While the majority of work in communication disorders has focused on English, there has been a growing trend in recent years for the publication of information on languages other than English. However, much of this is scattered through a large number of journals in the field of speech pathology/communication disorders, and therefore, not always readily available to the practitioner, researcher and student. It is the aim of this series to bring together into book form surveys of existing studies on specific languages, together with new materials for the language(s) in question. We also have launched a series of companion volumes dedicated to issues related to the cross-linguistic study of communication disorders. The series does not include English (as so much work is readily available), but covers a wide number of other languages (usually separately, though sometimes two or more similar languages may be grouped together where warranted by the amount of published work currently available). We have been able to publish volumes on Finnish, Spanish, Chinese and Turkish, and books on multilingual aspects of stuttering, aphasia, and speech disorders, with several others in preparation.

Full details of all the books in this series and of all our other publications can be found on http://www.multilingual-matters.com, or by writing to Multilingual Matters, St Nicholas House, 31-34 High Street, Bristol BS1 2AW, UK.
4 Comprehension of Exhaustive Wh-Questions

Petra Schulz

Introduction

Exhaustivity is a central feature of the semantics of wh-questions like ‘Who is reading a book?’, ‘Who is eating what?’ or ‘Who is giving what to whom?’. Under an exhaustive reading of a wh-question, the answer exhausts the relevant set of elements satisfying the predicate. This is also referred to as the mention-all-reading. For example, in a situation in which Jane, Sue and Peter are reading a book, the exhaustive answer to ‘Who is reading a book?’ is ‘Jane, Sue and Peter’ and not just ‘Peter’. Presumably, exhaustive wh-questions exist in all languages, and the rules for their interpretation seem to be universal. There is, nevertheless, cross-linguistic variation regarding the availability of multiple wh-questions as well as the type of wh-movement and the presence of overt exhaustivity markers. The exhaustivity task described in this chapter assesses the interpretation of several types of exhaustive wh-questions. Data from about 400 five- and six-year-old typically developing (TD) children across 19 languages coming out of two EU projects (COST Action A33, COST Action IS0804) support the hypothesis that acquisition of this structure is cross-linguistically robust, with mastery of single wh-questions such as ‘Who is reading a book?’ preceding mastery of multiple wh-questions such as ‘Who is eating what?’ or ‘Who is giving what to whom?’.

Using Krifka’s (2001) structured meaning approach as the framework for our semantic account, we understand question meanings as functions that when applied to the meaning of the answer yield a proposition. In this approach, wh-expressions such as ‘who’ denote atomic individuals and plural individuals, marked by the plurality operator ‘∗’, who all belong to the domain of human beings, expressed as PERSON, as illustrated in (2):

\[(\text{[who]} \rightarrow \{x \mid x \in \text{PERSON}\})
\] = \{Jane, Sue, Peter, Sue+Jane, Peter+Sue, Peter+Jane+Sue,\ldots\}

Wh-questions denote structured propositions, where the wh-expression (e.g. who) specifies the focused question domain and the remainder of the question specifies the background of the structured proposition:

\[(\text{[Who is reading?]}) \rightarrow \langle \lambda x . x \text{ read}, \{x \mid x \in \text{PERSON}\}\rangle\]

Informally, in the semantic account the default exhaustive reading is derived when the question domain is universally exhausted; a mention-some reading is derived from an existential quantification over the question

This chapter is organised as follows: the first section provides an overview of the phenomenon of exhaustivity in wh-questions and of central findings on its acquisition in TD monolingual and bilingual children and those with SLI. The motivation for the particular task design is described in the second section. After outlining considerations in using the exhaustivity task with bilingual children in the third section, the following section describes the task in detail including issues of procedure and scoring. The concluding section offers suggestions for adopting this task to other languages.

Exhaustive Wh-Questions and Their Acquisition

Exhaustive wh-questions across languages

The rules for interpreting exhaustive wh-questions seem to be uniform across languages. In general, to know the meaning of a question is equivalent to knowing what counts as an answer (Hamblin, 1975). Following the semantic account outlined in Schulz and Roepel (2011), wh-expressions are ambiguous, with the exhaustive interpretation being the default in a more-than-one-answer context. For example, in a situation in which Jane, Sue and Peter are reading, in the default case question (1a) has to be answered with the exhaustive list in (1b) rather than with the singleton list in (1c).

\[(1) \begin{align*}
(a) & \text{ Who is reading?} \\
(b) & \text{ Jane, Sue and Peter.} \\
(c) & \# \text{ Jane.}
\end{align*}\]

