

TOWARDS A DEFINITION OF INTAKE IN SECOND LANGUAGE ACQUISITION

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Abstract

Intake is a concept that has long fascinated second language researchers as it provides a window onto the crucial intermediary stage between input and acquisition. A better understanding of this intermediary stage can help us to distinguish between input that is used for immediate (e.g. communicative) purposes only and input that is drawn on for learning. This article traces the different components from which intake can occur, reviews existing definitions of intake and suggests alternatives for its operationalisation.

Introduction

This article looks at input, output, and interaction as sources of language data for second language learners to draw on. The second part of the article looks at how learners extract linguistic information from this data and considers a crucial stage in the input-to-acquisition process, namely intake.

The study of input

The role of language input is acknowledged by researchers with different perspectives on second language acquisition. All agree that some form of input is needed for language learning to occur¹ (cf. Gass, 1997). How input is related to learning is an area of contention: 'it is uncontroversial that a learner needs input in order to acquire a language [...]. Unfortunately the consensus stops about there. How much input is necessary? What kind of input? Under what conditions need it be provided?' (Gregg, 2001, p.167).

What is input? Sharwood Smith defines input as 'the potentially processable language data which are made available by chance or by design, to the language learner' (1993, p. 167) and thus emphasises the point that input need not be *used* (processed), but potentially can be. Also, the *intent* with which the language data are presented or sought out, does not determine what is and what is not input. Carroll (2001) makes a distinction between stimuli as 'all [...] observable instantiations of the second language'² (p. 8) and input, which she reserves for stimuli that have entered the brain. To her, input is not physical information (sounds, visual data), but a mental representation, available for internal processors to use.

Not all definitions of input are quite as neutral as the above. Gregg's definition (2001) of input is 'information that is fed into an input-output device; the output is grammar', (p. 167). Gregg takes a mentalist view of language learning that sees language as innate and its development as set or 'triggered' by the language data available to the learner. Input here is seen as 'evidence'. Several researchers see the role of input as the main source of information from which language develops. Krashen (1982, 1985) makes a distinction between input in a general sense and *comprehensible input*, i.e. language data that are understandable to a learner. Comprehensible input in Krashen's view is sufficient for acquisition to take place. When talking about input,

¹ Although proponents of an innatist view of language learning (see below) point out that input can affect areas of a second language not contained in the input itself.

² This appears to differ somewhat from the commonly held view in cognitive psychology that 'stimuli' are 'anything in the environment we respond to'.

authors such as Krashen (but see also Faerch, Haastrup, & Phillipson, 1984; VanPatten 1996) thus often take it to mean a specific kind of (qualitatively different) language data.

Beebe (1985) argues that what constitutes input is determined to a large extent by the learner:

Studies of input in second language acquisition must view non-native speakers not simply as passive recipients of comprehensible or incomprehensible input from native speakers, but as active participants in choosing the target language models they prefer and thus acquiring 'the right stuff' according to their values. In other words, learners have 'input preferences' (or 'model preferences') in the sense that they consciously or unconsciously choose to attend to some target language models rather than others. (p. 404)

Another way of saying this is that input is what learners *pay attention* to in the language. This appears similar to what Sato & Jacobs (1992) write: 'in the present perspective, input is viewed as the object of the learner's attention' (p. 269). This is clearly different from Sharwood Smith's 'language data that are potentially available for processing' in that it combines information with the process of selecting it.

The different approaches to (research into) input were described by Schachter (1986) who identified 1) a data-oriented approach which observes, records, and transcribes actual learner - native speaker interaction, 2) a language-model approach which attempts to describe language itself (attempting to answer questions such as 'what does knowledge of a language consist of?'), and 3) a processing-model approach which focuses primarily on the processing learners engage in when interacting with the second language. Although these three approaches are all valid ways of investigating second language acquisition, most researchers would probably agree with the basic meaning of the word input as 'linguistic data'. This is also the working definition I adopt here.

Positive and negative evidence

Research has shown that the input learners receive does not provide all the information they need to learn a language. This has been referred to as the 'logical problem' of language acquisition (Bley-Vroman 1989). Chomsky (1959, 1965), most prominently, suggested that humans make use of internal building blocks ('universal grammar'), and that the input they receive serves as evidence of what is and what is not possible in the language that is learned. Language is thus to a large extent innate and the input triggers its development. In second language acquisition research the most vocal subscriber to this view is Krashen who has argued for the importance of comprehensible input as a necessary and sufficient condition for acquisition to take place (1982, 1985). Language develops on the basis of positive evidence, i.e. examples of actual language use.

Others, however, have argued that such comprehensible input alone is not sufficient for learning to take place; it can be used for comprehension only (e.g. Faerch & Kasper, 1980) without affecting change in the learner's interlanguage. 'Paradoxically, comprehensible input may actually inhibit learning on occasion, because it is often possible to understand a message without understanding all the structures and lexical items in the language encoding it, and without being aware of not understanding them at all' (Long, 1996, p. 425). Chomskyan researchers have proposed that in addition to universal rules, learners are also endowed with a set of language constraints, limiting the number of grammatical possibilities. However, if participants make use only of the input they receive and the positive evidence contained in it, then how is it possible that they make mistakes they themselves have never encountered before?

