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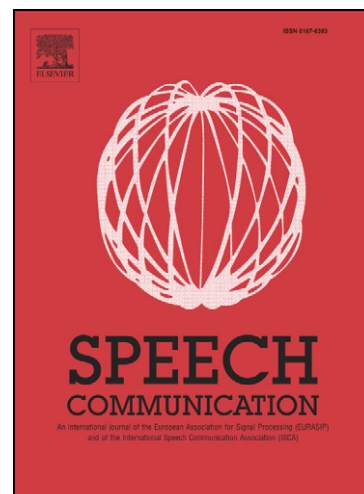
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Title: Developing a test of prosodic ability for speakers of Iberian Spanish

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Abstract:

In the absence of a Spanish prosody assessment procedure, an English one (Profiling Elements of Prosodic Systems - Children: PEPS-C) has been adapted for use with Iberian Spanish speakers. The paper describes the scope, principles and methods of the test and the modifications other than lexical translation that were required to produce a Spanish procedure. Findings from the first studies of data collected using the Spanish test are briefly considered: these suggest crosslinguistic parallels and English/Spanish differences in adult prosodic ability. Lengthier consideration is given to prosodic data from Spanish children and the use of prefinal contrastive accent in the two languages. We conclude that the test is a feasible and valid instrument for assessing Spanish prosodic ability and indicate possible directions for further research.

Keywords: prosody, intonation, test, contrastive accent, Iberian Spanish.

1 Introduction

1.1 *Prosody in relation to communication*

Prosody is the term used here to describe manner of speech and tone of voice, conveying such functions as verbal punctuation, stress, and indications of the speaker's attitude. Atypical prosody has attracted attention in a number of populations with communication disorders, e.g. those with autism, aphasia, schizophrenia or epilepsy (Baauw et al., 2004; Pascual et al., 2005; Sanz-Martín et al., 2006; Wing, 1991). Prosody is seen as contributing to communication problems and to social isolation, particularly when language is limited: prosody has a greater role in short utterances than in speech abounding in cues from rich vocabulary and varied grammatical structures, and in this respect deserves as much attention as, for example, segmental aspects of phonology, on which there has been more focus. Prosody is also important when language skills are generally good: in such cases, unusual prosody can be alienating. There is also reason to believe that prosodic awareness underpins language skills, being necessary for the infant to segment the continuous speech-stream that is the first experience of language (e.g. Jusczyk et al., 1992), and deficit in such awareness may continue to affect language development. Prosody, moreover, has a role in indicating such paralinguistic factors as emotion in speech (e.g. Mozziconacci, 1998) and, pragmatically, the cues of conversational interaction (e.g. Ford and Thompson, 1996). All these reasons suggest that prosody skills should be more widely studied than they are.

1.2 *Assessing prosody skills*

Until recently, there has been a lack of prosody assessment procedures accessible to language researchers and clinicians to enable them to evaluate prosody skills and their role in language development or communication deficit. Researchers in the UK have, however, developed a test, "Profiling Elements of Prosodic Systems - Children", otherwise known as PEPS-C (Peppé and McCann, 2003) that has been used in research projects involving, for example, children with autism (English atypical expressive prosody having been noted in the earliest definitions of this condition: Kanner, 1943; Asperger, 1944). These projects have shown significant differences between the prosody skills of UK English typically-developing children and those with autism (Peppé et al, 2007), as well as showing correlation between prosody and language skills (McCann et al, 2007). The test is available in four different accent-versions of English (UK General, UK Scottish, North American and Australian), and

has been distributed to researchers for the purpose of investigating prosody skills in the wider English-speaking population. To our knowledge, no prosody assessment procedure is available for speakers of Spanish, and the PEPS-C has been adapted for use in Spanish. The test has also been translated into French, Dutch and Norwegian, and there is demand for translations into European Portuguese, Finnish, Russian and Egyptian Arabic, suggesting that there is a similar lack of a prosody test and need for one in these languages also. It is not known, however, whether the principles underlying the English version holds good for other languages.

1.3 Aims

The current paper describes the structure and principles underlying the English PEPS-C, and the process of adapting it for use in Spanish. It reports on the problems of adapting prosody tasks into a different language, and considers, as far as possible, the validity of the test as a procedure for comparing prosodic data across the two languages. We emphasise that the neurotypical data was not collected with a view to crosslinguistic validation of the test, but as control data for specific atypical populations; it nevertheless serves as a basis for the exploration of prosodic development in Spanish children and some preliminary conclusions.

2 Method

2.1 Structure of the test

The PEPS-C test has a psycholinguistic basis, in that it assumes that an ability to discriminate between differences of prosodic forms is necessary to be able to distinguish the functions of prosody conveyed by them; and similarly, that an ability to produce prosodic forms is needed to use prosody expressively. The test therefore seeks to test prosodic ability at the levels of both form (perceptual and motor ability) as well as function (cognitive understanding and expression). It also assesses both receptive (input) and expressive (output) skills.

Existing prosody assessment procedures, e.g. the American PVSP (Shriberg et al., 1990), the British PROP (Crystal, 1982) and the Swedish procedure (Samuelsson et al., 2003) do not test receptive skills. They evaluate expressive prosody by means of recording a sample of speech and agreeing on the perceived communicative functions and forms of the prosody.

There are some disadvantages to such sampling. Firstly, it involves transcription, for which protocols differ and expertise is needed. Secondly, the content of utterances inevitably varies from speaker to speaker, making it hard to establish real equivalence of output and certainly making impossible all but the most general of conclusions to be reached on the basis of acoustic measurement. Finally, it also makes assumptions about the communicative aims of the speakers. The PEPS-C depends instead on elicited utterances for assessment of expressive prosody skills. The content of utterances is stipulated by pictures (a vocabulary test, to establish the labels for the pictures, is completed before testing), and is potentially ambiguous, with the possibility of being disambiguated by prosody. This disambiguating function is described in non-linguistic terms, requiring no ‘meta-prosodic’ skill, e.g. “Correct the speaker” rather than “Stress the word he got wrong”. The resulting data is a set of short utterances, suitable for acoustic analysis, that are minimal pairs in terms of communicative function. The functions are objectively defined and conveyed by prosody alone.

The PEPS-C program delivers pictures successively on a laptop screen both as stimuli for expressive utterances and as response choices to auditory stimuli played by the computer. In input tasks there are only two possible responses to each item, to avoid undue demand on auditory memory; this occasions a high possibility of chance scoring, which means that a relatively large number of items (16 for each task) is necessary for there to be a reasonable band of non-chance scores (> 11 and < 5). For comparison purposes, and because there was also a possibility of producing the right answer by chance, there are also 16 test items in each output task. Because of the relatively wide chance-band, testees were deemed to have reached competence level in a task if their score was at least 12 (75%), rather than 8 (50%). In expression tasks, the competence level was similarly set at 75%.

Information on the performance of typically-developing UK children on the PEPS-C is reported in Wells et al. (2004), and can also be seen in control data for other papers (e.g. Peppé et al., 2006; Peppé et al. 2007). Some of this data is included in figures below for comparison with the Spanish data.

2.1.1 Prosodic Forms, discrimination and imitation

The terms intonation and prosody are both used to describe suprasegmental characteristics of speech. There is controversy about the definition of the individual terms, but for convenience ‘prosody’ has been adopted here as the overarching term. Prosodic characteristics derive from variations in the duration, amplitude and fundamental frequency

(f0) of speech-sounds, and from non-articulatory pauses: these provide the acoustic realisations or exponency of the communicative functions conveyed by prosody, and are thus considered to be the forms of prosody. Although duration, amplitude, f0 and pause each have functions of their own (e.g. variations in syllable-duration/speech-rate alone will give indications of relative urgency) they also, commonly, operate in combination. Thus the acoustic correlates of accent comprise changes in f0 (a perceived step up or down in pitch) as well as extra length and loudness on accented syllables (e.g. Face, 2001; Fry, 1958; Llisterri et al., 2003; Martínez-Celdrán, 1984; Quilis, 1981). PEPS-C assesses ability not only in communicative functions relying largely on variations in intonation (as well as in loudness and pitch-range) - as in the turn-end and affect tasks, see 2.1.2.1 and 2.1.2.2 - but also in functions conveyed by more broadly prosodic combinations involving not only intonation but also syllable timing and place of prominence (i.e. the chunking and focus tasks, 2.1.2.3 and 2.1.2.4). The form tasks test the ability to discriminate between contour differences (Short-item Discrimination) and between the combinations of forms used for phrasing and accent (Long-item Discrimination). As a test of ability to produce a range of prosodic forms, there are Imitation tasks.

2.1.1.1 Auditory discrimination

In the PEPS-C, discrimination is assessed as a same/different task. The stimuli used for the function tasks were recorded using a recording of the laryngeal signal as well as a microphone: there was thus an auditory representation of prosodic forms without lexical information. The microphone recordings (i.e. with lexical and prosodic information) were used for the function input tasks, and the laryngeal recordings (indicating prosody alone) for the auditory discrimination task, thus enabling testers to ascertain truly whether testees could distinguish sameness and difference in the prosodic forms used in the function tasks. Thus an auditory discrimination test item consists of hearing the laryngeal recording of, for example, “lemon” said twice, either with the same intonation both times (same) or with different intonation each time (different). Responses are thus either right (scoring 1 point) or wrong (score 0). Two tasks of this type were included, to test this ability over both short items (one- and two-syllable utterances in English, one to four syllables in Spanish) and long items (six- and seven-syllable utterances in English, seven to ten syllables in Spanish).