Using Krifka’s (2001) structured meaning approach as the framework for our semantic account, we understand question meanings as functions that when applied to the meaning of the answer yield a proposition. In this approach, wh-expressions such as ‘who’ denote atomic individuals and plural individuals, marked by the plurality operator ‘∗’, who all belong to the domain of human beings, expressed as PERSON, as illustrated in (2):

\[(\text{[who]} \rightarrow \{x \mid x \in \text{PERSON}\})
\] = \{Jane, Sue, Peter, Sue+Jane, Peter+Sue, Peter+Jane+Sue,\ldots\}

Wh-questions denote structured propositions, where the wh-expression (e.g. who) specifies the focused question domain and the remainder of the question specifies the background of the structured proposition:

\[(\text{[Who is reading?]}) \rightarrow \langle \lambda x . x \text{ read}, \{x \mid x \in \text{PERSON}\}\rangle\]

Informally, in the semantic account the default exhaustive reading is derived when the question domain is universally exhausted; a mention-some reading is derived from an existential quantification over the question
domain. The exhaustivity feature that is needed to yield the exhaustive reading could be modelled in different ways. Following Nelken and Shan (2004) and Nishigaushi (1999), we assume that the wh-element in questions contains a variable that is universally quantificational in nature.

Regarding multiple wh-questions, in a situation in which Jane, Sue and Peter each ate something, the paired wh-question (4a) requires an exhaustive paired list (PL) answer as in (4b) and not a single pair (SP) answer as in (4c). Finally, triple wh-questions like (5) require exhaustive triple list answers as in (5b) and not just one triple as in (5c). Importantly, complete answers to multiple wh-questions require exhausting the domain of pairs or triples; i.e. they require forming the respective pairs and triples and universally exhausting the question domain. Put differently, in most languages multiple questions generally presuppose that there is more than one answer and hence an SP answer is ruled out (Krifka, 2001). If pairing or tripling does not take place, non-target-like exhaustive lists of individuals may be formed, as illustrated in (4d) and (5d) with subject lists, marked as #.

(4) (a) Who is eating what?
    (b) Jane (ate) an apple, Sue a banana and Peter a hamburger.
    (c) # Jane an apple.
    (d) # Jane, Sue and Peter.

(5) (a) Who is giving what to whom?
    (b) Jane is giving a book to Sue, and Peter a necklace to Amanda.
    (c) # Jane is giving a book to Sue.
    (d) # Jane and Peter.

PL answers are derived semantically as follows. The multiple wh-question is answered via a function, i.e. a mapping procedure from a given domain to values. The multiple wh-question (4), repeated here as (6), is transformed by the operators in (7) to a question that asks for a mapping procedure (Krifka, 2001: 23):

(6) Who is eating what?
    (a) $\lambda x.y.\left\langle eat(y)(x)\right\rangle$, person $\times$ thing

(7) (a) $\text{FUN}(R) = \lambda f x. [x \in \text{DOM}(f) \rightarrow \text{R}(\langle x, f(x) \rangle)]$, the set of functions $f$ such that every $x$ in the domain of $f$ stands in the $R$-relation to $f(x)$
    (b) $\text{FUN}(A \times B) = \text{the set of functions from } A \text{ to } B$

The answer specifies a function by enumeration, such as 'Jane an apple', 'Sue a banana', and 'Peter a Hamburger', as illustrated in (8):

(8) $f$: {Jane, Sue, Peter} $\rightarrow$ {apple, banana, hamburger},
    Jane $\rightarrow$ apple
    Sue $\rightarrow$ banana
    Peter $\rightarrow$ hamburger

In the default case, single wh-questions (1) as well as multiple wh-questions (4) and (5) are assumed across languages to contain an underlying universal quantifier, triggering the exhaustive interpretation (cf. Schulz and Roeper [2011] for a summary of the various accounts).

In contrast to their uniform interpretation, wh-questions exhibit cross-linguistic variation with regard to their syntactic and lexical properties (Boškovic, 2003; Dayal, 2005; Grohmann, 2008; Hagstrom, 2008; cf. Schulz et al., in prep. for a discussion). First, while single wh-questions as in (1a) are present in all languages, in some languages like Irish and Italian multiple wh-questions like (4a) and (5a) are not allowed. Second, some languages employ quantifying question particles such as 'allemaal' in Dutch, 'all' in Irish English, 'ne‘e’ in Hausa, and 'alles' (all) in German, which function as exhaustivity markers in wh-questions, as illustrated in (9) (cf. Zimmermann, 2007).