L. White found (1989b) that learners' language behaviour supports the transfer hypothesis. This states that second language learners primarily make decisions of acceptability on the basis of their first language. When the first language (e.g. English) is more restrictive (for

example in requiring adverb adjacency) than the second (e.g. French), learners will limit themselves to the more restrictive use found in their first language. To avoid this type of transfer White has argued that negative evidence is needed (e.g. L. White, 1987, 1989a, 1991; see also Bley-Vroman, 1986). Negative evidence is defined as 'the type of information that is provided to learners concerning the incorrectness of an utterance' (Gass, 2003, p. 225) and may help by drawing learners' attention to language form. Trahey writes: 'exposure to positive evidence can lead to changes in linguistic competence when the structure to be acquired is readily available in the input. However when the problem is one of 'unacquiring', as in the case of SVAO, positive evidence appears not to be sufficient' (1996, p.134).

The role of negative evidence, however, is disputed. Some have claimed that it is not clear that it occurs at all outside instruction (Pinker, 1989). However, several studies have shown it to exist in both first (Farrar, 1992), and second language acquisition (Oliver, 1995). Mackey, Oliver & Leeman (2003) investigated 48 native speaker/non-native speaker and non-native speaker/non-native speaker dyads consisting of both adults and children while completing an information gap task. Although they found differences between the various groups (with native speakers notably providing more feedback than non-native speakers), in all cases at least 30% of errors resulted in feedback and between 25% and 41% of these resulted in modified output.

It has, however, been argued that even if negative evidence occurs, it is not relevant to learning. Schwartz (1993) writes:

If there were a *translation algorithm* that could take the knowledge that results from being told "This is not a grammatical sentence in this language" and convert it into information that is in a form the processes in the language module could make use of, then ND [negative data] could be usable. It appears, however, that there exists no such mechanism' (p. 158).

Schwartz does not argue that negative evidence cannot result in learning, but says that it does not result in the type of knowledge underlying second language proficiency. However, evidence exists that learners can in fact make use of negative data. An often cited study in this respect is one by Bohannon & Stanowicz (1988) which showed that children do benefit from negative evidence in learning their first language³. Also for second language learning there appears to be evidence showing a facilitative effect on learning (see below), but it has been pointed out that in interpreting the results of such studies one has to be careful to distinguish between immediate effects (uptake) and delayed effects (learning) (cf. Birdsong, 1989).

Negative evidence can be provided in different ways. Long (1996) distinguishes between explicit negative evidence (such as error correction), and implicit negative evidence (such as when one interlocutor shows not to have understood the other, or reformulates an utterance without it interrupting the flow of the conversation (i.e. recasts). Negative evidence can perform different functions. Firstly, it can help learners 'notice the gap' between the input and their own output. R. Ellis (1995) describes this as making a cognitive comparison⁴. As a result of realising this gap, participants can then attempt to reformulate their utterance or store information about that aspect of the language. It may also result in quite sudden shifts in the learner's interlanguage, for example when it leads to a realisation that certain forms cannot be used in the target language at all. Secondly, negative evidence can also increase learners' awareness of the target language in a broader sense. By drawing attention to what is *not* possible in the target language, negative feedback necessarily contrasts different linguistic forms and encourages learners to understand the differences (Schmidt, 1990).

³ Although their study has been criticised for only investigating one particular socio-economic stratum of society, thus questioning its generalisability to other groups of learners.

⁴ Although this term appears broader in that it need not involve a 'gap' in the sense of an inability to express oneself, i.e. the comparison could be made between two sources of input. Swain (1998) refers to this as noticing a 'hole'.

Research on various types of negative evidence has shown facilitative effects on learning. Carroll & Swain (1993) for example, investigated instruction of English dative alternation combined with one of four types of feedback. Learners either 1) received metalinguistic information about their responses, 2) were told when their answer was wrong, 3) received a recast with a model answer, or 4) were asked if they were sure about their answer. The results showed that all four groups improved performance, but that the metalinguistic group did best.

Han (2002) investigated the effects of recasts for tense consistency provided during eight sessions over a period of two months in written and oral narration tasks. Feedback was given individually, and was consistent; all errors were recasted. Using a pretest-posttest-delayed posttest design she found recasts to lead to increased awareness (and much greater awareness than in the no-recasts group), and improved tense consistency both on the production tasks and on an immediate and delayed posttest⁵. Recasts were given in individual settings, and Han suggests that this may have contributed to the results.

A number of other studies have also found benefits for negative feedback on second language learning (e.g. Pica, 1994; Mackey & Philp, 1998), however a small number did not (e.g. Sanz & Morgan-Short, 2004). Mackey, Oliver & Leeman (2003) point out that a range of variables (types of dyads, type of interaction, age, etc) affects the provision, uptake and learning effects of negative evidence and that more research needs to be done to isolate and investigate those variables.

