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Comprehension of Infrequent Subject–Verb Agreement Forms: Evidence From French-Learning Children

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Two comprehension experiments were conducted to investigate whether young French-learning children ($N = 76$) are able to use a single number cue in subject–verb agreement contexts and match a visually dynamic scene with a corresponding verbal stimulus. Results from both preferential looking and pointing demonstrated significant comprehension in 30-month-olds with no preference for either singular or plural. These results challenge previous claims made on the basis of English and Spanish that comprehension of subject–verb agreement expressed as a bound morpheme is late, around 5 years of age (V. A. Johnson, J. G. de Villiers, & H. N. Seymour, 2005; A.-T. Pérez-Leroux, 2005). Properties of the adult input were also analyzed. Possible implications for theories of syntactic acquisition are discussed.

Many languages encode a distinction between singular and plural reference, and do so in a variety of ways. This distinction is sometimes encoded redundantly, resulting in grammatical agreement. In English, for example, the number of a referent noun is typically encoded in a determiner entering a dependency with presence versus absence of an *–s* morpheme on the noun: ***A*** *boy* (singular) versus *Some boy**s*** (plural). When such nouns occur in subject position they enter a dependency with a verb and the number of the referent noun is also reflected on the verb; however, presence of an *–s* morpheme on the verb marks singular while its absence marks plural: *A boy jump**s*** versus *Some boy**s*** *jump.* The relation between the *–s* morpheme and the number category across agreeing constituents is therefore, not a simple one. It is further complicated by the fact that the *–s* morpheme has three phonological realizations, depending on properties of the preceding segment: */əz/* after voiced and voiceless consonants corresponding to segments like ''s,'' ''z,'' ''ch,'' and ''j'' (e.g., *buzzes*), */z/* after vowels and remaining voiced consonants (e.g., *goes, jogs*), and */s/* after remaining voiceless consonants (e.g., *jumps*). Despite its phonological variation, *–s* is highly regular in the language because it applies to all verbs, apart from modals (e.g., *can, may*, etc.) and auxiliaries which involve additional phonological changes to the roots/stems (e.g., singular *has*, *does*, *is* vs. plural *have*, *do*, and *are*).

The task for a child acquiring any language with an agreement system is at least twofold: She must acquire the expression of number distinctions on nouns and verbs and the principle of agreement across syntactic categories and functions (e.g., subject) that holds in her language. Prerequisites appear to be in place by age 2. For example, the prerequisite category of ''noun'' is supported by studies based on productivity of use of appropriate morphemes (Tomasello & Olguin, 1993) and that of

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''verb'' by studies on novel verb learning (Bernal, Lidz, Millotte, & Christophe, 2007). Asymmetrical omission in production indicates that 2-year-olds already distinguish a category of ''subject'' (Valian & Aubry, 2005). Even 17-month-olds show sensitivity to word order suggestive of a subject category in a preferential looking experiment, correctly interpreting the subject in ''Where's Big Bird tickling Cookie Monster?'' by picking the video of Big Bird tickling Cookie Monster, not Cookie Monster tickling Big Bird (Hirsh-Pasek & Golinkoff, 1996).

Several studies have explored children's comprehension and production of subject–verb agreement. First, studies of language production fail to find evidence that 2-year-olds have knowledge of subject–verb agreement. The first multiword utterances spontaneously produced by young children acquiring English do not exhibit its systematic use. Mastery of third-person singular agreement (defined as 90% of use in obligatory contexts) takes place between the ages of 26 and 46 months (Brown, 1973; De Villiers & de Villiers, 1973). In a sentence completion task with nonce verbs requiring the suffix /əz/ (e.g., *nazzes*), even 7-year-olds were shown to have difficulty producing this agreement, succeeding only about 48% of the time (Berko, 1958). In another study comparing the three phonological instantiations of the *–s* morpheme in English, /z/ was found to be the first one to be productively used for marking plural in nouns in an elicitation task, at the age of 6 (Anisfeld & Tucker, 1967). Overall, these production studies show poor performance levels that, moreover, appear to be sensitive to the task used (elicited vs. spontaneous production).