(9) Wer sitzt alles auf einem Stuhl?
    Who sits all on a chair?

Third, in some languages plural marking on the wh-pronoun and/or on the verb can be used to signal a non-singleton reading. In Turkish for example, the wh-pronoun itself can be marked for singular or plural, as illustrated in (10) (Grimm et al., 2010). In Dutch, the verb can be marked for singular or plural, even though the subject wh-pronoun is singular, as shown in (11a) and (11b) (Hollebrandse, 2003).

(10) (a) Kim sandalyede oturuyor?
    Who_SG sits on a chair
    (b) Kimler sandalyenin üzerinde oturuyor?
    Who_PL are sitting on a chair

(11) (a) Wie leest er een boek?
    who reads_SG a book
    (b) Wie lezen er een boek?
    who read_PL a book

Fourth, wh-questions differ regarding wh-movement. They may require fronting of all wh-words (e.g. Bulgarian, Polish, Romanian, (12)), or fronting of one wh-word (e.g. German, English, Hebrew), or may require the wh-words to be left in situ (e.g. Japanese). Interestingly, these differences do not result in different interpretations.

(12) Kto co je?
    Who what eats
    'Who is eating what?'
Finally, although in most languages wh-elements seem to be used only for question formation, in some languages like German several wh-elements are homophones between question-words and indefinites, as illustrated in (13) for the object wh-word. In German, stressing the wh-element, expressed via capitals, disambiguates the meaning.

(13) (a) Wer istt WAS?
    “Who is eating what?”
(b) Wer istt (et)was?
    “Who is eating something”

Acquisition of exhaustive wh-questions across languages and acquisition types

Investigation of the acquisition of exhaustivity in wh-questions originated with Roepfer and de Villiers’ (1991) pioneering study on multiple wh-questions, looking at monolingual English TD children. Using a question-with-picture task, Roepfer and de Villiers (1991) found that while adults consistently responded to multiple wh-questions like (4) with exhaustive paired lists, 4- to 6-year-olds did so in about 80% of the cases and younger children in only 30% of the cases. Subsequent studies in English, Spanish, German and Swiss-German confirmed that the exhaustivity property of wh-questions is recognised by TD children around age 5–6 (Gavarró et al., 2010; Heizmann, 2012; Hollebrandse, 2003; Oiry & Roepfer, 2009; Penner, 1994; Pérez-Leroux, 1993; Roepfer & de Villiers, 1991; Roepfer et al., 2007; Schulz & Roepfer, 2011; Stangen, 2008; Wojtecka, 2010).

The exhaustivity task, used in COST Actions A33 and IS0804, assesses the interpretation of single, paired and triple exhaustive wh-questions. Up to now, data from 415 four- to six-year-old TD children across 19 languages have been collected (Afrikaans, Basque, Catalan, Cypriot Greek, Danish, Dutch, English, Estonian, French, German, Greek, Hebrew, isiXhosa, Polish, Portuguese, Romanian, Swedish and Turkish). The results confirm the hypothesis that acquisition of this structure is cross-linguistically robust, with mastery of single wh-questions (around age 5) preceding mastery of multiple wh-questions (around age 6) and no difference between paired and triple wh-questions (for cross-linguistic comparisons: Schulz, 2010a, 2013b; Schulz et al., in prep.; for specific languages, cf. also Forys, 2013; Haznedar et al., 2012; Koch et al., 2012; Southwood, 2011, 2013; Vuksanović et al., 2012). Cross-linguistic uniformity was also found regarding the most frequent non-target answers: singleton responses as (1c) to single and multiple wh-questions, and exhaustive lists of subjects or objects to multiple wh-questions as (4d) and (5d). These error types indicate that the underlying universal quantifier(s) (and mapping procedure) were not taken into consideration when interpreting the question (cf. Schulz & Roepfer [2011] for details).