Input and learnability

For some researchers the primary role of input is to trigger the development of innate knowledge of language (Krashen, 1981; Schwartz, 1993; L. White, 1989a). Pienemann (1984, 1985, 1988, 1989, 1998), sharing this viewpoint, argues that language (including a learner's second language) develops in a predictable, and pre-determined way. His language processing theory posits a number of determinants of the relative difficulty and acquisition order of various linguistic features in the input. The first of these is psychological complexity and refers to the extent to which 'the language learner must re-order and re-arrange linguistic material in the process of mapping underlying semantics onto surface forms' (1987, p. 89). The second is saliency; items that are more salient are easier and will be acquired earlier. Items are more salient if they come in sentence initial or sentence final position. The third determinant is the distance between an item that triggers a transformation and the place in the sentence where the transformation is effected. The greater the distance, the harder the item. The most important premise of processing theory, however, is that learners must go through various "levels" which they cannot skip. At the first level learners are unable to organise lexical material into word classes or categories and cannot identify where the information in the sentence is. At the second level they are partially able to do so but generally only on the basis of salient sentence items (e.g. sentence first or sentence final). At the third level learners are able to organise some of the lexical material into categories but transformation is limited to either word or constituent initial or final position. At the fourth level they are able to recognise all elements in a sentence. The fifth level, S-procedures, deals with an exchange of information between internal constituents. Pienemann sees these levels as an 'implicational hierarchy of processing procedures'. Implicational here means that each procedure necessarily builds on the other; 'the learner cannot acquire what he/she cannot process' (p. 87). Again, language development is seen as predetermined.

Others see a more active role for the learner and more possible variation in the acquisition of various features in the input. Goldschneider & DeKeyser conducted a metastudy (2001) of second language research on the acquisition of morphemes. Using multiple regression

⁵ It has to be pointed out that the participants in the study were at an upper-intermediate level and reported high motivation for learning English.

analysis they identified five determinants explaining a large portion of the variation in performance found in the individual studies. These were: 1) perceptual saliency, or how easy it is to hear or perceive a given structure⁶. 2) Semantic complexity or how many meanings are expressed by a certain form. 3) Morphophonological regularity as the degree to which a grammatical feature is affected by its phonological environment. 4) syntactic category as the difference between lexical and functional and free versus bound items. 5) frequency. All of these factors will, to some extent, impact on the order in which they are acquired⁷.

N. Ellis (2002a, 2002b) specifically investigated point 5) above and argued that frequency largely determines acquisition. Second language acquisition, in his view, is to a large extent exemplar based and not based on abstract rules or structures (2002a): 'the acquisition of grammar is the piecemeal learning of many thousands of constructions and the frequency-biased abstractions of regularities within them' (p. 168). He sees second language learning as a form of implicit learning, dependent on input. However, he points out that this may not apply to initial registration of language forms, which may require attention and conscious noticing. What gets registered initially gets grouped later, by 'unconscious processes of association to form larger units that are henceforth used in pattern recognition' (p. 174).

Other aspects of the input have been identified as affecting noticing and learning. VanPatten (1985, 1990, 1996; VanPatten & Cadierno, 1993) argues that learners assign varying degrees of "communicative value" to different aspects of the input, defined as 'the meaning that a form contributes to overall sentence meaning' (2001, p. 759) and 'the relative contribution a form makes to the referential meaning of an utterance [...] based on the presence or absence of two features: inherent semantic value and redundancy within the sentence-utterance' (1996, p. 24). The communicative value of a form is greater if its semantic value is greater and if it is not redundant. In his 1990 study, VanPatten asked subjects to mark all the occasions they heard the Spanish article *la*, the third-person plural verb morpheme *-n*, or the word *inflación*. His results showed that attending to the verb morpheme or the definite article resulted in lower comprehension levels. He attributed that to their lower communicative value and suggested that learners first look for content words in the input. If sufficient attentional resources are available grammatical forms may then be processed. VanPatten's concept of communicative value has come under heavy criticism. DeKeyser et al. (2002) argue that both form and meaning *can* be processed simultaneously and that to expect the internal parser to scan all content for communicative value first while saving certain parts of the input to be processed later is not congruent with current thinking and findings from research into sentence processing.

Output and interaction

The roles of output and interaction on acquisition have received considerable attention since the publication of Hatch's early papers (1978a, 1978b) in which she drew attention to their potential benefits to learning. For some (e.g. Krashen, 1981) the role of interaction is predominantly that it provides learners with comprehensible input (i.e. input that is attuned to their developmental level). For others, interaction and the output it generates directly contribute to learning. Long is well-known for his interaction hypothesis (1981, 1983, 1996) which emphasises the crucial role of the process of negotiation on learning. Negotiation, or the 'modification and restructuring of interaction that occurs when learners and their interlocutors anticipate, perceive, or experience

⁶ Saliency is a term also used by other researchers with sometimes different or additional meanings. For example Bardovi-Harlig (1987) defines it 'in terms of availability of data' (p. 401), (which appears to be similar to frequency) and uses it to explain findings of acquisition order (preposition stranding before preposition pied piping) which appear to go against the order predicted by universal grammar (unmarked construction such as preposition stranding are acquired first).