Second, subject–verb agreement has been evaluated using tests of language comprehension, which only found evidence of emergence late in acquisition (Johnson et al., 2005). In a picture selection task using auditory stimuli designed to phonologically mask the number on the noun by using verbs beginning in *s–* such that the child would have to rely on the verbal marking to provide a correct answer, they found that 5- and 6-year-olds, but not 3- and 4-year-olds, were able to select appropriate pictures when hearing *The duck swim**s** in the pond* or *The duck**s** swim in the pond*. In every age group tested, accuracy was higher for singular *–s* than for plural (null morpheme). The study was replicated in (Caribbean) Spanish, with similar results (Pérez-Leroux, 2005). In that language the pronominal subject is characteristically omitted with the consequence that plural number of the subject may be solely encoded as a suffixal *–n* on the verb (e.g., singular *Nada en el charco* ''[It] swims in the pond'' vs. plural *Nada**n** en el charco* ''[They] swim in the pond''). The pattern is completely regular in the language and is the same in all varieties of Spanish. Three- to 4½-year-olds performed at chance level in both singular and plural conditions. Older children (4;8–6; 6-year-olds) performed at chance level in the singular condition (null morpheme) but selected the matching picture 67% of the time in the plural condition (*–n*). While the results for Spanish- and English-learning children showed a similar pattern of no comprehension under the age of 4 and similar accuracy level (60%–70%) for children aged 5 and 6, their accuracy level with regard to number was the opposite in the two languages. This was interpreted by Pérez-Leroux (2005) as evidence that children were in fact sensitive to *overt* marking (*–s* on third singular verbs in English, *–n* on third plural verbs in Spanish).

The conclusion of a late emergence of subject–verb comprehension based on Pérez-Leroux's (2005) results is, however, challenged by an independent claim that Spanish-learning children show a preference for singular marking (Childers, Fernandez, Echols, & Tomasello, 2001). In a pointing task using colored drawings of a girl or two children performing actions of walking, singing, sleeping, running, etc., 36-month-old (but not 30-month-old) Chilean Spanish-learning children showed a significant preference for third-person singular auxiliary forms (e.g., *Está corriendo* ''is running'') over plural forms (e.g., *Está**n** corriendo* ''are running''). A trend toward significance in the same direction was found with lexical verbs (e.g., singular *Come los sandwiches* ''eats the sandwiches'' vs. plural *Come**n*** ''eat''). A study of child-directed speech in Guatemalan Spanish by a subset of the authors is mentioned as evidence that there is a disproportionate number of third-person singular forms in Spanish input to young children, which may explain the bias for singular forms in the experimental results.

Another challenge to the claim of late comprehension of subject–verb agreement comes from a study originally designed to explore comprehension of number marking rather than agreement per se, but suggesting that young children are particularly sensitive to verbal marking (Kouider, Halberda, Wood, & Carey, 2006). In that preferential looking study, 24-month-olds (but not 20-month-olds) looked longer to the matching screen when they heard audio stimuli with several markers of number which included verbal marking (e.g., *There **are some** blicket**s**, There **is a** blicket*). When only one nominal

cue was provided (e.g., *Look at the blicket**s**, Look at the blicket*) only 36-month-olds succeeded at the matching task. Detailed looking-time analyses suggested that the most important cue was the distinctive auxiliary (*are* vs. *is*). These results were replicated with familiar nouns using a manual search paradigm and interpreted as evidence that lexical distinctions (*is* vs. *are*) are easier to acquire than bound morphology (*–s)* because the auxiliaries are more salient than a single bound morpheme (Wood, Kouider, & Carey, 2009). They are also more frequent than *–s* marking on a verb in English. Indeed, relative frequencies in the adult input based on a study of two corpora (Nina: 2,835 utterances, Suppes, 1974; Naomi: 705 utterances, Sachs, 1983) reveal that *is* occurs in 26% of adult utterances versus 7% for *–s* (Zaroukian, 2009).

Third, subject–verb agreement was also evaluated through preference studies in younger children given that absence of comprehension does not preclude awareness of agreement. Nineteen-month-olds acquiring English revealed a sensitivity to grammatical subject–verb agreement in *–s* in a headturn preference study, based on grammatical stimuli like *The boy bake**s** bread* and *The boy**s** bake bread* versus ungrammatical **The boy bake bread* (Soderstrom, 2002; Soderstrom, Wexler, & Jusczyk, 2002). However, these young children were unable to distinguish grammatical from ungrammatical double marking on noun and verb (**The boy**s** bake**s** bread*) and double verbal marking (**The boy doe**s** bake**s** bread*). This is indicative of some sensitivity to the grammatically appropriate number of *–s* morphemes as well as their placement, hence to the English grammar, rather than a mere sensitivity to and perceptual preference for inflected verbs over uninflected ones (Soderstrom, 2008).

Seeking to tease apart sensitivity to marking from sensitivity to word order as well as the role of lexical knowledge and function words, Soderstrom, While, Conwell, and Morgan (2007) tested young children' ability to track *–s* marking (e.g., verbal as in *The baker bake**s** bread* or nominal as in *The baker**s** bake bread*) in passages involving six highly familiar nouns and verbs while manipulating the position of these content words. They found that 16-month-olds were sensitive to grammatically appropriate placement of *–s* on highly familiar nouns and verbs when adjacent to function words (e.g., auxiliaries, prepositions, and determiners). Their study confirms the crucial role played by function words in children' initial formation of grammatical knowledge (Höhle & Weissenborn, 2003; Shady, 1996; Shi, Marquis, & Gauthier, 2006; Shi, Werker, & Cutler, 2006) and provides evidence of the facilitating role played by known content words.