2.1.1.2 *Imitation*

In order to gain an impression of prosodic repertoire, or the ability to produce prosodic forms, the testee is required to imitate recorded utterances. These reproduce and extend the range of the forms needed to complete the output function tasks. Thus a testee might hear “lemon” said with exaggeratedly enthusiastic intonation and have to copy not only the word but also the exact way it was said in the stimulus. In imitation tasks there are three scoring options: good (score 1), fair (score 0.5) and poor (score 0).

2.1.2 **Prosodic Functions, receptive and expressive**

The functions of prosody have been categorised as grammatical, pragmatic, and emotional (see e.g., Roach, 2000); the signalling of turntaking in dialogue (e.g. Ford and Thompson, 1996; Couper-Kuhlen and Ford, 2004) can also be considered as a distinct function. These four functions are taken into account in the PEPS-C (see Appendix for instructions and further examples). The same four prosodic functions are also present in and relevant for Spanish prosody.

2.1.2.1 *Interaction (Turnend)*

The interactional function, referred to as Turnend in the PEPS-C, is conveyed by intonation at the end of an utterance, and can determine the kind of response required. A sharply rising tone ending high, usually described as questioning, implies that some contentful response is required, while a falling intonation usually suggests finality, requiring concurrence or acknowledgement (Cruttenden, 1997). As such, the ability to perceive and express this distinction appropriately is instrumental in conducting turn changes in conversation, and is thus an example of the interactional function of prosody. In the PEPS-C task, “lemon” said with a rising tone indicates someone questioning or offering the item, while said with a falling tone it indicates someone stating “lemon”, or reading the word out. In input tasks, responses are right (score 1) or wrong (score 0); in output tasks they are right (score 1) ambiguous (score 0) and wrong (score 0): this scoring is the same for all the function tasks.

In Spanish, the intonation patterns are as in English, i.e. rising and falling intonation at the end of the utterance; these are similarly involved in the expression of questions and

declarations respectively (Beckman et al., 2002; Gil, 1991; Martínez-Celdrán, 1984; Navarro Tomás, 1944; Quilis, 1981; Sosa, 1999).

2.1.2.2 *Emotion (Affect)*

Affective functions include the expression of emotions, or of the speaker's affective state, by use of intonation and variations in factors such as loudness, speech rate and pitch range (Mozziconacci, 1998). These tend to apply to an entire utterance rather than a few syllables of it. For example, an utterance said with prosody suggesting positive affect will generally have a wider and higher pitch range than one said with prosody suggesting negative affect (Banse and Scherer, 1996). Tasks addressing this function in the PEPS-C are designated Affect and the instance of affective function used in the test is the difference between liking or disliking items of food. For example, "lemon" said with wide pitch-range would indicate liking.

In the Spanish language, intonation can be considered as one of the main vehicles conveying the emotions or affective states of the interlocutor (Navarro Tomás, 1944; Quilis, 1981). Different parameters, such as fundamental frequency (melodic contour), loudness and duration, contribute to express this function (Quilis, 1981).

2.1.2.3 *Grammar (Chunking)*

The grammatical function used in the test is the segmenting of utterances into prosodic phrases. In English, ends of phrases are signalled by a number of prosodic factors including pause after the phrase (Butcher, 1981); lengthening of the final syllable (Scott, 1982); and the inclusion of nuclear tone (Crystal, 1969; Beckman, 1996), located at or near the end of the utterance. For example, in utterances such as *chocolate cake and buns* or *red and pink and black socks* there will be boundary markers on the final word, but also potential internal boundaries (after *chocolate* in the first utterance and after *red* and/or *pink* in the second). In the PEPS-C, the presence or absence of prosodic boundary markers within the utterances resolves the possible ambiguity: as to whether or not the cake is made of chocolate or the bi-coloured socks are red and pink or pink and black, and thus functions as an example of the use of prosody to convey grammatical distinctions.

Through similar pitch, pause and lengthening correlates, the demarcation function of prosody in Spanish contributes to the segmentation of speech utterances to resolve cases of grammatical ambiguity (Beckman et al., 2002; Quilis, 1981).

2.1.2.4 Pragmatics (*Focus -prefinal contrastive focus-*)

The pragmatic function in PEPS-C concerns the focus of utterances, sometimes known as phrasal accent. In English, focus is indicated by the accented word or syllable in an utterance, usually the stressed syllable of the final word; in the absence of any need for particular emphasis, the focus of an utterance is said to be broad, as in the neutral utterance *He asked for some chocolates*; in this case, accent on the final word or syllable may not be noticeable. The salience of accent increases, however, if particular emphasis or contrast is required; the focus of the utterance is then described as narrow, and can be located at any point within an utterance. An example is the utterance *He asked for some CHOCOLATES* where *CHOCOLATES* is heavily accented in order to contrast with a previously mentioned item: an example might be *chewing-gum*. Accented syllables are relatively prominent, showing increase in loudness, duration and pitch features as previously mentioned (section 2.1.1); similar features also indicate stress, a term generally used to designate the main syllable of a word. In research on atypical prosody in autism (McCann and Peppé, 2003) and in prosody protocols forming part of clinical assessments for other disorders (e.g. Enderby, 1983; Parker, 1982), focus is the aspect of prosody that attracts most attention, is most often seen as disordered, and most frequently singled out for assessment.

In the PEPS-C the prominence of *blue* in the statement “*I wanted BLUE and black socks*” suggests that the speaker was presented with a colour of socks other than blue, and the input task makes use of this distinction as an example of the function of stress placement to convey communicative focus. The output task for this function, unlike the others, involves a different scenario from the input task with different words: a game of football played between teams of coloured cows and sheep. The testee hears a commentator say “*Now the blue cow has the ball*” when the picture on the screen is of either a blue sheep or a green cow. The testee has to correct the commentator, saying either “*No, the blue SHEEP has it*” / “*No, the GREEN cow has it*”.

In Spanish, as in English, a particular word within a sentence can be emphasised depending on the communicative intention of the interlocutor, thus involving a pragmatic function. Focus marking through prosodic prominence is constrained by the Nuclear Stress Rule (Zubizarreta, 1998) by which the nuclear stress is placed on the lowest (rightmost) constituent of the phrase (Chomsky and Halle, 1968).

In order to ensure that the focalized constituent of the phrase is in a position to receive prominence via the Nuclear Stress Rule, Spanish has recourse to what has been called the prosodically motivated movement, which allows constituents to be rearranged in such a way that they can occur at the end of the sentence (Zubizarreta, 1998). It is therefore generally accepted that Spanish is essentially a language in which focal accent falls on the last constituent in the intonation phrase, that information structure is expressed through syntactic restructuring (word order variation) and that rhythmic prominence mediates in the relation between focus structure and intonation (Labastía, 2006; Zubizarreta, 1998). However, native speakers of Spanish have the intuition that they can emphasize a particular word of an utterance without manipulating word order (Face and D'Imperio, 2005). In fact, intonation alone, without what might be considered a focal word order, can also mark focus in Spanish (Face and D'Imperio, 2005). Thus, another main prominence assignment rule, the Emphatic/Contrastive Stress Rule, operates in Spanish (Zubizarreta, 1998) as well as the Nuclear Stress Rule. Cases of main prominence that are not generated by the Nuclear Stress Rule are generated by the Emphatic/Contrastive Rule. The emphatic stress has a purely metagrammatical function to signal correction or repair. It can also be used to reassert or deny the hearer's presupposition (Zubizarreta, 1998). The contrastive stress is partly metagrammatical and partly focus related: "It is metagrammatical in that it serves the function of denying part of the hearer's presupposition [...] and it is focus-related in that it introduces a variable and a value for it" (Zubizarreta, 1998, p.45). Stress associated with contrastive prominence is freely assigned and all sentences with main prominence in a non-final position can only have a contrastive (or emphatic) interpretation. Since the position of the nuclear stress in Spanish is at the end of the phrase, cases in which the main prominence is in phrasal internal position are unambiguously interpreted as cases of contrastive focus (Hualde, in press; Zubizarreta, 1998). Contrastive focus in prefinal position is the function assessed in the Spanish PEPS-C, in accordance with the structure of the English PEPS-C.

The existence of prefinal narrow or contrastive accent has been attested in Spanish (e.g. Beckman, et al., 2002; Face, 2001, 2002, 2006; Face and Prieto, in press; Gil, 1991; Quilis, 1981, Sosa, 1999). Face (2002) found four different strategies for marking prefinal contrastive focus in Castilian Spanish, one of them, the most frequent one, involving the existence of a focal pitch accent. These four were: i) a late f_0 peak accent as the one used for prefinal broad focus but with a higher f_0 peak, ii) a high intermediate phrase boundary tone, iii) a low intermediate phrase boundary tone and iv) a rising pitch accent characterized by a f_0

peak aligned with the stressed syllable and followed by a f_0 valley that is not a boundary but a part of the following pitch accent; this is, a focal pitch accent with early f_0 peak alignment where the post-focal f_0 valley following it is realized near the onset of the next stressed syllable. This early peak accent in prefinal contrastive/narrow focus has been considered phonologically distinct from the late peak accent typical of prefinal broad focus (Face, 2001, 2002; Face and Prieto, in press). Thus, alignment of the rising pitch accent is contrastive in Castilian Spanish, with late peaks characterizing prefinal broad focus accents and early peaks typical of prefinal narrow focus accents (Face and Prieto, in press). In fact, the existence of a clear contrast between these two types of rising accents in prenuclear or prefinal position in Castilian Spanish is considered the standard view in this respect (Face and Prieto, in press). As mentioned above, apart from differences in alignment of the rising pitch accent in prenuclear position, other cues are also used to convey the contrast between broad and narrow focus, such as intonational breaks, f_0 pitch height, duration of the stressed syllable, duration of the f_0 rise, and post-focal pitch range reduction (e.g. Face, 2001, 2002, 2006; Face and D'Imperio, 2005).