⁷ Goldschneider & DeKeyser point out that 'we have argued that these five factors are not a completely heterogeneous set, but can all be seen as aspects of salience in a broad sense of the word' (p. 37).

difficulties in message comprehensibility' (Pica, 1994, p. 493), has a number of beneficial effects. Firstly, it aids in increasing understanding, and thus results in the learner receiving more, and more comprehensible input, necessary for learning to take place. Negotiation exchanges are said to result in 'denser' than average speech, with more repetitions, reformulations, expansions, extra stress, and a range of other features, all of which increase frequency and saliency of aspects of the input. Learners are also more likely to benefit from this enhanced input as they have at least partial control over the semantic content of the interaction and can thus free up attentional resources to pay attention to form in the input. They are likely to be alert as they try to get their meaning across and as a problem in the communication occurs.

Secondly, interaction takes place in a context that is meaningful to the interlocutors. From this context learners derive a degree of support which helps them in their understanding as well as in getting their meaning across. They also derive support from their conversation partners who may supply words, or restate utterances, and in so doing provide scaffolding, allowing learners to express meaning they would otherwise be unable to.

Next, interaction can also lead to the occurrence of negative feedback (one form of negative evidence, see above), i.e. information about what is and is not understandable and/or correct in a speaker's output:

Negative feedback is generally facilitative of L2 acquisition, and necessary for the acquisition of specifiable L2 structures (such as the English adverb-placement example for French speakers) for which positive evidence will be insufficient. A mechanism is posited whereby, while correct-form meaning associations are strengthened both by positive evidence *and* that negative feedback that contains positive evidence, incorrect associates are weakened and in some cases ultimately relinquished altogether as a result of both negative evidence *and* prolonged absence of support in the input. (Long, 1996, p. 430).

Gass (1997; Gass & Varonis, 1994) has argued that since such negative feedback is situated in a communicative context and is thus linked to actual communicative goals, it is more likely to be usable to the learner.

However, it is not entirely clear how much negotiation of meaning takes place, with some claiming that it is substantial (Pica, 1994), and others that it is not (Skehan, 1998). It has also been pointed out that although interaction can have beneficial effects, conversational success in itself does not necessarily result in learning (Faerch & Kasper, 1980).

Swain has argued for the important role of learner production in learning. Her "output hypothesis" (1985) developed from observations of Canadian immersion students who, despite years of receiving exposure to the second language, did not fully develop in particular certain grammatical aspects of the target language. Swain found that the immersion classes were characterised by a lack of opportunities for output and afforded few opportunities for "pushed output", i.e. output that required them to 'stretch their interlanguage'. Many students were able to get by using communication strategies to get their meaning across and were never challenged to further develop their language. Swain suggested that by requiring learners to produce comprehensible output, they would be pushed to be more accurate and to pay attention to both form and meaning, and in so doing move from semantic to syntactic processing. In addition, Swain (1998) suggested that output would 1) induce noticing, 2) allow for hypothesis formation and testing (see also R. Ellis & He, 1999; Pica 1988), and 3) give opportunities for meta-talk. The effect of output on 1) noticing, was investigated in another article (Swain & Lapkin, 1995) in the context of a writing task with a think-aloud protocol. The authors found that learners do become aware of problems in their writing and engage in strategic thought processes to solve those problems. Swain (1985) has suggested that output can also serve to help with developing automaticity (referred to as the fluency function of output) and this seems to have been corroborated by research showing that when producing the language, connections in the brain

are strengthened, aiding the process of automatization (cf. de Bot, 1992, 1996). Izumi, in several studies, investigated the effect of output on noticing (2002, 2003; Izumi, Bigelow, Fujiwara, & Fearnow, 1999). He suggested (2002) that Swain & Lapkin's study may have found an effect for the noticing induced by the output because their measurement was immediate task performance. To investigate if there was also a delayed effect he made use of a written reconstruction task to measure noticing of English relative clauses, followed by a series of posttests. He found that in comparison with a control group who received a receptive (meaning-focused) task only, output did have an effect on both noticing and learning.

Benefits have been found for non-interactive language production. In the general learning domain, Baddely (1990) writes about the effects of producing an item: 'the act of successfully recalling an item increases the chance that that item will be remembered. This is not simply because it acts as another learning trial, since recalling the item leads to better retention than presenting it again; it appears that the retrieval route to that item is in some way strengthened by being successfully used' (p. 156).

In the second language acquisition domain N. Ellis & Sinclair (1996) found that subjects encouraged to rehearse foreign language utterances were better than both silent controls and subjects prevented from rehearsal by articulatory suppression at a) comprehension and translation, b) explicit metalinguistic knowledge of the detailed content of grammatical regularities, c) acquisition of the foreign language forms of words and phrases, d) accuracy in pronunciation, e) some aspects of productive, but not receptive, grammatical fluency and accuracy.

Although not rejecting a role for output and interaction, VanPatten (1996, 2002a; VanPatten & Cadierno, 1993) has argued that the role of input and input processing are crucial for language development. VanPatten & Cadierno (1993) compared traditional form-focused instruction (rule presentation followed by output practice) on direct object pronouns with 'Processing Instruction' which 'involves explanation and practice/experience processing input data, taking learner strategies in input processing as the starting point for determining what explicit instruction should look like' (p. 225). In the study, participants receiving processing instruction were given an explanation of the target structure as well as 'explanations of important points to keep in mind about the position of object pronouns of Spanish' (p. 231). This was followed by a reading or listening exercise in which participants had to demonstrate understanding of the structure, and an activity in which they had to respond to the content of the input. VanPatten & Cadierno found that input processing led to significant gains for both comprehension and output skills, compared with a significant improvement for output skills only for the traditional group. VanPatten argued that second language instruction should include an increased focus on improving the way learners process the input, as opposed to focusing primarily on output practice. However, in a replication study, DeKeyser & Sokalski (1996; see also DeKeyser et al., 2002), found that the relative effectiveness of production versus comprehension practice depends on the complexity of the target structure and on the delay between practice and testing; there may be an immediate, but no lasting effect for comprehension practice. Allen (2000) investigated acquisition of French causatives and compared the effects of processing instruction and production-based instruction. She did not find an advantage for the processing instruction group compared with the production group, but both groups did improve compared with a control group. Other studies have reported similar findings (Erlam, 2003; Salaberry, 1997).