Overall, these last studies suggest that while an early sensitivity to the presence of morphemes encoding number distinctions as well as agreement can be detected relatively early—at least in English—comprehension/production of agreement encoded as a bound morpheme takes a long time to acquire. At present, the reasons for such a lag are unclear. One factor may be the methodology used in the comprehension/production studies, an issue we will discuss in more detail later on. Other factors may be grounded in the properties of the languages tested so far and/or the input received by the children. For example, the fact that one number category is null in these languages (i.e., plural in English, singular in Spanish) may have caused children to focus their attention onto the overt one. Acquisition may also have been influenced by adults' disproportionate use of singular verbal forms around young children.

There is another reason why comprehension might be delayed in English and Spanish. In both languages, overt verbal agreement is marked by a single consonant in (word-final) coda position. Numerous studies on word recognition have found evidence that perception of consonants is affected by their position in a syllable and in a word, both in adults (e.g., Redford & Diehl, 1999) and infants (e.g., Swingley, 2003; Zamuner, 2006; though see Nazzi & Bertoncini, 2009; Swingley, 2009, for positive evidence of coda consonant processing). Swingley (2009) characterizes some of the challenge as follows: ''Word-final consonants are, in general, less clearly articulated; they are heard only after perception of the initial parts of the word has led children to consider an interpretation; and they enjoy less of the benefit of membership in dense phonological neighborhoods.'' Thus, if agreement marking occurred in (word-initial) syllable onset position, earlier comprehension may be found.

French has a subparadigm of agreement of this very sort. While 10% of French verbs have retained phonological encoding of person–number distinctions on the verb itself, the remaining 90% (known as conjugation class I, ending in *–er* in the infinitive) have lost it despite its retention in the spelling. This results in near-complete homophony of the verb form, e.g., /dãs/ ''I, you, he, she, they dance'' (with the exception of first-person plural ''we'' form in *–ons* /dãsõ/ and second-person plural ''you'' form in *–ez* /dãse/, which are extremely rare in child-directed speech). In connected speech, these homophonous verbal forms can be distinguished

via subject pronouns under certain conditions. Whenever the verb is consonant-initial the pronunciation of the third-person singular pronoun *il* ''he'' versus plural pronoun *ils* ''they'' is identical, for example, *Il(s) danse(nt)* /i(l)dãs/ ''he/they dance'' though speakers idiosyncratically vary in realizing /l/, independently of number. /i(l)/ thus behaves as a default form in French.

However, for vowel-initial verbs in this conjugation class (e.g., *embrasser* ''to kiss''), which represent about one fourth of the verbs of this class (702 out of 2,673 verbs or 26.3% according to the Manulex ''child'' database, Lété, Sprenger-Charolles, & Colé, 2004; 1,062 out of 4,655 verbs or 22.8% according to the Lexique ''adult'' database, New, Pallier, Ferrand, & Matos, 2001), the phonological fusion of the subject pronoun with the verb results in distinct phonological forms in the third-person singular versus plural. For example, singular *Il embrasse* ''he kisses'' is pronounced /i**l**ãbras/. Its plural counterpart, *Ils embrassent* ''they kiss,'' has two minimally different pronunciations of the pronoun that idiosyncratically vary across speakers: /i**z**ãbras/ and /i**lz**ãbras/. In either case, plural marking involves a *liaison* ''linking'' or latent consonant surfacing only with vowel-initial verbs in the immediate presence of a subject pronoun, plus resyllabification whereby the plural marker /z/ finds itself in *onset position of the second syllable*, e.g., /i(**l**)**.z**ã.bras/ (Encrevé, 1988; Tranel, 1996). This and other special properties have led a growing number of linguists to propose that French subject pronouns are in fact best analyzed as mere agreement markers (Auger, 1994; Culbertson & Legendre, 2008; Fonseca-Greber & Waugh, 2003; Jakubowicz & Rigaut, 1997; Lambrecht, 1981; Miller, 1992; Pierce, 1992).

The present study, therefore, tests the hypothesis that this French subject–verb agreement subsystem will be comprehended earlier than the English and Spanish type, possibly as early as 24 months of age. In Experiment 1, we built on growing evidence that the intermodal preferential looking paradigm (IPLP; Golinkoff, Hirsh-Pasek, Cauley, & Gordon, 1987; Hirsh-Pasek & Golinkoff, 1996) is an established method for investigating early comprehension of syntax (e.g., Dittmar, Abbot-Smith, Lieven, & Tomasello, 2008; Fisher, 2002; Lidz, Waxman, & Freedman, 2003; Naigles, 1990). In Experiment 2, we exploited recent successful attempts at incorporating pointing as a way of engaging young children (Bernal et al., 2007; Brandone, Pence, Golinkoff, & Hirsh-Pasek, 2007; Dittmar et al., 2008; Maguire, Hirsh-Pasek, Golinkoff, & Brandone, 2008). In both experiments, we followed Soderstrom et al. (2007) by only presenting our subjects with verbs known to them, based on parental report. We expected familiarity to facilitate comprehension.