2.1.3 Practical administration of tasks

The tester explains each prosody task and administers two practice items per task. If testees fail the practice tasks they are re-administered and if these fail, the task is aborted. Practice items are followed by the 16 test items. In input tasks, the testees make judgments by clicking on the half of the screen that showed the relevant response choice; this click prompts the next stimulus, in a fixed order. In some circumstances, the tester replays the item, for example, where a testee has been distracted, or has not heard the item due to ambient noise, or says a wrong mouse click was made. In output tasks, the tester sits out of line of sight of the screen, to ensure neutrality of judgment. The testees respond to the picture stimulus in their own time, with the stimulus constantly visible to them. After each response, the next stimulus appears, in randomised order, in response to a key press by the tester after making a judgment on the testee's response. Judgments are made without the use of headphones, to allow the tester to evaluate them as they might be perceived in a natural hearing environment. The Appendix gives details of instructions; and a demonstration of the program, with examples of the pictures used, is located on the website: <http://www.qmu.ac.uk/ssrc/prosodyinasd/>.

2.1.4 Adaptation process

Although the prosodic functions included in the English PEPS-C are also present in Spanish, some modifications were required in order to translate and adapt the test from English to Spanish.

2.1.4.1 *Function tasks: Turnend (Final de Turno), Affect (Afecto)*

Two main reasons made it necessary to change some food items in both Turnend and Affect tasks. The first one was the need to include items that were likely to be familiar to Spanish children and participants in general. The second reason derived from considerations of segmental phonetics: it was desirable to avoid clusters of consonants that may be difficult to pronounce, and voiceless consonants which present problems for spectrographic analysis, should this be a goal. Some familiar items were excluded for these reasons.

In PEPS-C Affect tasks, the emotion of ‘liking’ and ‘disliking’ food-items is used. While in British English this distinction can be conveyed effectively by the use of differing tones (rise-fall for liking and fall-rise for disliking) with concomitant adjustments for tempo (duration), pitch-range and initial pitch-height, it was necessary to find out what intonational distinctions conveyed the same meaning differences in Spanish. A pilot study was therefore conducted with this aim. As reported in Martínez-Castilla and Peppé (in press), native Spanish speakers rated the expressiveness of intonationally different prosodic realisations of one Spanish word. Agreement as to category of emotion was highly significant, and an inverted U form contour with exaggerated pitch peak within the tonic syllable consistently expressed ‘liking’, while ‘disliking’ was mainly expressed by a flat melodic contour with a slight fall. The stimuli for the Spanish PEPS-C were recorded in accordance with these findings.

2.1.4.2 *Function tasks: Chunking (Segmentación)*

Chunking items also needed adaptation. As already indicated, the English version uses both food items (simple versus compound nouns, e.g. *chocolate, cake and buns* versus *chocolate-cake and buns*) and sock-colour items (e.g. *red and pink&black socks* versus *red&pink and black socks*) Although, in Spanish as in English, prosody is capable of differentiating between single nouns and compound nouns, in general this is done not by means of prosody but by including a word between the items. So the English example cited previously translates into Spanish as “*tarta, chocolate y bollos*” versus “*tarta DE chocolate y*

bolos”. It was therefore necessary to substitute such items by others where prosody could fulfil its demarcation function.

Apart from adding a word between two nouns, there are other ways to form compound nouns in Spanish; by juxtaposing two simple nouns (e.g. *sofá-cama* -sofa-bed-), noun plus adjective (e.g. *camposanto* -graveyard-), adjective plus noun (e.g. *bajamar* -low tide-), noun plus preposition plus verb (e.g. *máquina de afeitar* -shaver-), verb plus noun (e.g. *limpiacristales* -window-cleaner-), two adjectives (e.g. *agridulce* -bittersweet-), and pronoun plus verb (e.g. *dondequiera* -wherever-). From all these possible patterns, juxtaposing two simple nouns, as in the English version, was considered the most suitable one. This decision was based on two considerations. The first one was the simplicity of depicting the compound noun for identification, since participants have to choose between two pictures that reflect the heard sentence, in the input task. The second took production factors into account. Familiarity of the compound noun was again a factor, since results in a prosody test must not be contaminated by lexical retrieval problems. Similarly, ease of production was a criterion, and the pattern ‘verb plus noun’ was avoided because the verb within the compound noun is expressed in a specific verbal tense and producing it exactly in that tense in the list of two simple nouns would be unnatural, e.g. *abrelatas* (*can-opener*). Compound nouns that involve slight inflectional changes of one of the words, e.g. *mapamundi* / *mapa, mundo* (*world-map* / *world, map*) were also avoided. Examples of resulting items include *barco-pirata* / *barco, pirata* (*pirate-ship* / *pirate, ship*), and *pez-espada* / *pez, espada* (*sword-fish* / *sword, fish*).

Sock-colour items remained as in the English version. In order to have words with the same accent pattern and the same number of syllables, it was only necessary to change some colours.

2.1.4.3 Function tasks: Focus (Foco)

Traditionally, the Romance languages (including Spanish) mark focus with word order, in comparison to the Germanic ones, such as English, that use intonation for this purpose (Face and D’Imperio, 2005, Swerts 2007, Swerts et al., 2002). In Spanish, neutral focus (i.e. broad focus) is prosodically identified by the nuclear accent (pitch accent associated with the most prominent word of the phrase) which in general must be placed on the final word of the melodic group according to the Nuclear Stress Rule (Zubizarreta, 1999). In other words, final position in Spanish is more prominent than other positions: this has given rise to different studies concerning focus and word order since, as described before

(section 2.1.2.4), the choice of word order is closely related to the metrical organization (e.g., Contreras, 1980; Zubizarreta, 1998). Consequently, in both declaratives and absolute interrogatives, intonation does not distinguish narrow focus from broad focus in final position (Face, 2002, 2006). Moreover, having narrow focus in nuclear or final position does not force a contrastive interpretation (Zubizarreta, 1998). However, intonation, through different strategies, can distinguish between broad and narrow focus in non final position (e.g. Face, 2001, 2002). Hence, considering that the structures of the English and Spanish tests were intended to be as similar as possible, and that narrow focus in prefinal position is unambiguously interpreted with contrastive meaning in Spanish, it was decided to avoid any emphasis on the last word of the sentence, thus assessing only the ability to understand and produce narrow or contrastive accent in prefinal position (as in the English version). However, in the Focus input task, direct translation into Spanish of the sentences used in the English version of PEPS-C would bring about the location of the narrow focus at the end of the phrase (e.g. *I wanted blue and BLACK socks* is translated as “quería calcetines azules y NEGROS”). This location, although typical in Spanish, would not be necessarily interpreted with contrastive meaning. Moreover, in a test setting, the prominence of the final position would make it difficult to differentiate between broad and narrow focus. Materials were, therefore, modified in order to place contrastive accent on a non-final word. The new input task items refer to foods instead of socks. The context where contrastive accent has to be identified is as follows: a child has been given just one food item to eat but he wants another one. Participants are shown two pictures of food and a recorded sentence; they have to decide which of the two foods the child is asking for, e.g. *Quería paella y YOGUR para comer*” versus “quería PAELLA y yogur para comer (*I wanted paella and YOGURT to eat / I wanted PAELLA and yogurt to eat*). The addition of the words *para comer* avoid the possibility of contrastive accent occurring at the end of the utterance.

With respect to the expression of focus, a task similar to the English one was first developed, i.e. the animal football task, where participants have to correct the commentator’s mistakes using contrastive accent. As in the English version, this task avoids asking for a contrastive accented word in the last position of the sentence. For UK children, this was one of the easiest tasks and many of the children (Wells et al., 2004; Peppé et al., 2007) scored at or near ceiling at the age of 5, and British adults scored similarly. As already demonstrated, the placing of contrastive accent prefinally in Castilian Spanish is well-attested (e.g. Face, 2001, 2002, 2006; Zubizarreta, 1999), so it was reasonable to assume that a sample of adult

Spanish speakers would show mastery of this function. Nevertheless, when piloted with five adult native speakers of Spanish, the results indicated difficulties in carrying out the task. Because of this, and foreseeing similar problems with other participants of any age, several new focus output tasks were designed.

Two of the new tasks, together with the original one (referred to as Football), were tested in a sample of 41 adults. In the first new task (Food1), participants were shown a picture but no recorded sentences. The picture showed a plate with the food the child had already been given, and the call-out showed the two foods he wanted to eat, i.e. the food on the plate plus another one. As in the Focus input task, participants had to say what the child wanted to eat, (respecting the order of the foods in the picture). For example, a picture might be presented of a child with a call-out showing milk and biscuits. In one case there was milk on the plate; in the other, biscuits. Participants had to say “*quería leche y GALLETAS para comer*” or “*quería LECHE y galletas para comer*” respectively (“*I wanted milk and BISCUITS to eat*” / “*I wanted MILK and biscuits to eat*”). In the second new task (Food2), participants were presented with both pictures and recorded sentences. In this case, the pictures showed only the child and the call-out with his two desired foods. Participants heard what the child’s mother had understood he wanted to eat, but in the recorded sentences she made a mistake over one of the two food items. Therefore, the instruction was to correct the mother by saying exactly what the child wanted to eat, again respecting the order of the items (e.g. “*ha dicho que quería leche y GALLETAS para comer*” or “*ha dicho que quería LECHE y galletas para comer*” (“*he said he wanted milk and BISCUITS to eat*” / “*he said he wanted MILK and biscuits to eat*”). Neither task presented any opportunity for placing contrastive accent at the end of the sentences.