Despite VanPatten's suggestions, there appears to be evidence of a facilitative effect for output and interaction⁸. In sum, output and interaction can:

- provide additional input
- result in comprehensible input which impacts on learning
- enhance fluency by allowing participants to produce the target language

⁸ VanPatten (2002) has recently clearly acknowledged a number of important roles for output, such as that it can function as a 'focusing device', drawing learners to mismatches between the input and their own output, and he has acknowledged its role in the development of fluency.

- facilitate form-meaning connections
- result in negotiation of meaning which in turn can raise awareness of the target language
- provide opportunities for negative feedback
- impact on learning directly as a result of verbalisation

Definitions of intake

The term intake 'has taken on a number of different meanings, and it is not always clear what a particular investigator means in using it' (McLaughlin, 1987, p.13). That was true nearly two decades ago, and it still is true today. The purpose of this section, then, is to review these different meanings and identify the commonalities and differences between them.

Definitions of intake come into three broad categories: those that see intake as a product, those that see it as a process, and those that see it as a combination of the two. Coming into the first of these categories is Corder (1967) who provides the earliest recorded definition of the term as: 'a mental representation of a physical stimulus' (p. 165). For Corder, intake is thus something that has been detected but has not yet been integrated into the learner's developing second language system as it is still linked to the physical stimulus. Others also see intake as a product, but give it quite a different meaning. Krashen, for example, on the basis of an investigation of caretaker speech (1978) concludes: 'intake' is, simply, where language acquisition comes from, that subset of linguistic input that helps the acquirer learn the language' (1981, p. 101) and: 'intake is first of all input that is *understood*' (p. 102; emphasis in original). Interestingly, Krashen talks of input in first language acquisition containing 'a high proportion of *intake*' (p. 102, 1981; emphasis in original) by which he means language input of which a great deal is understood. This is interesting because it shows that for Krashen the occurrence of intake is something that is not so much dependent on the learner as on the quality of the input. It appears that in Krashen's view one cannot help but understand appropriately used input, and thus be provided with intake. It must be noted that, perhaps as a result of this interpretation, Krashen appears to use the terms input and intake somewhat arbitrarily. For example, on a different occasion, he talks about language acquisition developing better when the intake is communicative and understood. Finally, Krashen claims that intake 'builds' acquisition, but how this happens is not elaborated on.

Also Faerch & Kasper (1980) see intake as a product but make a distinction between intake for communication and intake for learning. Intake for communication is detected input that the learner has comprehended (maybe partially on the basis of non-linguistic aspects relating to the communication that takes place), whereas on the basis of intake for learning 'the learner forms her hypotheses about the L2 rules and tests them out subsequently' (p. 64). Intake for learning is clearly processed more deeply as it requires the learner to (consciously or not) make a comparison between current knowledge and new information, whereas this is not the case with intake for communication. Loschky & Bley-Vroman (1993) see intake for communication as depriving the learner of the potential for feedback and thus a chance to notice a difficulty with his/her performance:

Thus, it may be possible to (1) comprehend native speaker input, or (2) make one's interlanguage output comprehensible to a native speaker without (3) focusing on or using the target form of instruction. [...] this is certainly possible through use of strategic competence. Second, as a consequence of this, negative feedback which could potentially destabilize one's target language hypotheses may be either absent or non-salient. The learner may never 'notice a gap'. (p. 131).

Sharwood Smith (1986) does not specifically discuss intake but does make a similar distinction as do Faerch & Kasper. He talks about input having dual relevance, for immediate communicative purposes but the input may also 'contribute to the substantiation or reflection of some current hypothesis about the target language system' (p. 243). Input may not be relevant for acquisition where the learner is not developmentally ready or where the demands of the

communicative exchange are heavy, even though the input can be interpreted. Sharwood Smith later defined intake as 'that part of input which has actually been processed by the learner and turned into knowledge of some kind' (1994, p. 8). He specifies this by saying 'input is, as it were, the goods that are presented to the customer, including the articles that the customer picks up to look at. Intake is what is actually bought and taken away from the shop, i.e. what passes into the ownership of the customer' (pp. 8-9). This is ambiguous. What is meant by 'ownership' here? Is it a hire-purchase which may be returned at any time, are 'the goods' consumed before the buyer even arrives home, are they shelved for future use, or are they used every day?