Most importantly, results from several studies indicate that exhaustivity in single and especially in multiple questions is problematic in monolingual children with SLI (Afrikaans: Southwood, 2011; English: Roepfer, 2004; French: Chondrogianni & Roesch, 2012; German: Schulz, 2013c; Schulz & Roepfer, 2011; Serbian: Vuksanović et al., 2012), confirming that SLI can also affect the domain of sentential semantics (cf. Schulz, 2010b). Recently, studies initiated by COST IS0804 have been started with bilingual TD and SLI children who are acquiring typologically diverse languages as their first language (L1) combined with typologically different second languages (L2s) (e.g. Hungarian L1 and Serbian L2, Russian L1 and Hebrew L2, English L1 and French L2, Arabic L1 and French L2, Turkish L1 and German L2). Bilingual TD children have been found to master single and multiple wh-questions about a year later than their monolingual peers, which is expected given their often later age at onset of acquisition. However, bilingual TD learners differed from bilingual children with SLI who showed persistent difficulty with exhaustive wh-questions (Armon-Lotem et al., 2013; Prévost 2012; Schulz, 2013b, 2013c; Vuksanovic & Bjekic, in prep.). In sum, evidence available to date seems to indicate that exhaustivity in multiple questions is problematic in bilingual SLI, just as in monolingual SLI.

Motivation for the Particular Task Design

The task aims at tapping into children’s understanding of single and multiple wh-questions that require an exhaustive reading. Developed first for German, the exhaustivity task was then adopted in the COST Action A33 successfully for 13 different languages and tested with 5-year-old monolingual TD children. In the COST Action IS0804 it was used with monolingual and multilingual TD and SLI children aged 4–10 from language backgrounds as diverse as Hebrew and isiXhosa. The task employs the method of question-with-picture (cf. Schulz & Roepfer, 2011). A child sees a picture and simultaneously hears a question to which he/she has to respond verbally. The simultaneous presentation of picture and test question enables the child to access the visual information while processing the question and planning the response.

Construction of the exhaustivity task

In constructing the task, the underlying structure of the event depicted, the wording of the wh-questions and the pictures were carefully
controlled. First, all events involve six individuals some of whom share a
certain property like EAT AN APPLE, while others are not involved in any
visible activity. This contrast makes the task as easy as possible in terms of
visually processing the depicted actions. To achieve comparability across
items, all items show a one-to-one mapping between the individuals
having the property being asked about in the wh-question and the
object(s) participating in the activity. Across all wh-questions, pictures
were constructed so that the answer lists would not contain the same
object twice or contain objects from the same category. This served to
avoid collective answers. For the paired question ‘Who is eating what?’,
for example, the picture shows a girl, mom, dad and grandma eating an
apple, ice cream, a banana and a piece of cake, respectively, in contrast
to all of them eating an apple or all of them eating some type of fruit.
In the test items, the number of individuals having the property in question
varies between two and five out of the total of six. This variation ensured
that children could not develop guessing strategies, such as listing all
individuals in the picture or consistently responding with the same number
of individuals. Results from this task as well as from the similar task
used in Schulz and Roeper (2011) indicate that the number of individuals
that have to be listed by the child does not influence his/her response
patterns in any systematic way. In other words, children did not tend to
give exhaustive list answers depending on the number of individuals, with
small numbers favouring exhaustive lists. Note that this is contrary to the
purely cognitive hypothesis that processing load associated with the
need to produce longer lists would lead to avoidance of exhaustivity. In
addition, a previous version of this task (Stangen, 2008; cf. summary in
Schulz & Roeper, 2011) tested whether changes in the absolute number
of individuals across pictures influence children’s response behaviour.
In that design, there were between three and six individuals of whom
between two and four shared the property under question. In the multiple
wh-condition, pictures displayed between two and four individuals sharing
the same property. It was found that these changes did not influence
children’s response patterns: a smaller answer list did not alter children’s
willingness to give exhaustive responses, and a larger answer list did not
lead to repeating elements (single items, pairs, triples) of the list or leaving
some elements out.

Second, wording of the test questions was carefully controlled. The
range of wh-words used in the wh-questions was limited to achieve
comparability across items. All wh-questions are subject-questions or –
in case of multiple questions – contain as the first wh-word a subject.
Multiple wh-questions contain as the second (or third) wh-word ‘what’,
‘where’ and ‘(to) whom’, which in English function as direct and indirect
objects, marked as accusative and dative. Note that superiority effects
were not tested in this design; therefore, the order of wh-words was
always wh-subject and wh2-non-subject. There is general cross-linguistic
consensus that object-questions are more difficult and are acquired later
than subject-questions in TD monolingual children and those with SLI
(e.g. Friedmann & Novogrodsky, 2011; Schulz, 2013c), and in multilingual
children (cf. Schulz [2013a] for early L2 learners of German). Therefore,
subject wh-questions are used rather than object wh-questions to avoid
additional complexity. Moreover, as complex wh-phrases have been
found to be more difficult and to be acquired later in TD children and
those with SLI (Friedmann et al., 2009; Friedmann & Novogrodsky, 2011),
wh-words rather than complex wh-phrases like ‘which person’ or ‘which
people’ are used throughout the test items. In this way, interference with
additional factors like complexity of wh-words is avoided. All verbs used
in the wh-structures are inflected for present tense (or present progressive,
depending on the particular language). They require one or two arguments
(e.g. feed, build, show, give) and fall into different semantic classes: stative
(e.g. have), process (e.g. play) and telic (e.g. sell). Moreover, the verbs used in
the stimuli met the following criteria: They were easy to illustrate within a
one-picture set-up, and they are part of the lexicon of pre-schoolers. Finally,
minimal verbal discourse contexts were given before each question to make
the wh-question felicitous. As a lead-in, general questions like ‘Look, what
is happening here?’ were used. More specific introductory sentences like
‘Look, they are hungry’ before asking ‘Who is eating what?’, used by Schulz
and Roeper (2011), were avoided in order to not prompt the child with the
plural of verb and pronoun.