Results for these three Focus output tasks (Football, Food1 and Food2) were compared. For total scores, a one way ANOVA with repeated measures (Football, Food1 and Food2) revealed a significant main effect of type of Focus output task ($F(2,39) = 21.36, p < .001$). Bonferroni post hoc tests also showed significantly lower results in Football in comparison with Food1 and Food2 ($CI_{.95} = -8.28$ (lower) -3.68 (upper), $p < .001$; $CI_{.95} = -7.65$ (lower) -2.11 (upper), $p < .001$ respectively), but no differences between Food1 and Food2 ($p > .05$). The proportions of participants who scored above competence level (see section 2.1) were also studied in each task. No significant differences were found between the percentage of adults who performed above or below the pass criterion in the Football task ($\chi^2(1) = 1.98, p = .16$; 39% scored above). However, significantly more participants scored above

the pass criterion both in Food1 (93%: $\chi^2(1) = 29.88, p < .001$) and Food2 (85%: $\chi^2(1) = 20.51, p < .001$). In Food2, of those who scored at chance, some participants systematically emphasised the second food item and others the first. This appeared to indicate a lack of understanding of the function assessed, rather than problems related to unnaturalness. We interpreted these results as indicating that the task was valid but that attention should be paid to instructions and whether the testee had understood the task. In the light of these results, the Football task was excluded from the final Spanish version of PEPS-C. Between the Food tasks, Food2 was considered the best choice for the Spanish PEPS-C. Different reasons supported this decision. Firstly, this task seems to be more ecologically valid since participants hear sentences and have to make use of contrastive accent in a context where people often use this function: correcting mistakes from other people's statements. Apart from this, the materials in Food2 are more similar in structure to the responses required in the English Focus output task, thus facilitating future crosslinguistic comparisons. Finally, Food2 is less cognitively demanding: this is an advantage, as the PEPS-C is intended to be used not only with adults but also with children and populations with communication and developmental disorders. A task such as Food1, where contrastive accent has to be elicited from just a picture, could lead to problematic results probably more attributable to the complexities inherent in the task than to real difficulties in using this function.

2.1.4.4 Form tasks

Only the Long-item Imitation task needed alteration. Since the imitation tasks consist in imitating words/phrases with the different types of intonation/prosody involved in the function tasks, the change in vocabulary occasioned by the different Focus output task required the substitution of the first items from the original (Football) Focus output task by items from the new one (Food2).

2.2 Participants

2.2.1 Spanish sample

A total of 141 participants completed the final version of the Spanish PEPS-C. In the child group, 73 children and teenagers were selected by age to form the following different groups:

7;6-9;5 (N = 11);

9;6-11;5 (N = 15);
 11;6-13;5 (N = 6);
 13;5-15;5 (N = 21);
 15;6-17;5 (N = 20).

Because of the constraints of collecting data, smaller age intervals and homogeneous group sizes were difficult to achieve. Children and teenagers were recruited from schools and high-schools in Madrid. They were assessed in a quiet classroom in their educational centres.

There were 68 adults ($\geq 17;6$ years) who also completed the test. Of these, 28 were also recruited in Madrid, from work and neighbourhood settings. The other 41 adults were recruited in Edinburgh and came from a variety of backgrounds. They were assessed in their respective residences. Sessions lasted between 30 and 45 minutes.

All participants had Iberian Spanish as their native language and none of them presented hearing, language or educational problems. The variety of Spanish spoken by all children and teenagers and most of the adults was Castilian Spanish from Madrid. 26 of the adults recruited in Edinburgh were from other regions of Spain, but the input task stimuli were in Castilian Spanish, the variety most familiar from the media to people from all areas of Spain, so regional variation is unlikely to have played a part in input task results. As for expressive task performance, it is unlikely that regional variation was a significant factor since assessment of the function output tasks is perceptual, and the listener (tester) would tune into the particular realisations of individuals as in naturally-occurring conversation. In fact, no significant differences attributable to regional origin were found in PEPS-C scores ($p > .05$, for all Krustal-Wallis tests).

Table 1 shows the demographic data of the participants:

INSERT TABLE 1 ABOUT HERE

2.2.2 UK sample

For the UK data, 32 adults completed the UK Scottish version of the PEPS-C. They had all been resident in Scotland (mainly Edinburgh) for at least three years, and, like the Spanish adults, had no structural abnormalities of the vocal tract, no unaided hearing loss and no clinical history of speech and language difficulties. Age data was not collected, but all were in the age range 18-60 years. They were interviewed in their homes or in a quiet university room.

The UK children had no structural abnormalities of the vocal tract, no evidence of current hearing loss, and no cognitive, speech or language impairment. Their receptive language skills were at least the age-equivalent of 4 years, and they completed the UK Scottish version of the PEPS-C. English was their first language, and their families had lived in Scotland for at least three years: thus, any effect that unfamiliarity with the Scottish accent might have on their understanding of prosody was minimised. Their data has been grouped in the following age-ranges to facilitate comparison with the Spanish data:

- 4;11-6;1 (N = 40): not included in statistical analysis (no Spanish data);
- 6;2-7;5 (N= 52): not included in statistical analysis (no Spanish data);
- 7;6-9;5 (N= 25);
- 9;6-11;5 (N = 27);
- 11;6-13;5 (N = 18): not included in statistical analysis (insufficient Spanish data);
- 13;5-15;5 (N = 7): not included in statistical analysis (insufficient data);
- 15;6-17;5 (N = 1): not included in statistical analysis (insufficient data).

3 Results

The psycholinguistic approach adopted in PEPS-C is based on the notion that what is being tested is the participants' abilities to understand and express prosody in context and to perceive and produce the forms involved in the different functions included in PEPS-C. Within this framework, the ceiling effects found in some tasks are interpreted as showing that the functional distinctions assessed are already acquired at the chronological ages considered in the study.

Results are divided into two sections: Spanish results and crosslinguistic comparisons (adult data, child data and inter-rater reliability). The two language-versions can be considered as truly parallel if there is no significant between-language difference in the adult scores. Regarding prosodic development, it appeared in Wells et al. (2004) that while some English prosodic skills are present by the age of 5, others continue to develop through early childhood until the age of about 11. An indication of continuing development in prosodic skills in Spanish children would suggest that similar skills are being assessed in both language versions of the test.

3.1 Spanish results

Descriptive statistics for Spanish PEPS-C tasks by each age group are presented in Table 2. In all tasks except for Focus Output, every group performed above chance level, being near or reaching ceiling scores. This suggests that, in general, prosodic forms and functions have already been acquired at these ages. It can be seen, however, that scores also continue to rise with age in some tasks. It must be noted that the slight decrease in scores in the 11;6-13;5 group might be due to the lack of reliability of these data as a consequence of the small sample size of this group.

INSERT TABLE 2 ABOUT HERE

Figure 1 and Figure 2 present box plots for each PEPS-C task. The dark line represents the median; the box shows the interquartile range (the middle 50% of the distribution) and the whiskers depict the remaining 25% at the top and bottom of the distribution. The atypical values are represented by circles and the outliers by asterisks.

INSERT FIGURE 1 ABOUT HERE

INSERT FIGURE 2 ABOUT HERE

As can be seen in Figures 1 and 2, ceiling effects were present in Turnend and Affect tasks. In Chunking Input, although most of participants achieved high scores and were well above chance level, more than 25% of the scores in the youngest participants (7;6-9;5) were below competence level (<12) and a few outliers were present in the 9;6-13;5 age groups. A worse performance was observed in Chunking Output where 50% of the youngest participants (7;6-9;5) performed at chance. In respect of Focus tasks, Input results were similar to the ones previously described for Chunking Input. With regard to form tasks, high scores and ceiling effects were observed in every group.

However, Focus Output is out of step with the other tasks: more than 75% of the youngest participants failed, and 50% or more of the 9;6-13;5 age groups performed at chance too. While children and teenagers aged between 9;6 and 13;5 usually emphasized either the first or the second food in all items, the youngest children stressed irrelevant parts of the sentence (e.g. *'NO, ha dicho que quería tomates y guisantes para comer'*). In the 13;6-17;5 age group, the majority of participants achieved a better than competence-level score in this task, i.e. at around 14 years, participants no longer score at chance level and scores continue

to improve with age. By contrast, for the adults the whole of the central tendency for this task was above the competence level; but nevertheless, high variability was also observed, with some adult participants scoring at a non-chance low level (i.e. <5).

Examination of score distributions within age groups reveals that even when the mean score of an age group exceeds the competence level in a particular task, some participants might not achieve competence level. This occurred mainly in the youngest groups, and suggests the existence of variability within age groups.

In order to explore prosodic development further, several age group comparisons were conducted. Because of the small sample size of some of the age groups, only two groups with relative large sample size -the 7;6-9;5 and 13;6-15;5 age groups- were chosen to exemplify possible age effects. Results are presented in Table 2. Mann-Whitney tests revealed an improvement related to development in Short- and Long-item Discrimination, Turnend Input, Chunking Input and Output, and Focus Input and Output tasks.