Carroll (2001) also sees intake as a product but makes a very clear distinction between comprehension and intake. She describes comprehended speech as a 'speech signal which has been successfully parsed and re-encoded in semantic terms' (p. 9). Carroll rejects the view that intake consists of comprehended speech as it would mean that all learning would involve concept learning. To her, comprehending speech is 'something that happens as a *consequence* of a successful parse of the speech signal' (p. 9; emphasis in the original). She sees intake as a subset of the input; stimuli that are perceived by the learner. She defines it as 'that which is taken in by the hearer' (p. 10). In addition, perceived stimuli are characterised as "transduced stimuli", or stimuli neurally available for processors to extract further information from. Carroll emphasises that intake is not input to the learning mechanisms, but input to speech parsers. Her view of intake thus diverges from that of the other authors cited here.

Gass's (1997) model of second language acquisition consists of a number of stages starting from raw input. Several factors (including time pressure, frequency, affect, salience, associations and prior knowledge) influence whether input gets noticed, or apperceived. Apperception is conceptualised as a priming device. It prepares the learner for the possibility of subsequent analysis. Some or all of the noticed input may be comprehended, with comprehension relating to a continuum of properties of the apperceived input, from meaning-related properties to deeper, grammatical features. What gets comprehended may (depending on a range of factors) become intake, which Gass defines as the 'process of assimilating linguistic material' (p. 5). Intake can thus be conceptualised as apperceived input that has been further processed. This further processing can take the form of hypothesis testing, rule strengthening, storage for later use, or the intake may remain unused. It is interesting to note that unlike Faerch & Kasper (1980), Gass sees comprehension (comprehended input) as a prerequisite for intake to take place.

VanPatten's (1996) definition of intake is similar to Gass's: 'intake is the subset of filtered input that serves as the data for accommodation by the developing system. It is the input that has been processed in some way by the learner during the act of comprehension. Intake [...] are the data made available for further processing (e.g. internalization) once the input has been processed' (p. 10). More recently VanPatten (2002) defined intake as 'the linguistic data actually processed from the input and held in working memory for further processing' (p. 757). For VanPatten, as for Gass, intake follows or occurs simultaneously with the process of comprehension. Leow holds a similar view: 'intake, [...] is that part of the input that has been attended to by second language learners while processing the input' (1993, p. 334).

Others have approached intake as a process, rather than as a product. Chaudron's definition of intake (1985a), for example, encompasses the processes Carroll, Gass and others refer to: 'intake is processing of target language input', or 'the mediating process between the target language available to learners as input and the learners' internalized set of L2 rules and strategies for second language development' (p. 1). And: 'in speaking of intake we are, in effect, referring not to a single event or product, but to a complex phenomenon of information processing that involves several stages, roughly characterized as (1) the initial stages of perception of input, (2) the subsequent stages of recoding and encoding of the semantic (communicated) information into long term memory, and (3) the series of stages by which learners fully integrate and incorporate the linguistic information in input into their developing grammars' (p. 2). Chaudron refers to this process as a continuum from preliminary to final intake, although he concedes that

the two ends of the continuum constitute very different categories of cognitive activity (1983, pp. 438-439).

Also Boulouffe (1987) conceptualises intake as a process and calls it 'the notoriously impenetrable interval between input and output' (p. 245). She describes intake as 'the locus of the learner's active search for inner consistency' (p. 246) by which she means a process of equilibration through accommodation or assimilation of new knowledge. She gives examples of students receiving feedback on an incorrect production of a target sentence. The number of attempts represent the intake process whereby the new knowledge (the correct sentence structure) is assimilated. She clearly sees intake as the process of learning, hypothesis testing, transfer etcetera. It is also a process that requires the learner's active participation as it is something that is subject to control.

Similarly, Hatch (1983) writes: 'if the learner "casts a net" into the input, the result is supposedly intake' (p. 79) and 'for me, all input is intake if the learner does respond in some way to it' (p. 81).

We might say that input is what the learner hears and attempts to process. That part that learners process only partially is still input, though traces of it may remain and help in building the internal representation of the language. The part the learner actually successfully and completely processed is a subset called intake. That part, then, is the language that is *already* part of the internal representation. (p. 81).

Yet others acknowledge that intake can be seen as both a product and a process. Kumaravadivelu (1994) provides an overview of the preceding 25 years of theorising into intake and suggests that a focus on intake as either a product or a process is flawed. He proposes a synthesis of a range of intake factors (age, affective factors, negotiation etc) and intake processes (structuring, inferencing, transfer etc) that dynamically interact and are co-requisites for intake. Intake factors determine which aspects of the input get engaged. These receive attention and as a result of this, consciously or unconsciously, a mismatch is detected between that aspect of the input and existing knowledge the learner has. As a result of this mismatch a range of intake processes execute that form the process of learning. Like Chaudron then, Kumaravadivelu includes within intake the whole process from detection to final acquisition. It is difficult to see how this proposal of intake can be distinguished from one of learning in general.