Third, the pictures were designed in a way to minimise children’s burden
of processing the visual scenes. Each picture displays several family
members involved in everyday activities. Family members, referred to
with generic terms (mother, father, grandfather, grandmother, boy, girl),
rather than individuals with real names or characters that differed across
pictures, were chosen to minimise memory effects. The characters are
portrayed in a way to facilitate recognition of their family member role.
Hence, stereotypical role models were chosen that in both COST Actions
proved acceptable and identifiable across different cultural settings found
in the 17 countries in which the task has been used so far. Similarly, the
actions depicted in the scenes and referred to in the wh-questions involve
everyday activities like eating, drinking and bike riding, and were chosen
with the aim of being easily visually identifiable and known in different
cultural settings.
Considerations in Using the Task with Bilingual Children

The exhaustivity task can be used with bilingual children of different acquisition types (simultaneous, and sequential, with different ages at onset of acquisition of L2). As described above, attempts were made to keep language demands beyond the phenomenon under investigation to a minimum. A vocabulary check has been added, which contains all objects that are used in a given question or are needed to answer test questions (n=40). This vocabulary check does not serve as a pretest; rather it can be used to ensure that the child knows the object words and is familiar with the way objects like BIKE or BUTTERFLY are depicted in the main task. The child is asked to name objects one by one. In order to keep track of how many objects the child can name at the first round, the experimenter may count the number of known items. If a child does not know an object or its name, the experimenter supplies the correct answer and then presents the child again with the picture.

The exhaustivity task can be administered in one or all of the child’s languages. As in other multilingual test contexts, it is crucial that the experimenter addresses the child only in the language being tested to facilitate a monolingual communication mode. Code-switching or responses in the other language may be noted separately as they may shed light on the child’s language dominance or lexical gaps. However, for quantitative analyses, we evaluated those responses together with responses in the tested language. One reason is that in our experience, code-switching and non-target language responses rarely happen in ‘monolingual mode’ test situations.

Description of the Exhaustivity Task

Materials

In the main test, the question-with-picture method is used. As illustrated in Table 4.1, there are four conditions: single wh-questions, paired wh-questions, triple wh-questions and single wh-ALL-questions. The items are ordered in a block design to avoid interference between the different test conditions and to ensure comparability across languages: In languages without multiple wh-questions like Italian or without overt lexical exhaustivity markers like French, the experiment ends after Part A-1 and Part A-3, respectively. Part A contains 20 test items and 10 control items. Part B contains eight test items and four controls. Within a block, test and control items are presented in a random but fixed order.

<table>
<thead>
<tr>
<th>Part</th>
<th>Condition</th>
<th>No. of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>Single wh</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Single wh controls</td>
<td>4</td>
</tr>
<tr>
<td>A-2</td>
<td>Paired wh</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Paired wh controls</td>
<td>4</td>
</tr>
<tr>
<td>A-3</td>
<td>Triple wh</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Triple wh controls</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>Single wh-allees</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Single wh-allees controls</td>
<td>4</td>
</tr>
</tbody>
</table>

Typical test items for single wh-questions and single wh-allees-question are illustrated for German in (14) and Figure 4.1.

(14) Guck mal, was ist denn hier los?
‘Look, what is happening here?’
(a) Wer hat einen Fußball?
who has a soccer ball
‘Who is holding a soccer ball?’
(b) Wer hat alles einen Fußball?
who has all a soccer ball
‘Who (all) is holding a soccer ball?’

Figure 4.1 Example picture for a single wh-question (Who is holding a soccer ball?)