Specifically, we asked whether young French-learning children from two age groups (24 and 30 months) are able to map an auditory stimulus consisting of singular or plural combinations of a subject pronoun + familiar transitive verb + nonce object noun (e.g. *Il embrasse le taque* ''he kisses the tak'') with visually displayed dynamic scenes involving one or two actors.

The present study also investigates whether frequency might play an additional role, as suggested in Childers et al. (2001). While the target type of subject–verb agreement is found only when the subject pronoun *immediately* precedes the verb its actual manifestation in the adult input is unknown. Large samples of French adult input were analyzed in Experiment 3 with the goal of formulating possible implications of our experimental results for current theories of syntactic acquisition.

Experiment 1

In Experiment 1, we tested comprehension of subject–verb agreement by investigating the ability of 24- and 30-month-old children to match an orally presented utterance to the appropriate video among a pair of actions presented simultaneously. The speech stimuli instantiated a common pattern of subject–verb number agreement in French, that is, a lack of phonological singular–plural distinction on the verb itself but a marking through liaison between the subject pronoun and the vowel-initial verb, resulting in number agreement being expressed as a single consonant in syllable onset position. The task used was the IPLP because it places relatively few demands on children by measuring comprehension through looking time, thus without requiring them to either make meta-linguistic judgments or even perform an action such as pointing, which requires more complex decisional and motor planning.

Method

Participants

Participants included 20 monolingual French-speaking 24-month-olds (10 males, 10 females; M = 23 months, 28 days; range = 22 months, 18 days to 26 months, 3 days), and 20 monolingual French-speaking 30-month-olds (10 males, 10 females;

M = 30 months, 27 days; range = 28 months, 19 days to 35 months, 14 days). An additional seven 24-month-olds were tested but excluded from the experiment, due to fewer than four analyzable trials (1), excessive side bias (> 85% looking to one side; 4), not contributing data to all conditions (1), and video file problem (1). An additional seven 30-month-olds were tested but excluded from the experiment, due to fussiness (2), excessive side bias (2), or for not contributing data to all conditions (3). Children were all tested in Paris. They were recruited from a database of parents who volunteered to participate in child development studies and came from diverse socioeconomic backgrounds.

Materials

Video stimuli Two 8-year-old boys recruited for this purpose were filmed performing 1 of 10 simple actions on unfamiliar objects for which the French children tested did not have a name. For each action, either one boy performed the action alone while the other boy was standing immobile next to the first boy (singular video), or the two boys performed the action together and simultaneously (plural video). Figure 1 shows characteristic still images from the actual videos used for the kissing action. For each action, different unfamiliar objects were used in the singular and plural conditions (a total of 20 unfamiliar objects were used). Thus, the same action was performed on different objects by the single boy (singular video) versus the two boys (plural video). All video sequences lasted 6 s.

Audio stimuli. All speech stimuli were recorded by the same female speaker using moderate child-directed speech. Ten verbs, referring to the ten actions of the videos, were used: *accrocher* ''to hook,'' *allumer* ''to switch on,'' *apporter* ''to bring,'' *arrêter* ''to stop,'' *attacher* ''to tie,'' *attraper* ''to catch,'' *embrasser* ''to kiss,'' *enlever* ''to remove,'' *essuyer* ''to wipe,'' and *ouvrir* ''to open.'' These verbs were chosen because they fulfill several important constraints. They are transitive and belong to the dominant conjugation class (Class I), except for *ouvrir* ''to open,'' which nevertheless follows the same phonological pattern; third-person singular and plural forms of the verb are homophonous. They have been found to be known by many children in previously collected MacArthur Communicative Development Inventory (MCDI) data (Kern, 2003; Nazzi, 2005; Nazzi, Floccia, Moquet, & Butler, 2009; Nazzi & Pilardeau, 2007) and in a large cross-sectional corpus (Le Normand, 1986). All verbs are vowel initial, with phonologically identical third-person singular and third-person plural forms, number agreement being only signaled by liaison between the pronoun and the verb. Of the two pronunciations of the plural pronoun (/iz/, /ilz/), the native speaker who recorded the stimuli consistently used the former.