Finally, although not concerning itself so much with attempts to define intake, some recent neurobiological research has made efforts to come to a more precise understanding of what constitutes intake and where in the brain the product or process is localised. Sato & Jacobs (1992) identified the nucleus reticularis thalami (NRT) as that area of the brain that seems to facilitate processing in other areas of the brain known to be involved in (language) learning and production, including the hippocampus, the cerebellum, the basal ganglia, and the cingulate gyrus. The authors propose that the NRT functions as a "gating mechanism" that allows or inhibits information flow to these areas. As such the NRT can be said to facilitate intake from input in a literal sense. Their assertion, however, that 'the key assumption here is that information ascending through the NRT to the cerebral cortex constitutes intake (or at least potential intake)' (p. 287) casts some doubt on their own claims as it shows that by adding the afterthought between brackets, the authors make a distinction, perhaps implicitly, between what enters the system and aspects of that information that may be used for language learning. Although the authors admit that 'the NRT's posited role in language acquisition is at present neither directly observable nor testable' (p. 287), identifying the neurobiological correlates of the intake process is a promising approach to arriving at a more precise, and meaningful interpretation of the processes that the concept of intake is said to embrace.

Research into brain activity may help make such processes 'observable'. One relevant example is the work of Buckner (2000) who, quoting himself, writes:

Neuroimaging data suggest a pattern relating localized brain activity and memory encoding. Several neuroscientific hypotheses have proposed that certain regions within the frontal cortex participate in the short term maintenance and manipulation of information over brief periods of time, as would be required during many kinds of information processing tasks. Deep processing tasks and intentional tasks make use of such processing, while shallow processing tasks do not (Buckner & Tulving 1995).’ (p. 285)

Buckner relates this to the formation of memory traces and writes: ‘one speculation would be that the critical cascade that drives episodic human memory formation occurs when frontal activity provides a source of information (input) to medial temporal lobes and functions to bind together the outcomes of information processing from frontal and other cortical regions to form lasting, recollectable memory traces’ (p. 285). The same could apply to language learning where frontal processing provides input to the rest of the developing system. This is an interesting, but as of yet little explored avenue for research into the topic of intake.

A working definition of intake

Above a wide range of existing definitions have been discussed. Next I turn to what I believe are the key elements in these definitions and drawing on these I will propose a working definition of intake.

First, I make a distinction between input and stimuli, where stimuli are seen as the language potentially available to a learner, and input as those stimuli that have entered the learner’s system. Secondly, and in line with most of the authors mentioned above, I see intake as resulting from that subset of the input that is detected by the learner. Following Tomlin & Villa (1994), I do not equate detected input with noticed input. A definition of intake or an operationalisation of it, should probably leave open the question of whether or not intake can only be derived from noticed input, until greater evidence for either position has been found (cf. Schmidt, 2001). For some (e.g. Carroll, 2001; Sato & Jacobs, 1992⁹) this detected input equals intake. However, detected input can be used for comprehension only and this need not involve any attention to the formal aspects of the input, nor does there have to be any link with long-term memory. To resolve this, Faerch & Kasper (1980) proposed a distinction between intake for comprehension and intake for learning. However, this seems to create unnecessary confusion, as these two terms refer to different representations and subsequent uses of input. It may be more accurate to distinguish between detected input, the influence of which does not reach beyond the moment, and intake, the influence of which is potentially lasting.

Tomlin & Villa (1994) define detection as ‘the process by which particular exemplars are registered in memory and therefore could be made accessible to whatever the key processes are of learning, such as hypothesis formations and testing.’ (pp. 192-193). Assuming that ‘memory’ in the above definition refers to ‘working memory’, I see intake as a subset of this detected input, which is accessible (and not merely could be made accessible) to ‘whatever the key processes are of learning, such as hypothesis forming and testing’. Which exemplars or what subset of the detected input becomes intake depends on a large range of factors, including (but perhaps not necessarily) the amount of attention given to that subset of the detected input. This in turn depends on aspects of the input, such as its saliency, on the learner and the state of her interlanguage, and on other, non-cognitive factors such (e.g. motivation).

Intake is thus detected input that goes beyond what is held in working memory for immediate recognition and comprehension. It establishes a link with long-term memory. In case of a subsequent encounter with the particular linguistic phenomenon these links and/or connections

⁹ Sato & Jacobs specify this by suggesting that only detected input that enters certain areas of the brain affect language learning.

are strengthened. This would explain frequency effects (N. Ellis, 2002a, 2002b). The degree to which this happens, again, depends on a large range of factors including the amount of attention paid to the input, the strength of existing connections, as well as learning aptitude etc. As a working definition then, I propose the following:

Intake is a subset of the detected input (comprehended or not), held in short-term memory, from which connections with long-term memory are potentially created or strengthened.

The above is quite similar to how Tomlin & Villa (1994, p. 196) describe what precedes potential acquisition by a learner. They write:

1. The learner must discern the presence of some element of grammatical form.
2. The learner must discern that there is a new or unusual character to the event representation witnessed.
3. The learner must discern that there is a relationship holding between these two levels of grammatical form and mental representation.
4. The learner must send those observations off for further processing (hypothesis formation and testing).

The result of stages 1-3 is intake. However, in an attempt to accommodate connectionist views on acquisition, the working definition includes the possibility of the strengthening of existing knowledge as opposed to the learner discerning only a 'new or unusual character to the event representation'.