3.2 *Crosslinguistic comparisons*

3.2.1 **Adult data**

Figure 3 shows the mean scores of 68 Spanish and 32 UK adults (>18 years) on the 12 PEPS-C tasks, with standard deviations as error bars.

INSERT FIGURE 3 ABOUT HERE

Both nationalities scored above chance level on all tasks, but t-tests showed that the Spanish group scored significantly higher than the UK group on five tasks: Short-item Imitation ($p = .001$), Turnend Input ($p = .024$), Affect Input ($p = .002$), Long-item Imitation ($p = .013$), and Focus Input ($p = .003$), and marginally better on most of the others. Standard deviations are in general small for both nationalities.

3.2.2 **Child data**

Descriptive statistics for child data are presented in Figure 4.

INSERT FIGURE 4 ABOUT HERE

Except for Focus Output in the Spanish data and Chunking Output and Focus Input in the youngest UK group, both nationalities performed above chance level on all tasks in both

age-groups, with scores at or near ceiling. This suggests that, as previously observed, prosodic forms and functions have in general already been acquired at these ages. However, results from ANOVAS (with language and age group as between-subjects variables) showed significant differences between the two age groups in both languages in Short-item Discrimination ($p = .01$), Long-item Imitation ($p = .002$), Chunking Input ($p = .008$), Chunking Output ($p < .001$) and Focus Output ($p = .001$); which would suggest that these prosodic skills have improved in the intervening years. A significant main effect of language, in favour of Spanish, was found in Affect tasks (Input: $p = .013$; Output: $p = .005$). Finally, significant interaction effects were found in Turnend Input and Output, and in Focus Output. Bonferroni pairwise comparisons showed that in Turnend tasks, Spanish children in the 7;6-9;5 group scored higher than UK children of the same age (Input: $p = .004$; Output: $p < .001$); and that there were no differences between the two nationalities in the 9;6-11;5 group ($p > .50$).

There was however the opposite direction of interaction effect for Focus Output. In this case, moreover, each UK age group performed better than the corresponding Spanish one (both age groups $p < .001$). In fact, in general, the Spanish Focus Output task shows results very different from the UK data.

Figure 5 shows differences between scores from the younger group (age 7;6-9;5) and the adults for both nationalities.

INSERT FIGURE 5 ABOUT HERE

Further ANOVA analyses were carried out as a function of language and age group between the youngest group and the adult group. Results were similar to the ones previously reported about the child data with a few differences. Although in Short-item imitation and Long-item Discrimination no prosodic development effect was observed in the 7;6-9;5 and 9;6-11;5 age groups, this effect was found when the youngest group (7;6-9;5) was compared with the adult group ($p < .001$ in both tasks). In addition, in Focus Input, there was not only a main effect of age but also a main effect of language (in favour of Spanish).

3. 2. 3 Inter-rater reliability

As a measure of inter-rater reliability, approximately 20% of the items in each expressive or imitative task were scored by two raters in both Spanish and English versions, and statistically analysed using Cohen's Kappa. For the Spanish version, agreement between

raters was highly significant ($p < .001$): mean Cohen's Kappa coefficients for function and form tasks were 0.91 and 0.45 respectively. Similar patterns of rating reliability were found in the English PEPS-C, with figures again highly significant ($p < .001$): $\kappa = .70$ for function tasks; $\kappa = .20$ for form tasks. This suggests that reliability of judgment is very acceptable for the Spanish function tasks but only moderately so for the English function tasks; and for both languages the agreement for form tasks is not as good.

4 Discussion

As expected, Spanish adults reached ceiling scores in all the tasks. Moreover, the significant differences observed between age groups suggest developmental progress. These two results suggest that similar skills are being targeted in both languages, thus contributing to the validity of the Spanish version of PEPS-C as a useful assessment to evaluate Spanish prosody across different ages. It could be argued that differences in results between age groups are due to cognitive development instead of linguistic development. However, such a clear improvement in results at higher ages has been taken to be evidence of developmental progress in the tested aspect of language in all other language tests. Crosslinguistic differences also account for developmental progress. Thus, results' patterns such as the ones shown for turnend tasks, where there were differences only in the youngest groups (7;6-9;5), but not between the 9;6-11;5 groups, would make unlikely that differences were due to cognitive level.

In general, the mean scores of Spanish adults are higher than those of UK adults on the same tasks, and significantly so on five (Short-item Imitation, Turnend Input, Affect Input, Long-item Imitation and Focus Input). There are many possible reasons for this, e.g. difference in participants; difference in tasks and instructions; difference in familiarity of items; different levels of difficulty in input tasks; overall higher or lower scoring on output tasks by judges of one nationality; and crosslinguistic differences in prosodic ability.

Adult participants of both nationalities were randomly selected and from a similar age-range, and there is no obvious reason why the Spanish testees should have been prosodically more able than the UK participants. The Appendix gives an indication of the level of difference in tasks and instructions, and it can be seen that most of these (Focus Output is an exception) are exactly parallel in the two languages. Similar care was taken with the

familiarity of items. The level of difficulty, although not measured acoustically, was intended to be similar; the first author, who recorded the stimuli for the Spanish version, was very familiar with the level of difficulty in the English PEPS-C. Three of the tasks showing significant differences are function input tasks (two of them also show significant crosslinguistic differences in the child data: Affect Input and Turnend Input), where no latitude for scoring can occur. We think that the most likely reason for this is that the level of difficulty was easier for Spanish speakers: this may be more a characteristic of the Spanish language than an artefact of the test, but more work would have to be done to establish this. None of the output function tasks show significant Spanish/English differences, but significantly better performance by Spanish speakers is shown on both imitation tasks: there is more latitude for variation in scoring in these tasks and it is possible that Spanish raters gave higher scores on these, although there is no clear reason as to why this should be.

The child data shows significant improvement in scores between the two child age-groups for both nationalities, as well as improvement between the youngest children and adults. While the degree of difference is not uniform across all tasks, the differences between Spanish and UK children's scores on Focus tasks demonstrate how different the scores could have been, thus suggesting that in general the same linguistic phenomena are being tested in the tasks of both language-versions of the test. Apart from this, in Turnend tasks, different developmental patterns between languages in the two child groups were found: the Spanish 7;6-9;5 age group performed as well as the older age-group but an age effect was found between these groups in the UK data. In spite of this, prosodic development was also observed in Spanish participants in Turnend Input (where scores in the 13;6-15;5 age group were significantly higher than those in the 7;6-9;5 group).

The reliability figures suggest that both Spanish and English versions need a training programme for testers to help them agree on rating criteria. They show, however, certain similarities, e.g. less agreement in both nationalities on the imitation tasks.

The difference in scores on the Focus Output task suggests that the ability tested in this task (prefinal placing of contrastive accent) seems to develop late in Spanish children: both groups of Spanish child participants fail this task, while the youngest UK children score at or near ceiling. As previously mentioned, Spanish, as a Romance language, tends to mark focus with word order, whereas Germanic languages (such as English) prefer to use intonation for this purpose. For English-speaking children, therefore, the Focus Output task appears to tap into a core function of prosody. In Spanish, by contrast, although focus can be

conveyed only through intonational clues, the preference for conveying focus through word order variation may well make the expression of focus by intonation more demanding. This would explain the difficulties in producing prefinal placing of contrastive accent found in Spanish speaking children and therefore the slower developmental rate observed in Spanish.

It is notable, however, that in the adult data there is no significant difference between nationalities on this task, suggesting that in spite of the slower developmental rate, this function is, in general, finally mastered. Some adults (four) scored <5 on this task: this is a non-chance result, suggesting a systematic but misleading use of prefinal accent, perhaps caused by a misunderstanding which transpired too late to abort the task. Adults who failed this task were mainly from Madrid, an area whose regional variety of Spanish has been shown to present contrastive differences in peak alignment and peak height between narrow and broad focus in prefinal position (e.g. Face, 2001, 2002). However, recent studies have pointed out more variability in the realization of pitch accents than what had been previously conceived, which might explain the low scores found in some adults (Ramírez Verdugo, 2005; Toledo, 2006). Four adult participants scored at chance, stressing either the first or the second food item, as happened in some children and teenagers. All these results would suggest that the Spanish Focus Output task is useful for distinguishing better-than-average prosodic ability and preventing ceiling scores at later stages of prosodic development. Yet, variability between speakers has also been noticed (e.g. Face, 2006). So the possibility remains that some adults might not use intonation to convey prefinal contrastive focus.

Results in the Focus Input task for Spanish participants, where only some of the youngest children scored at chance, contrast with those found in the Focus Output one. This difference observed between the Input and Output Focus tasks mirror the developmental differences found in other linguistic domains where perception is mastered before production. This, together with the developmental patterns found in both tasks would guarantee the validity of the function assessed. Interestingly, the developmental pattern for the prosodic function of focus seems to be inverse in English, where, contrary to expectations, production precedes perception (Cutler and Swinney, 1987; Peppé et al., 2007).

Future studies should develop new focus output tasks for Spanish allowing for change of word order. Perhaps then, the crosslinguistic differences observed in Focus Output would be significantly diminished, confirming that the typical strategy used to convey focus in Spanish, using both syntax and prosody, is less demanding than using only intonation.