The verbs were embedded in short sentences consisting of the third-person subject pronoun in either singular (*il* ''he'') or plural (*ils* ''they'') form, the verb, and an NP (determiner *le* ''the'' + noun). Pseudo-words rather than real nouns were used as direct objects of the transitive verbs to refer to the unfamiliar objects. We used 20 different pseudo-words (one for each of the unfamiliar objects), which all had a consonant–vowel–consonant structure (e.g., /gef/). The decision to use unfamiliar objects and pseudo-words was made on several grounds, including neutralizing possible lexical noun knowledge effects across subjects, eliminating possible effects of the predictability of the object reported in imitation tasks (Valian, Prasada, & Scarpa, 2006), as well as a possible but problematic distributive interpretation associated with singular phrases/sentences. A sentence like *Il embrasse la poupée* ''He is kissing the doll'' matches both a scene in which only one boy kisses the doll and a scene in which two separate boys are kissing the doll (see Kouider et al., 2006, for a similar argument). In contrast, the use of distinct pseudo-nouns as objects (e.g., *embrasser le voube* ''to kiss the voub'' vs.

Figure 1. Video stimuli in the singular (left screen) and plural (right screen) conditions.

embrasser le taque ''to kiss the tak'') refer to events that are distinguished on the basis of the unfamiliar objects involved. A proficient user of French would need to make use of their knowledge of *il* (singular) versus *ils* (plural) to assign a singular or plural interpretation to *il embrasse le voube* and *ils embrassent le taque*.

Procedure

Prior to coming to the lab, parents were asked to name which of the ten verbs used in the experiment their child knew. They were not asked whether their child knew specific forms of the verbs. Right before their visit, parents also completed a French version of the MCDI questionnaire (Fenson et al., 1993; Kern, 2003) modified by the authors to include more verbs and to break down pronominal forms into subcategories to allow for correlation analyses (see below). The MCDI is a parent-friendly, successful, and reliable tool for measuring lexical and function words a young child understands and/or produces spontaneously. MCDI questionnaires were returned for 18 (of 20) 24-month-olds and 17 (of 20) 30-month-olds.

Each child was tested individually in a soundproof booth for about 10 min using the IPLP. Children sat on a parent's lap during the whole session. The parent, wearing dark glasses rendered completely opaque by covering the inside of the lenses with thick paper, was blind to the video stimuli. Each child was presented with 6–8 trials (depending on the number of test verbs reported to be known by their parent). All trials consisted of the sequence of events described in the following paragraph.

The child's attention was first centered by flashing a central light located between the two presentation screens (the child facing the whole display). Once the child looked at the central light, the baseline phase started, in which two videos were simultaneously displayed on two screens in silence for 6 s. Both videos depicted the same action, one being the singular video and the other being the plural video. After this video presentation, the central light was flashed again. Once the child looked at it, the test phase started, consisting of the audio presentation of a speech stimulus matching one of the two scenes, immediately followed by a 6-s-long presentation of the same two videos presented during the baseline phase. Once the test phase was over, a 3-s eye-catching video (a ''dance'' performed by the two boys) was displayed on the screen of the matching video to mark the end of the trial (following Kouider et al., 2006). Previous studies have shown that children tend to look longer at the scene matching the speech stimulus during test compared to baseline (e.g., Golinkoff et al., 1987; Naigles, 1990).

For half of the trials, the speech stimulus corresponded to the singular video, while it corresponded to the plural video for the other half of the trials. Moreover, the side of the matching video was counterbalanced within participants. Children who knew only six verbs (instead of eight) were tested on the same number of singular (three) and plural (three) videos. The last two videos of the session (one singular, one plural) were displayed on the same screen.

Coding and Reliability

A digital video camera placed between the two TV screens was used to record the child's looks during the baseline and test phases. The videos were coded offline frame by frame using SuperCoder (Hollich, 2005). For each frame, a trained coder blind to the condition (i.e., whether the audio stimuli were the singular or the plural) coded whether the child was looking at the matching video, at the nonmatching video, or away. Then, for each trial, we calculated the percentage of time that the child spent looking at the matching video compared to the nonmatching video. Trials in which children only looked at one video during baseline were discarded from the analysis. Overall, we analyzed a mean of 5.25 trials (out of a mean of 7.30 trials actually presented) per 24-month-old and a mean of 5.15 trials (out of a mean of 7.45 trials actually presented) per 30-month-old. Ten percent of the data were recoded by a different trained coder, with an average agreement of 98% for the 24-month-olds, and 94% for the 30-month-olds.

Results and Discussion

For both the baseline and test phases, the percentages of looking toward the matching videos were averaged over trials separately for trials in which the singular video versus the plural video was the target, leading to four measures per child.

Mean percentages to the matching videos were entered into a three-way analysis of variance (ANOVA) with the main between-subject factors of age (24 vs. 30 months) and the main within-subject factors of phase (baseline vs. test) and number (singular vs. plural target). The effect of phase approached significance, $F(1, 38) = 3.73$, $p = .061$,

η_p^2 = .09, indicating that the children tended to look longer at the matching videos during test (M = 52.27%, SD = 17.36) than during baseline (M = 47.01%, SD = 8.80). However, the triple interaction also approached significance, $F(1, 38) = 3.33$, p = .076, η_p^2 = .08, suggesting that the effect of phase was modulated by age and/or number. No other effect or interaction reached significance.