Operationalising intake

Intake has been operationalised and measured in a number of different ways. Several authors operationalise intake as a change in performance. Zobl (1985) simply sees changes in a learner's rule output after an exposure session as evidence of intake. Similarly, Rosa & O'Neill (1999) recommend performance measures when attempting to measure intake such as recall protocols, cloze tests, grammaticality judgements, and rule formation, all to be administered soon after the treatment or exposure to the target input. They concede that intake tasks that introduce production as a factor may be inadequate in that 'there is some potential for interference from inappropriately automatized production routines' (p. 286). In their own study they made use of a multiple-choice recognition task. Interestingly Rosa & O'Neill write in a footnote to their 1999 article: 'in order to minimize the possibility of learners performing the posttest on the basis of memorized material, all of the test sentences containing the target structure were different than the sentences included in the treatment task' (p. 549). This appears to measure learning, not intake.

Leow (1993, 1995) also used multiple-choice recognition tasks and gave participants very limited time to complete their tasks, which were administered immediately after exposure.

To measure learners' intake of linguistic items in the input, a multiple-choice recognition assessment task was carefully designed to address only the linguistic item that had been attended to by the learners in the input. The three factors crucial to this assessment task were a) the administration of the assessment task immediately after exposure to the input, b) the limited amount of time learners had to complete the task (cf. Chaudron, 1985), and c) a single, final answer. (1993, p. 337).

The fact that only items that had been attended to by the learners in the input were included in the recognition test may have raised participants' awareness of those items. In a later study (2001a) Leow also made use of think-aloud protocols. In that study he aimed to investigate the effects of awareness on acquisition and recorded correct verbal production of the target form. Chaudron (1985) warns that production measures need to be used with caution as they could cause interference from previous knowledge.

Shook (1994) made use of both production tests (cloze test, sentence completion) and a recognition test (multiple-choice sentence completion) all of which were administered immediately following the exposure. Shook claims that 'it is most improbable that the data collection procedures used could reflect anything except the immediacy of Process I [the input-to-intake stage], and thus this study does not reflect any acquisition of the grammatical input' (p. 85).

The above measures of intake have in common that they attempt to probe beyond what is held in short-term memory (and as such aim to measure intake as opposed to detected input). Likewise, they attempt to avoid measuring (performance based on) previous knowledge. A measure of intake should also avoid measuring acquisition; any measure that requires retention of knowledge for extended periods of time is an indication of knowledge in long-term memory, not intake. Intake tests, then, can only be administered after, but reasonably soon after exposure to the second language. This does not preclude task performance as a measure of intake, however, exposure to the target language (i.e. a listening or reading passage) needs to be separated in time from the activities participants are asked to perform on that input.

Forced recognition tests, grammaticality judgment tests, as well as measures containing a degree of production, including fill-in-the-gap, jumbled sentences tests etcetera, are all potentially valid measures, despite their individual drawbacks (provided they are administered not too long after exposure to the input). However, more subtle measures such as the forced recognition tests, are more likely to be sensitive to intake in the early stages of the learning process. Measures requiring production need to be used with care. Free production, and measures such as fill-in-the-gap without multiple-choice options are more likely to measure integrated knowledge, and can sometimes be awareness-raising. Verbal protocols can help to provide an additional measure of intake and can act as a comparison with performance measures.

Conclusion

Although there are great differences in the various positions researchers have taken in relation to the roles of input, output, interaction, and intake in second language acquisition, there is certainly also considerable agreement. First, there appears to be a consensus that language learning cannot take place without input (although, as mentioned above, input can affect the development of aspects of the language not contained in the input itself). There appears to be a reasonable degree of consensus that certain types of input are more favourable to learning than others, and that input at the very least has to be *comprehensible*. A range of characteristics of the input determine what is acquired (within the constraints of a predetermined developmental order) and a manipulation of those can affect learning. There is evidence, at least for second language learning, that both output and interaction to some extent facilitate learning, either through the provision of more comprehensible input, or by drawing attention to certain aspects of the input, or the learner's own output.

Of all the information available to the learner, only some remains. This is where the road forks. Connectionists (cf. Plunkett & Elman 1997). argue that information that is not detected is discarded, but all information that is detected, affects the learner's developing system. It is unclear what the role of intake in such a system is, if indeed there is any; it is perhaps telling that I was unable to find a clear account in the literature of how such a process would fit into a connectionist approach (but see N. Ellis 2002a, 2002b, for a discussion of the role of noticing in essentially frequency drive implicit learning). Many second language researchers working from an information-processing perspective view this differently: information may be detected but that does not mean that it has any lasting effect. It can be used for communication purposes or be lost before it is stored. Although this group of researchers holds very different views on the exact process affecting what information is incorporated and what is not, they do appear to agree that there is a level of processing that takes place on the input, that determines whether aspects of it may potentially be learned or not. Some have labelled one or more of the various stages in this

processing as 'intake' (one exception appears to be Carroll, for whom intake equals something more akin to input, as defined by most other second language researchers), others (e.g. Sharwood Smith) appear to be talking about this stage without using the same term. Leow points out that the concept is useful to have and apply: 'the distinction between input and intake has theoretical value because it proposes that there is at least one intermediate stage of input processing through which the input second language learners receive must pass before any or all of it can become part of learners' developing linguistic system' (1993, p.334). Although some refer to the actual processing as intake, others to its product, and yet others to both, investigating this processing or its product is crucial in understanding how input becomes part of a learner's system.

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