In respect of the Football task, participants failing this task presented two main patterns of prosodic realizations: ambiguity/absence of expression of contrastive prominence or systematic prominence in the adjective. According to Zubizarreta (1998), sentences with contrastive stress on the adjective inside the subject are ambiguous in respect of the scope of the contrast. This might account for the ambiguity or lack of contrast present in some participants, where differences between prefinal narrow and broad focus were not clear enough to be contrastive. In those cases where the colour was systematically accented, a clear boundary after the subject was perceptually noticed. This might be related to the strong tendency to separate subjects from the rest of the utterance material in the intonational phrasing of Spanish (i.e. subject separated from the verb and object, creating two independent prosodic phrases) (D'Imperio et al., 2005). The ambiguity about the scope of the contrast created in the Football task together with the Nuclear Stress Rule could have led to place the accent in the rightmost constituent of the phrase, so, in the adjective (as usual in Spanish all participants produced the colour after the animal).

5 Conclusion

The studies suggest that it is feasible to conduct prosody tasks by the method described here in both English and Spanish, and our criteria concerning prosodic development (within and between languages) and crosslinguistic similarity between adult data have on the whole been met. Further research would prove more definitively whether English and Spanish prosody skills are similar and whether the prosodic development of Spanish and English children is comparable, but this is beyond the scope of the present paper.

Results from the age groups studied suggest that, in general, from the age of 7;6 years, prosodic forms and functions have already been acquired in both Spanish and UK children. However, the use of prefinal contrastive accent seems to follow a slower developmental progress line, with participants younger than 13;6 years apparently unable to use it appropriately. Comparison of age groups suggest that many prosodic abilities improve with age in both language groups, since despite exceeding the competence level, children of 7;6-9;5 years scored significantly lower than the adults in several function and form tasks. In order to deepen the study of prosodic development, future studies should extend the age groups, focusing on assessing prosodic abilities in younger children (i.e. 4-7;6).

The Focus Output task results suggest interesting prosodic differences between the two languages, namely that Spanish children are much slower than UK children in acquiring this skill, but that they do acquire it eventually. This difference in the developmental rates of acquisition of prefinal contrastive focus may reflect the classical division between English and Spanish as examples of languages that prefer to express focus through intonation or through word order respectively. Highlighting contrastive items only by intonation means is not the most common strategy in Spanish, and therefore could represent a more demanding strategy for children. This needs further investigation, although the evidence presented here is considerable.

Apart from the expression of contrastive accent, the study suggests that some aspects of prosody develop at different rates in both Spanish and English. It is therefore important, from the point of view of both clinical investigation and research into language development, to have a prosody test in Spanish that allows for a comprehensive assessment of these skills.

APPENDIX

A summary of PEPS-C tasks and materials used; English and Spanish versions compared.

Legend:

, = internal phrase boundary; **bold** = accented; *Italics* = recorded stimuli; ‘’ = response.

/ = rising contour; \ = falling contour; ^ = inverted U-contour; ~ = U-contour; LN\ = low narrow falling (flat) contour.

Task		Abbreviated instructions and examples
English	Spanish	
Checks		Vocabulary check, same-different distinction.
		Vocabulary check, same-different liking/disliking facial emotion distinctions.
Short-item		Same or different? laryngeal recordings, e.g.
Discrimination		1. \honey \honey (same); 2. ~tea ^tea (different).
	Entonación	¿Igual o diferente? laryngeal recordings, e.g.
	Input	1. LN\plátanos LN\plátanos (same); \uvas /uvas (different).
Short-item		Imitation task: Say what you hear and copy exactly the way
Imitation		it's said, e.g. 1. '~ apples'; 2. 'pear' etc.
	Entonación	Imitation task: Di lo que oigas imitando exactamente lo que
	Output	se oye, e.g. 1. '\fresas'; 2. '^manzanas' etc.
Turnend Input		Is he offering it to you or saying what he sees in the book?
		Testee hears e.g. 1. /cream? (offering); 2. \tea. (naming) and clicks on the appropriate picture.
	Final de Turno	¿El niño te está ofreciendo la comida o está nombrando la
	Input	comida que aparece en su libro?
		Testee hears e.g. 1. /¿queso? (offering); 2. \sandía. (naming) and clicks on the appropriate picture.
Turnend Output		If the picture shows someone offering food, say the food as though you were offering it to me; if it shows somebody looking at a book, just tell me what the food is.

Final de Turno Output	Si en la pantalla aparece el niño ofreciendo la comida, ofrécemela tú a mí; si aparece con su libro, nombra la comida que veas.
Affect Input	Does she like it or not very much? Testee hears e.g. 1. ^ <i>cream</i> (likes it); 2. ~ <i>tea</i> (not much) and clicks on the appropriate face.
Afecto Input	¿Le gusta o no le gusta mucho la comida? Testee hears e.g. 1. ^ <i>fresas</i> (likes it); 2. LN\ <i>queso</i> (not much) and clicks on the appropriate face.
Affect Output	Say the food sounding as though you like it if you do, and as though you're not too keen on it if you aren't. Then click on the smiley face if you like it and on the sad face if you don't.
Afecto Output	Cuando te guste la comida, nombra la comida de manera que se note que te gusta; si no te gusta, di la comida expresando que no te gusta. Después haz clic en la cara correspondiente según te guste o no.
Long -item Discrimination	Same or different? laryngeal recordings, e.g. 1. <i>red and blue socks</i> - <i>red and blue socks</i> (same); 2. <i>red and black&pink socks</i> - <i>red&black and pink socks</i> (different).
Prosodia Input	¿Igual o diferente? laryngeal recordings, e.g. 1. <i>negros y rosasyverdes</i> - <i>negros y rosasyverdes</i> (same); 2. <i>quería tarta y galletas</i> - <i>quería tarta y galletas</i> (different).
Long-item Imitation	Imitation task: Say what you hear and copy exactly the way it's said, e.g. 1. 'green and red&black socks'; 2. ' green and blue socks'; 3. 'The green cow has the ball', etc.
Prosodia Output	Imitation task: Di lo que oigas imitando exactamente lo que se oye, e. g. 1. 'calcetines negrosyrosas y rojos'; 2. 'quería tomates y guisantes '; 3. 'barco, pirata y agua', etc.
Chunking Input	Click on the picture that fits: recorded stimuli, e.g. 1. <i>fish, fingers and fruit</i> ; 2. <i>pink&black and green socks</i> .

		Boundary after 1 st or 2 nd lexical item.
	Segmentación	Haz clic en el dibujo que corresponde con lo que se oye:
	Input	recorded stimuli, e. g. 1. <i>pez, espada y limón</i> ; 2. <i>calcetines negrosyrosos y rojos</i> . Boundary after 1 st or 2 nd lexical item.
Chunking		Say what you see: picture-strips, e.g.
	Output	1. ‘pink and black&green socks’; 2. ‘fish-fingers and fruit’. Boundary after 1 st or 2 nd lexical item.
	Segmentación	Nombra los dibujos que aparecen en la pantalla en el mismo
	Output	orden en que aparecen: picture-strips, e.g. 1. ‘calcetines negros y rosasyrojos’; 2. ‘pez-espada y limón’. Boundary after 1 st or 2 nd lexical item.
Focus Input		Which colour was forgotten? recorded stimuli, e.g. <i>I wanted <u>red</u> and blue socks / I wanted red and <u>blue</u> socks</i> . Click on the appropriate colour.
	Foco Input	¿Cuál es la comida que está pidiendo ahora? recorded stimuli, e.g. <i>Quería paella y <u>yogur</u> para comer / Quería <u>paella</u> y yogur para comer</i> . Haz clic en la comida que no tiene y que pide ahora.
Focus Output		Correct the commentator: ‘No, the <u>red</u> cow’s got the ball’ / ‘the red <u>cow’s</u> got it’.
	Foco Output	Corrige a la madre: ‘No, ha dicho que quería leche y <u>galletas</u> para comer’ / ‘ha dicho que quería <u>leche</u> y galletas para comer’.

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Table 1

Demographic Data of Age Groups.

Age group	N	Chronological age	Gender (F/M)	Iberian Spanish variety
7;6-9;5	11	8.51 (0.64)	6/5	Madrid
9;6-11;5	15	10.59 (0.51)	8/7	Madrid
11;6-13;5	6	12.35 (0.77)	2/4	Madrid
13;6-15;5	21	14.54 (0.59)	11/10	Madrid
15;6-17;5	20	16.56 (0.59)	8/12	Madrid
>=17;6	68	26.44 (5.32)	39/29	Madrid, Cataluña, Comunidad Valenciana, I. Baleares, Zaragoza, País Vasco, Galicia, Asturias, Andalucía, Extremadura, Murcia, I. Canarias.

Note. Values in parentheses represent standard deviations

Figure 1

Box plots for Spanish PEPS-C results in input tasks.