In order to specify the triple interaction, separate ANOVAs with the two factors of phase and number were conducted for each age group. At 24 months of age (Figure 2), both main effects were nonsignificant (both Fs < 1). For the phase factor, only ten of the twenty 24-month-olds increased their looking times toward the target video between familiarization and test. However, the Phase × Number interaction was significant, $F(1, 19) = 7.06$, p = .016, η_p^2 = .27. Planned comparisons, though not reaching significance, showed that the 24-month-olds tended to decrease their looking towards the singular video in the singular target trials, $F(1, 19) = 1.29$, p = .27, η_p^2 = .06, while they tended to increase their looking toward the plural video in the plural target trials, $F(1, 19) = 2.96$, p = .10, η_p^2 = .14. Overall, this pattern shows that the 24-month-olds tended to increase their looking toward the plural video between baseline (M = 46.37%, SD = 11.68) and test (M = 54.02%, SD = 25.16). This was confirmed by an ANOVA with the factors of phase and number on the variable percent looking at plural video showing a main effect of phase, $F(1, 19) = 7.06$, p = .016, η_p^2 = .27, and no other effect or interaction, $F(1, 19) < 1$. Although it is unclear why they did so, this pattern of results brings no evidence in support of an understanding of number agreement at 24 months of age.

At 30 months of age (Figure 3), there was a main effect of phase, $F(1, 19) = 9.09$, p = .007, η_p^2 = .32, establishing that the older children looked longer at the matching video after having heard the speech stimulus (M = 53.1%, SD = 8.5) than during baseline (M = 46.3%, SD = 12.9). This conclusion is also supported by the fact that fourteen of the twenty 30-month-olds increased their looking times toward the target video between familiarization and test (p = .058, binomial test). There was also a main effect of number, $F(1, 19) = 5.77$, p = .027, η_p^2 = .23, indicating that the older children tended to look longer toward the targets in the trials of the singular condition. Importantly though, there was no interaction between the two factors, $F(1, 19) < 1$, indicating that the older children increased their looking times toward the matching video between baseline and test in both the singular and plural conditions. This pattern of results is compatible with an understanding of number agreement at 30 months of age.

The present results reveal that the linguistic stimulus did alter the older children's initial preference. While the 24-month-olds looked longer at the video depicting two boys performing an action in the testing phase, regardless of singular versus plural verbal stimulus, the 30-month-olds systematically looked longer at the matching video in the testing phase both in the singular and plural conditions, compared with the silent phase.

Because the agreement form tested in the present study relies on the contrast between third-person singular (*il*) and plural (*ils*) subject pronouns, we

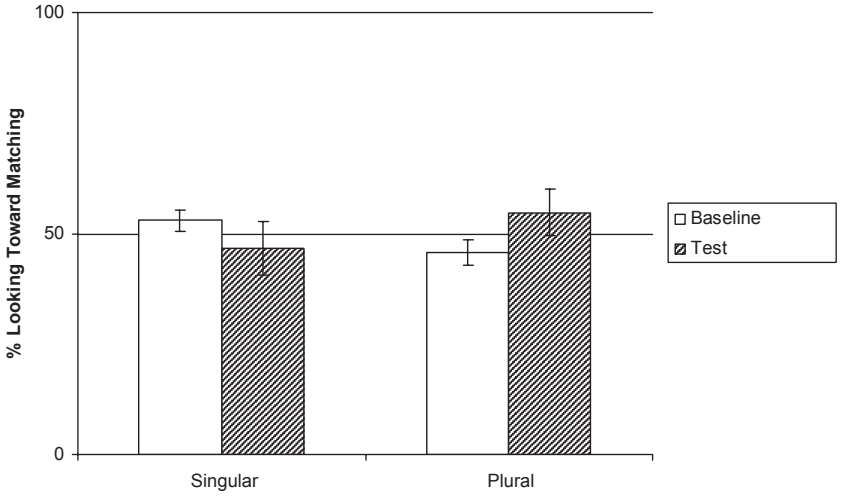

Figure 2. Mean percent looking times (and *SE*s) toward the matching video in silent baseline and at test, broken down by the number of the target, at 24 months of age.