Typical test items for paired wh-questions are given in (15) and Figure 4.2 and triple wh-questions are given in (16) and Figure 4.3, respectively.
granddad, grandmother/ grandma, boy, girl to minimise memory effects. In
the single wh and the single wh-alles test conditions, there are always six
individuals of whom between two and five share the property in question,
such as holding a soccer ball. This variation ensures that children cannot
easily develop guessing strategies, such as consistently responding with
the same number of individuals or listing all individuals in the picture. The four
single wh control items require a singleton answer and serve to prevent the
child from assuming that he/she always has to respond with more than
one individual. Recall that all wh-questions contain as the first wh-word
a subject. As single subject wh-questions are mastered around age 5–4, the
single wh control items should not pose any difficulties; children could
assume a gap or a variable to answer with the correct subject. In the paired
wh test conditions, the pictures display six individuals of whom between
two and five share the same property such as eating something or reading
something. The four paired wh control items (e.g. Who is building what?)
depict six individuals as well, one of whom is engaged in the activity in
question, such as building something, requiring an SP answer like ‘The
boy is building a tower’. Likewise, in the triple wh test conditions, six
individuals are depicted, of whom between two and four are sharing the
property in question like giving something to somebody. In the two triple
wh controls (e.g. Who is putting what where?), one individual is engaged
in the activity in question, requiring a single triple response like ‘Mom
is putting the fork on the table’. Even though in most languages multiple
wh-questions semantically presuppose a list answer (cf. Krifka, 2001), the
paired and triple wh control items are included to prevent the child from
assuming that he/she always has to respond with more than one pair or
triple, respectively. Note that, unlike single wh controls, paired and triple
control items were not expected to be mastered by all children around age
4, as more than one variable or gap has to be represented.

Procedure

Each of the participants is tested individually in a quiet room. If
children receive both parts of the experiment, two sessions are needed that
are about one week apart. In Session 1, children receive the pictures of all
family members, the vocabulary check and Part A of the main experiment.
In Session 2, Part B of the main experiment is administered. All sessions
should be audio- or ideally video-recorded for later data check against the
on-site coding and for further individual analyses.

All pictures are integrated in a PowerPoint presentation, shown typically
on a portable computer. The experimenter shows the child one picture at a
time and then asks the test question while the child is looking at the picture.
The child is encouraged from the very beginning to respond verbally rather
than by pointing, because pointing is possible as a response to single, but
not to multiple wh-questions. As usual, no response-contingent feedback is
given by the experimenter. Importantly, the child should not be prompted after giving his/her initial response, e.g. by asking ‘And who else?’ or ‘And what are they eating?’ Repetition of the test question is allowed if the child does not react or is not concentrating on the task. If the child corrects himself/herself, scoring is based on the self-corrected response.

In order to guarantee comparability across experimenters, a script was created for how to introduce the different parts of the experiment. In addition, to motivate younger or shy children to cooperate a story context was developed centred around a dog that likes taking pictures of his host family and now needs the child to explain the pictures to him. The dog-story context may be left out; all other prompts are obligatory. (17) illustrates the complete script:

(17) Exhaustivity script
This is x (name of dog or other animal puppet). He is pretty young and he lives with family Y. He brought some pictures from the family on the computer. Let’s look at them, ok?
(a) Introduction of test figures
Look, here’s a girl. Here’s a boy, etc. (E. shows the child the pictures of the single family members). Look, here they are all together (E. shows the family picture and points). This is …? (child should name the person)… and this is… ?, etc.
(b) Vocabulary check
Look, these are all things that family Y has. What is this? (E. points)
(c) Main test
Family Y lives in a house with a garden. They do lots of different things together, and sometimes the things they do are a little funny. X lives there and likes taking pictures. Because he is so young, he doesn’t always understand what is going on. He brought more pictures and would like to look at them with us. I’m sure he has questions about every picture. He recorded/wrote down the questions because he is a little shy and because he didn’t want to forget any of the questions. He really wants to know what his family is doing there. Let’s look at the picture together, ok?
(d) Lead in for each picture
Oh, look, what are they doing here? or Look, what is happening here? (i.e. the family characters, activities or objects are not verbally introduced).

The wh-questions should be spoken at the same pace and with the same prosodic marking (with stress on each of the wh-words) throughout the experiment. Therefore, all test stimuli may be pre-recorded and checked for pace and intonation, or – if this is not feasible – experimenters need to practice phrasing the wh-questions.

