. In a series of divided visual field studies (Peleg and Eviatar 2008, 2009), we have shown that direct connections between orthographic and phonological representations in the LH have differential consequences for the two types of homographs. In the case of homophonic homographs (e.g., *bank*), direct orthographic-phonological connections speed up lexical access. Alternatively, in the case of heterophonic homographs (e.g., *tear*), meaning activation is slower due to the competition between the different phonological alternatives.

The most interesting result was observed when contexts were biased toward the less-salient meaning. In the case of homophonic homographs, both the contextually appropriate less-salient meaning and the contextually inappropriate salient meaning were activated immediately in both hemispheres. In contrast, heterophonic homographs induced a different pattern of results: In the LH, at 150 ms SOA, only the contextually appropriate less-salient meaning was available. Nevertheless, 100 ms later (at 250 ms SOA), the salient meaning was activated as well. Importantly, these results indicate that salient meanings are always activated, regardless of context. Moreover, as predicted by The Graded Salience Hypothesis, even if context is strong enough to initially activate the less-salient meaning exclusively via a contextual predicative mechanism, salient meanings are still activated via automatic lexical processes when the relevant stimulus is encountered. Such findings cannot be accounted for by direct access/context sensitive models which, under these conditions, predict exclusive activation of compatible meanings, regardless of salience.

Taken together, our studies show that initial lexical processes are independent of contextual processes. Although context may have early effects occurring even before lexical access takes place (see also Rayner, Binder and Duffy, 1999), they do not affect lexical access and therefore do not block salient meanings. Salient meanings are accessed on account of their salience, regardless of contextual information to the contrary. Results obtained in our studies testify to the involvement in comprehension of distinct mechanisms that do not interact initially, thus enabling comprehenders to resist conformity with contextual information and have a choice (Giora, 2003: 199). The independence of the encapsulated, exhaustive (lexical) mechanism of contextual processes allows humans an access to meanings not necessarily related to or invited by the information accumulated outside the module. Indeed, Giora (2003) attests that comprehenders do not always suppress salient but contextually incompatible information, but occasionally utilize it for various purposes such as humor, pleasure, innovativeness, or subversion.

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