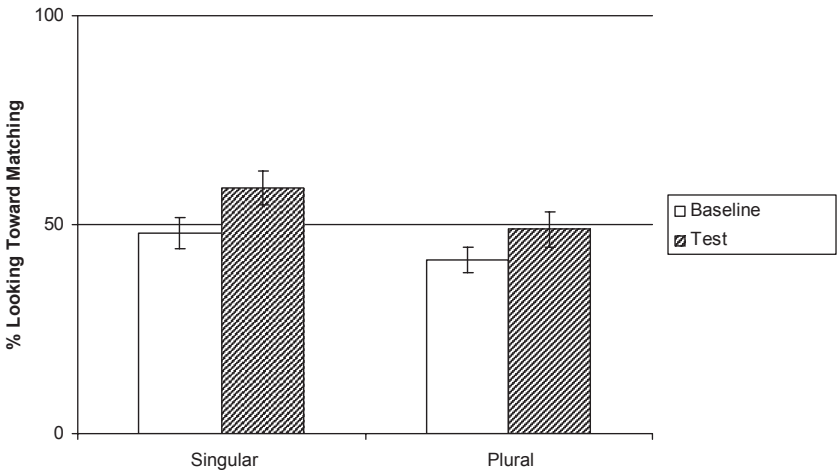

Figure 3. Mean percent looking times (and *SE*s) toward the matching video in silent baseline and at test, broken down by the number of the target, at 30 months of age.

computed children's knowledge of these elements according to parents' responses on the MCDI questionnaires filled out at the time of testing. At 24 months, 50% of the children were reported to understand singular *il* versus 29% for plural *ils*. At 30 months, 96% of the children were reported to understand singular *il* versus 88% for plural *ils*. These numbers show, first, an increase in comprehension of these pronouns between the two ages, for both *il*, $\chi^2(1, N = 35) = 6.32$, $p = .012$, $\phi = .49$, and *ils*, $\chi^2(1, N = 35) = 10.70$, $p = .001$, $\phi = .61$, suggesting that 30-month-olds may have representations of the singular and plural forms they use while 24-month-olds may not. Second, they establish a lack of singular–plural asymmetry, for both 24-month-olds, $\chi^2(1, N = 18) = 1.05$, $p = .31$, $\phi = -.23$, and 30-month-olds, $\chi^2(1, N = 17) = .34$, $p = .55$, $\phi = -.10$, corroborating the lack of an asymmetry in the IPLP results.

Correlation analyses between children's performance in the IPLP task (three variables: overall score, score on singular trials, score on plural trials) and MCDI data (six variables: total number of words/verbs/pronouns understood or produced) were also carried out for both age groups. The only significant correlation was a positive correlation found for 24-month-olds between performance on singular trials and total number of verbs understood, $r(17) = .54$, $p = .02$. No significant correlation was found at 30 months. These results suggest a rather weak link between lexical acquisition and comprehension of agreement, although caution is required in interpreting the present pattern of correlations given the small numbers of participants at each age.

Overall, the results of the present IPLP study demonstrate that 30-month-old children acquiring French are able to distinguish the singular and the plural marking expressed as the linking consonants /l/ versus /z/ in onset position of the second syllable of otherwise phonologically identical verbs. In particular, they were able to match these forms to the target stimuli, in the absence of any additional morphosyntactic or lexical cues. No such evidence could be found for 24-month-olds. These results, therefore, provide evidence for comprehension of a single number contrast by 30 months, which is probably emerging somewhere between 24 and 30 months of age. Like in Kouider et al. (2006) and Wood et al. (2009), young children showed comprehension of *verbal* number marking but there were significant differences in the stimuli. In the English case, the verbal contrast was lexical (*is* vs. *are*) and 24-month-olds showed comprehension with familiar or nonce objects only when several number cues were presented (e.g., ''Look, there **are some** blicket**s**'' vs. ''Look, there **is a** blicket''). When a single nominal cue in the form of the bound morpheme *-s* was presented, children younger than 36 months did not show comprehension.

Because the results of the French IPLP experiment clearly challenge the conclusion based on English and Spanish that subject–verb agreement is mastered late, around age 5 (Johnson et al., 2005; Pérez-Leroux, 2005), we set out to replicate them, using a different experimental technique. In Experiment 2, we administered a pointing task to a separate group of 30-month-olds and asked whether the 6.8% increase in looking time

observed between baseline and test in IPLP revealed an understanding of number agreement stable enough to be able to guide a pointing response, a task requiring both decisional and motor planning.

Experiment 2

IPLP has been widely and successfully used to investigate other aspects of language acquisition, in particular, argument structure in younger children (Hirsh-Pasek, Golinkoff, & Naigles, 1996; Naigles, 1990, 1996; Naigles & Bavin, 2002) because it places very few demands on them. For the present agreement study, it is worth asking whether adding some burden on children would result or not in comprehension failure. This, in turn, would reveal how robust the underlying representation of subject–verb agreement is, say, at 30 months of age. Therefore, Experiment 1 was replicated for 30-month-olds using a pointing task (more similar than IPLP to the methods used in previous studies on subject–verb agreement). If their representation of subject–verb agreement is stable, pointing is likely not to hinder comprehension, especially since children in that age range are known to succeed in this task (Brandone et al., 2007; Dittmar et al., 2008; Maguire et al., 2008).