Coding
Children’s responses are coded as correct when they contain the required lists of individuals, pairs or triples, depending on the test condition. Thus, grammatical errors like incorrect case marking or inflections, missing determiners, etc., are not counted. Likewise, responses where the verb or the referent names have been altered do not lead to classification as incorrect as long as the event referred to remains identifiable. Furthermore, note that in single wh-questions no difference was made between verbal responses and non-verbal responses via pointing. Table 4.2 summarises

<table>
<thead>
<tr>
<th>Table 4.2 Types of correct responses to the test items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
</tr>
<tr>
<td>Single wh (+wh-all)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Paired wh</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Triple wh</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

cf. Schulz and Roeper (2011: 396)
the most frequent types of responses coded as correct, illustrated with examples (1), (4) and (5).

In principle, responses can be incorrect in many different ways. However, results from previous versions of this experimental design (cf. summary in Schulz & Roeper, 2011) as well as data from the design described here across typologically different languages provide robust evidence that children’s non-target-like responses fall into distinct categories. As for single wh-questions, children may answer by naming one individual rather than by giving the exhaustive list; this is referred to as a singleton response. Rarely do children list more than one but not all individuals; this is referred to as a plural response. Children who have not yet mastered paired wh-questions typically respond with exhaustive lists of subjects, like ‘the girl, dad, grandma, mom’ in response to the question ‘Who is eating what?’ (cf. Figure 4.2). In some cases, exhaustive lists of objects are given; in our example, ‘apple, banana, cake and ice cream’. Both response types show that children have acquired universal quantification over one wh-variable, but not over two. Formulated in terms of Krifka’s (2001) structured meaning approach, the mapping procedure from a given and identifiable domain to values is not in place, but the universal quantifier exhausting either the domain or the range is. Children who have not mastered universal quantification respond with singleton answers, restricted to the subject (e.g. the girl) or the object (e.g. an apple). One pair responses, pointing to mastery of pairing, i.e. the mapping function, without mastery of universal quantification, like ‘the girl is eating an apple’, are rarely given. Incorrect responses to triples fall mainly into the same categories as described for paired wh-questions: exhaustive lists of subject, of direct or indirect objects or one singleton answers, naming one subject, direct or indirect object.

How to Adopt This Task to Other Languages

When adopting the exhaustivity task in a different language, language-specific properties of exhaustive wh-questions in that language have to be considered as well as what is already known about the language abilities of bilingual (un)impaired children in that language.

While the interpretation of exhaustive wh-questions seems to be cross-linguistically robust, as sketched in the first section, their form systematically differs across languages in several respects. First, the range of wh-question types allowed in a language varies. Paired and triple wh-questions may be ungrammatical, as in Italian and Irish English. In that case, Parts A-2 and A-3 cannot be used. If conjoined wh-questions (e.g. Who is eating and what [is he eating]?) are preferred over multiple wh-questions, it is crucial to clarify whether this is due to grammaticality or to preference issues, as has been suggested for example for Xhosa (Frenette Southwood, p.c.). Likewise, in languages without overt exhaustivity markers like Standard English, Part B cannot be used. However, in languages with plural wh-pronouns like ‘which ones’ (e.g. Turkish, Russian), Part B can be used with these structures, combined with either a plural or singular verb, depending on the language. Second, the type of wh-movement (overt or covert, fronting of one of all wh-pronouns) determines the serialisation of the wh-pronoun(s) in the sentence. Consequently, in languages with multiple fronting like Polish, the question ‘Who is eating what?’ is translated as shown in example (12) in the first section. Third, in most languages obligatory subject–verb agreement regarding number exists between wh-pronoun subject and the verb. In that case, both should be marked for singular to avoid priming non-singleton responses. However, in some languages like Dutch, a singular wh-pronoun subject can occur with both a singular and plural verb. In that case, Part A may be administered with singular marking to ensure comparability across languages, and Part B may be used with verbs with plural marking. Finally, in a few languages like German, some wh-elements are homophonous with the respective indefinite pronouns. The potential ambiguity arising for the non-fronted wh-elements (e.g. Who is eating what? vs Who is eating something?) can be avoided by stressing these words.

If little is known about how to interpret exhaustive wh-questions in a given language, the adaptation should first be administered to a control group of adults, who are expected to perform at ceiling. In the bilingual settings tested so far, i.e. early successive language learners with an age of onset of around 3 years and simultaneous bilinguals, the task proves suitable for ages 5–10. Our results suggest that multiple wh-questions are as problematic for bilingual SLI children as they are for monolingual children with SLI.