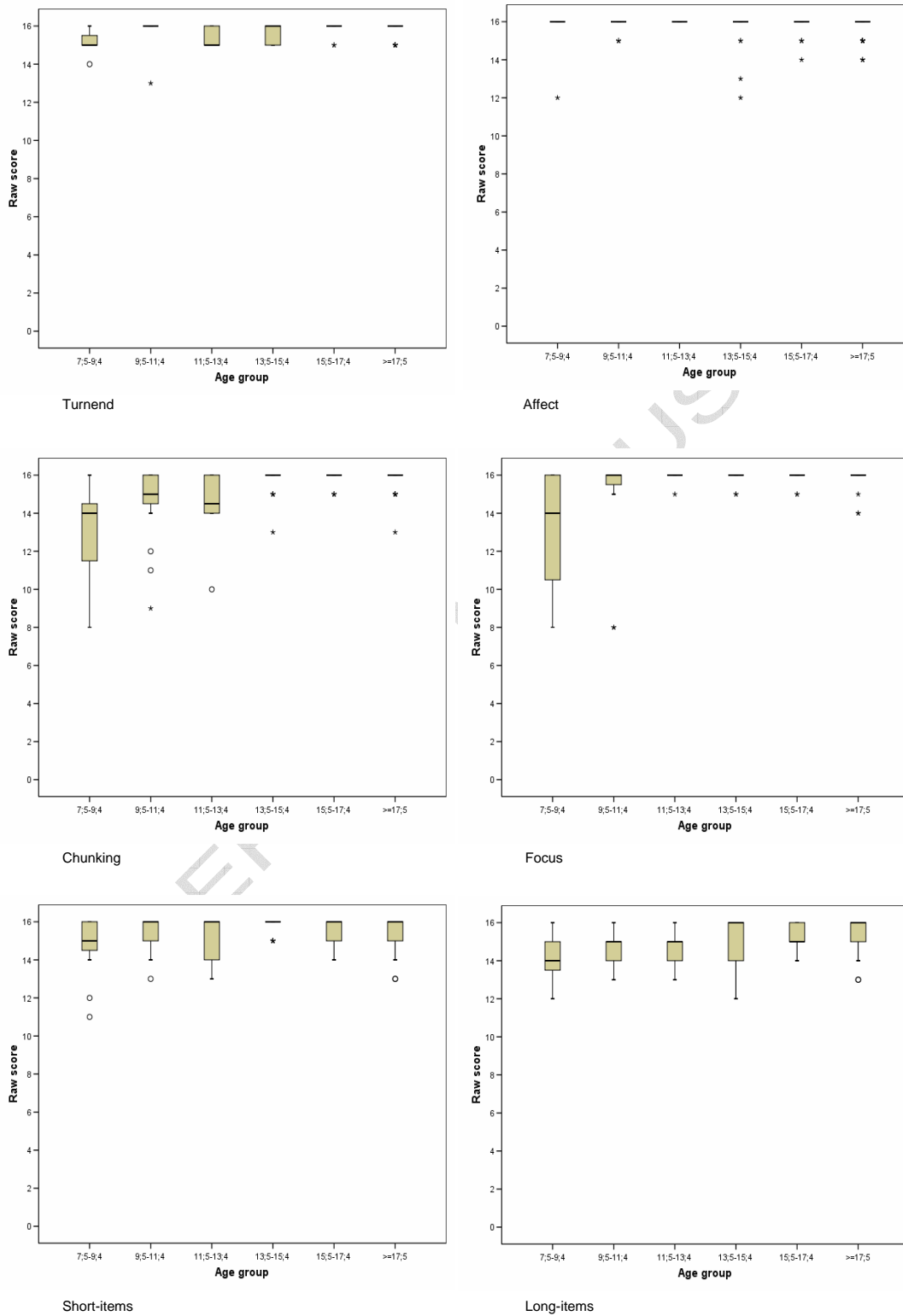


Figure 2

Box plots for Spanish PEPS-C results in output tasks.

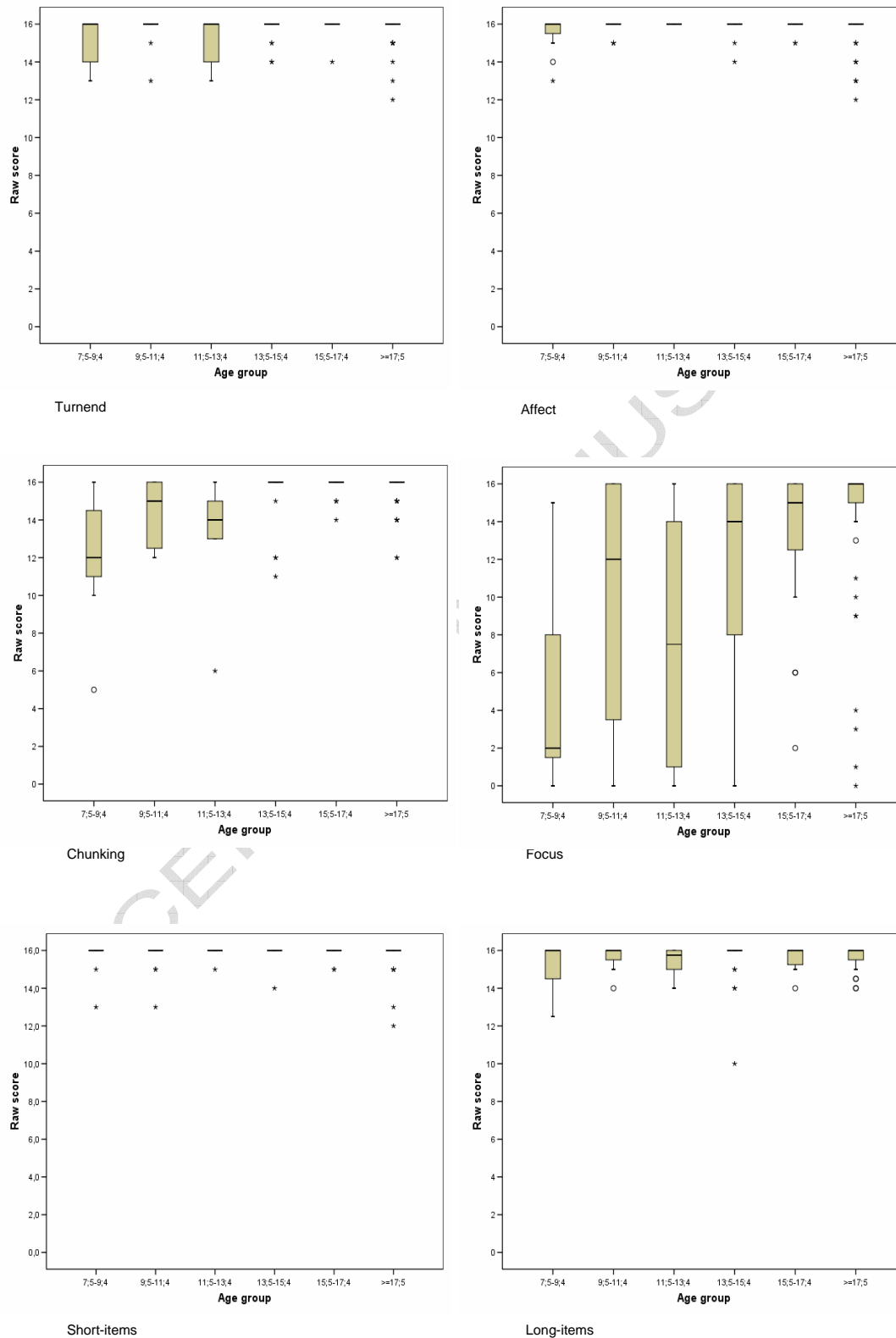
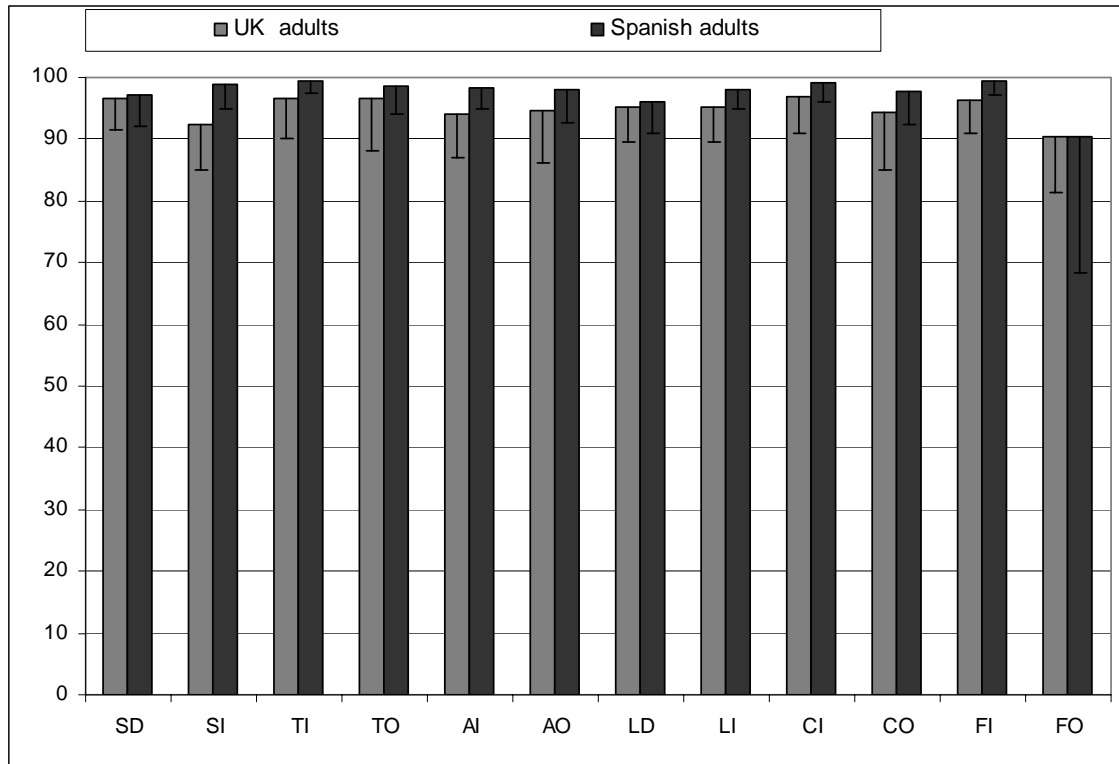