In conclusion, the attested vulnerability of exhaustivity in SLI together with its cross-linguistically robust acquisition path makes this structure a very good candidate for disentangling typical from impaired bilingual acquisition. Furthermore, research on exhaustivity in wh-questions may add to the evidence already available that SLI can also affect the domain of sentential semantics (cf. Schulz, 2010b).

Acknowledgements

The research reported here has been supported by COST Action IS0804 ‘Language impairment in multilingual societies: Linguistic patterns and the road to assessment’, by COST Action A35 ‘Crosslinguistic robust stages of children’s linguistic performance with application to language assessment’ and by the project MILA at the Research Center IDEA, funded by the LOEWE programme for excellence from the State of Hesse. I thank the working group members of both COST Actions for their valuable support, both theoretical and practical, that led to adoptions of this task in diverse languages, especially Anna Gavarro, Philippe Prévost and Naama Friedmann.
I also thank all researchers who used the exhaustivity task and shared their data and insights with me (Reli Argus, Larisa Avram, Sharon Armon-Lotem, Jovana Bjekić, Vasiliki Chondrogianni, Joao Costa, Marie-José Ezeizabarrena, Malgorzata Foryś, Naama Friedmann, Sharon Garner, Anna Gavaro, Angela Grimm, Kleanthes Grohmann, Ewa Haman, Belina Haznedar, Bart Hollebrandse, Kristine Jensen de Lopez, Maria Kambanasos, Napoleon Katsos, Corinna Koch, Maria Lobo, Natalia Meir, Michaela Nerantzi, Fernanda Pratas, Philippe Prévost, Athina Skordi, Anne Rösch, Rabea Schwarze, Irena Shnaiderman, Magdalena Smoczynska, Frenette Southwood, Laurie Tuller, Ianthi Tsimpli, Angeliek van Hout, Heather van der Lely, Spiridoula Varlokosta, Jasmina Vukasanovic, Christian Waldmann, John Weston and Magdalena Wojtcka). Finally, I thank the reviewer and the editors for helpful suggestions. I am indebted to Tom Roepert with whom I developed various versions of the exhaustivity task and who encouraged its cross-linguistic adoption. Thanks to Magdalena Wojtcka who created the pictures.

Note
(1) Note that in most languages, multiple wh-questions like (4a) are not felicitous in SP contexts, and hence never allow SP answers like (4c) (Bošković, 2003; Grohmann, 2002, 2003; Hagstrom, 1998). However, in Serbo-Croatian, Japanese (Bošković, 2003) and Malayalam (Grebenyova, 2006), multiple wh-questions have been argued to be felicitous in both PL and SP contexts, hence allowing SP answers like (4c) in an SP context.

References
5 Sentence Repetition
Theodoros Marinis
and Sharon Armon-Lotem

Introduction
Sentence repetition (SRep) tasks have been shown to be very sensitive and specific in identifying children with language impairment in monolingual populations (Conti-Ramsden et al., 2001) among others. Sensitivity measures the proportion of children who have language impairment and score very low in a specific task; specificity, in contrast, measures the proportion of children with typical language development (TLD) who do not score low in a specific task. Poor sensitivity may lead to under-diagnosis of specific language impairment (SLI), whereas poor specificity may lead to over-diagnosis. In a seminal paper, Conti-Ramsden et al. (2001) showed that sentence recall from Clinical Evaluation of Language Fundamentals 3 (CELF-3) (Semel et al., 1995) had 90% sensitivity and 85% specificity, much higher than measures for non-word repetition (78% sensitivity, 87% specificity), past tense (74% sensitivity, 89% specificity) and third singular -s (63% sensitivity, 90% specificity). These figures illustrate nicely that SRep tasks are more challenging for children with language impairment than other tasks and this is why 90% of children with language impairment score below the cut-off point. At the same time, they are more challenging for some children with TLD as well and this is why 15% of monolingual children with TLD score below the cut-off point, a higher proportion than on all other tasks. If SRep tasks are challenging for some monolingual children with TLD, will bilingual children find them even more challenging if they are tested in their second and non-dominant language?

SRep tasks have been used in bilingual children with variable success when the language tested was the children's second and non-dominant language. Some but not all studies so far have shown the effects of language dominance, age of onset (AoO) and/or length of exposure (LoE). Verhoeven et al. (2012) report language dominance effects on children's SRep performance, while Elin Thordardottir and Brandeker (2015) explore the effect of external factors such as LoE. Armon-Lotem et al. (2011) report that Russian–Hebrew and Russian–German bilingual groups already performed within the monolingual range on SRep tests in Hebrew as a second language.