Figure 3

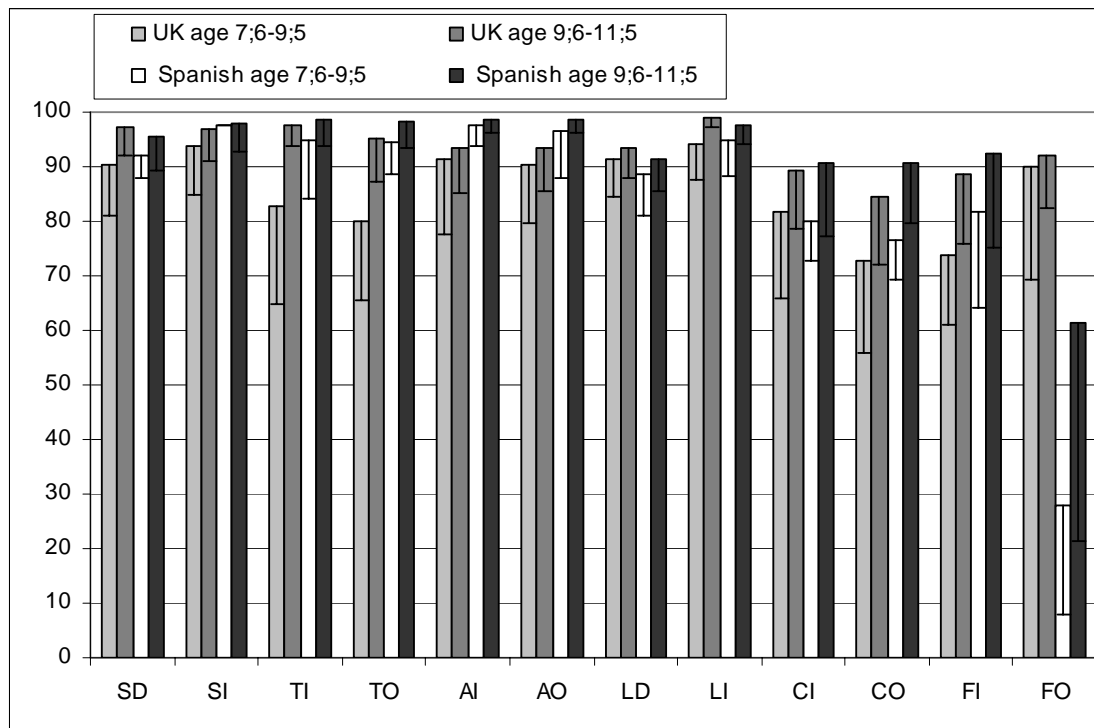
Percentage scores of UK and Spanish adults on PEPS-C tasks, with error bars showing standard deviations.



Legend: SD = Short-item Discrimination; SI = Short-item Imitation; TI = Turnend Input; TO = Turnend Output; AI = Affect Input; AO = Affect Output; LD = Long-item Discrimination; LI = Long-item Imitation; CI = Chunking Input; CO = Chunking Output; FI = Focus Input; FO = Focus Output.

Figure 4

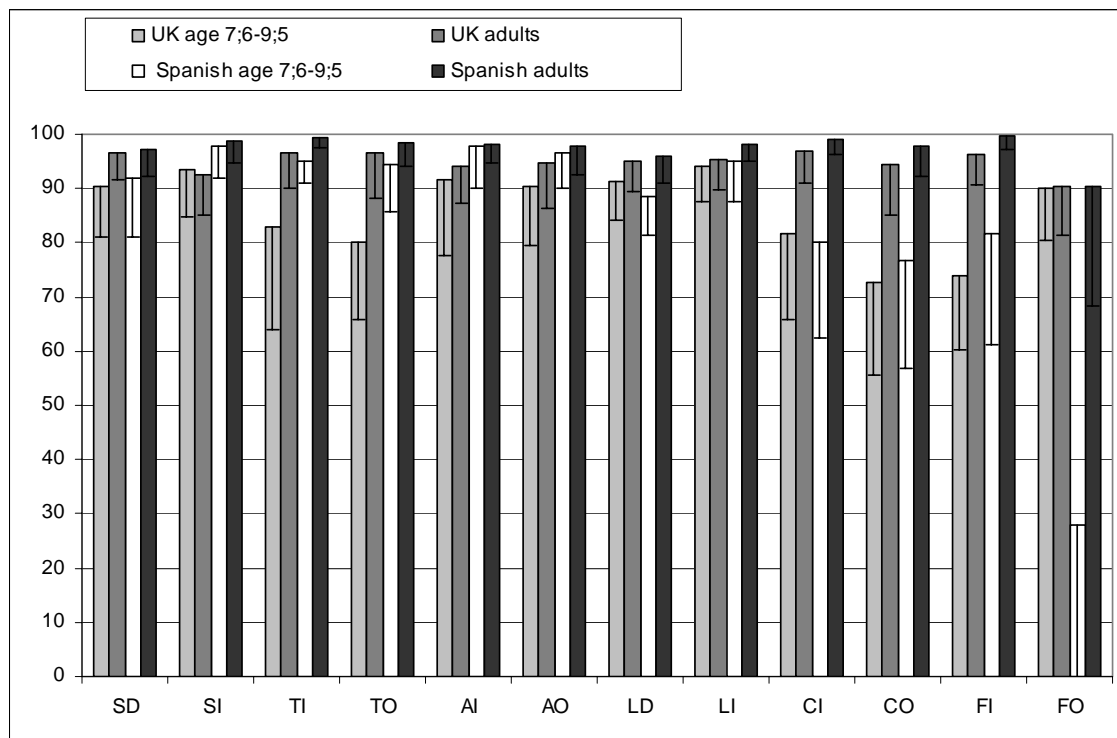
Percentage scores of two different age-groups of UK and Spanish children on PEPS-C tasks; error bars show standard deviations.



Legend: SD = Short-item Discrimination; SI = Short-item Imitation; TI = Turnend Input; TO = Turnend Output; AI = Affect Input; AO = Affect Output; LD = Long-item Discrimination; LI = Long-item Imitation; CI = Chunking Input; CO = Chunking Output; FI = Focus Input; FO = Focus Output.

Figure 5

Percentage scores of one age-group of UK and Spanish children on PEPS-C tasks compared with scores of UK and Spanish adults; error bars show standard deviations.



Legend: SD = Short-item Discrimination; SI = Short-item Imitation; TI = Turnend Input; TO = Turnend Output; AI = Affect Input; AO = Affect Output; LD = Long-item Discrimination; LI = Long-item Imitation; CI = Chunking Input; CO = Chunking Output; FI = Focus Input; FO = Focus Output.

Table 2

Mean Scores (SD) in PEPS-C Tasks by Age Group.

PEPS-C Task	Age group											
	7;6-9;5		9;6-11;5		11;6-13;5		13;6-15;5		15;6-17;5		>=17;6	
	(N=11)		(N=15)		(N=6)		(N=21)		(N=20)		(N=68)	
Short-item Discrimination	14.73*	(1.74)	15.27	(0.96)	15.17	(1.33)	15.76	(0.44)	15.50	(0.76)	15.54	(0.8)
Short-item Imitation	15.64	(0.92)	15.67	(0.82)	15.83	(0.41)	15.91	(0.44)	15.90	(0.31)	15.82	(0.65)
Turnend Input	15.18*	(0.60)	15.80	(0.78)	15.33	(0.52)	15.71	(0.46)	15.90	(0.31)	15.90	(0.31)
Turnend Output	15.09	(1.38)	15.73	(0.8)	15.17	(1.33)	15.71	(0.64)	15.90	(0.45)	15.76	(0.70)
Affect Input	15.64	(1.21)	15.60	(0.41)	16	(0)	15.57	(1.08)	15.75	(0.55)	15.72	(0.54)
Affect Output	15.45	(1.04)	15.80	(0.41)	16	(0)	15.86	(0.48)	15.90	(0.31)	15.68	(0.87)
Long-item Discrimination	14.18*	(1.17)	14.60	(0.91)	14.67	(1.03)	15.05	(1.24)	15.30	(0.73)	15.35	(0.79)
Long-item Imitation	15.18	(1.17)	15.63	(0.58)	15.42	(0.80)	15.43	(1.40)	15.68	(0.57)	15.71	(0.52)

Chunking Input	12.82**	(2.82)	14.53	(2.17)	14.17	(2.23)	15.67	(0.73)	15.80	(0.41)	15.85	(0.47)
Chunking Output	12.27**	(3.17)	14.53	(1.77)	13	(3.58)	15.33	(1.56)	15.75	(0.55)	15.63	(0.86)
Focus Input	13.09**	(3.30)	14.80	(2.78)	15.83	(0.41)	15.90	(0.30)	15.90	(0.31)	15.93	(0.36)
Focus Output	4.45**	(4.70)	9.80	(6.41)	7.67	(7.71)	12	(5.31)	13.40	(4.15)	14.47	(3.53)

Note. Values enclosed in parentheses represent standard deviations. Asterisks denote significant differences between 7;6-9;5 and 13;6-15;5 age groups: * significant at 0.05 level, **significant at 0.01 level.

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