Method

Participants

Participants included 16 monolingual French-speaking 30-month-olds (8 males, 8 females; M = 30 months, 12 days; range = 28 months, 18 days to 32 months, 11 days). Six additional children were tested but excluded from the experiment due to their refusing to participate (1) or pointing in fewer than four trials (5). Children were all tested in Paris. They were recruited from a database of parents who volunteered to participate in child development studies and came from diverse socioeconomic backgrounds.

Materials

We used the same visual and verbal stimuli as in Experiment 1 (of the two pronunciations of the plural pronoun, /iz/ and /ilz/, the experimenter consistently used the latter). Children were only presented with verbs that they comprehended according to parental report.

Procedure

Prior to coming to the lab, parents were asked to name which of the 10 verbs used in the experiment their child knew. Right before their visit, parents also completed a French version of the MCDI modified by the authors for present purposes. MCDI questionnaires were returned for 12 (of 16) children.

Each child was tested individually in a soundproof booth for about 10 min using a pointing task. Children sat on a parent's lap during the whole session. The parent, wearing dark glasses rendered opaque by covering the inside of the lenses, was blind to the video stimuli. The (female) experimenter sat to the immediate right of, and slightly behind, the child. Having the experimenter sit fully behind the child was tested but proved problematic: The child would frequently turn back because of interest or to seek approval. When pronouncing the target utterance, the experimenter was careful not to look at the child or the screens; rather she stared at the central light between the two screens so as not to influence the child's pointing.

The session started with up to four training trials intended to set up the pointing game. The structure of the trials was similar to that in Experiment 1, and it was the same for the training and test trials. The child's attention was first centered by flashing a central light located between the two presentation screens (the child facing the whole display). Once the child looked at the central light, a pair of pictures of bright, easily recognizable objects was shown in silence for 6 s. Then the screens turned black and the experimenter named one of the two objects and asked the child to point to it (e.g., *Tu as vu la pomme? Montre-moi avec ton doigt où elle se trouve la pomme, montre-moi la pomme* ''Did you see the apple? Show me with your finger where the apple is, show me the apple''). The two images immediately reappeared on their respective screens for 6 s. The child's task was to point to the matching screen. If the child didn't point during the first seconds, the experimenter repeated the invitation once to give the child another chance at responding and then, regardless of response, moved onto the next trial. Each trial ended with the 3-s eye-catching video displayed on the matching screen, as done in Experiment 1, following Kouider et al. (2006).

Each child was then presented with eight trials of familiar verbs (all knew at least eight of the verbs used in the present experiment). They were simultaneously presented the 6-s singular/plural versions of the actions used in Experiment 2 twice, first in silence then following the experimenter's

request (e.g., *Tu as vu? Ils attrapent le zappe, montre-moi avec ton doigt où ils attrapent le zappe, montre moi où ils attrapent le zappe* ''Did you see? They are catching the zap, show me with your finger where they are catching the zap, show me where they are catching the zap'').

For each child, the target was the singular action four times and the plural action the other four times (in random order). The order of presentation of the different actions/verbs was randomized by the experimenter, and the side of the matching video was counterbalanced within participants for each condition (singular/plural).

Coding and Reliability

Coding of children' pointing was done online by the experimenter, but the sessions were videotaped using a digital video camera placed between the two screens. Each trial was coded as correct (score = 1) or incorrect (score = 0). A response was coded as correct only if the child clearly and decisively pointed to one screen. Any hesitant, double pointing or refusal to point resulted in the elimination of the corresponding trials. Overall, children clearly pointed on 7.25 of 8 trials. The data were first coded online, then entirely recoded offline by an assistant not familiar with the study and blind to the conditions of each trial. Interrater reliability was of 96%. Only five trials led to different answers by the two coders; these trials were viewed again by the two original coders and a third coder, and coding agreement was easily reached.

Results and Discussion

There was no significant difference between the singular and plural conditions, $t(15) = .48$, $p = .64$, two-tailed, $d = .17$ (Figure 4). Overall, children pointed at the matching video 61.93% ($SD = 14.16$) of the time ($M = 64.06\%$, $SD = 26.48$ for singular; $M = 59.90\%$, $SD = 23.02$ for plural, the slightly better performance for singular being entirely due to 1 child who only pointed to singular actions), which is significantly above the 50% chance level, $t(15) = 3.37$; $p = .004$, two-tailed, $d = 1.74$. There was a majority of 12 children who gave more correct points versus 2 children who gave fewer correct points and 2 children who gave as many correct and incorrect points, $\chi^2(2, N = 16) = 10.38$, $p = .006$, $\phi = .38$.

Just as in Experiment 1, the lack of singular versus plural asymmetry revealed in the pointing task results is corroborated by MCDI evidence that

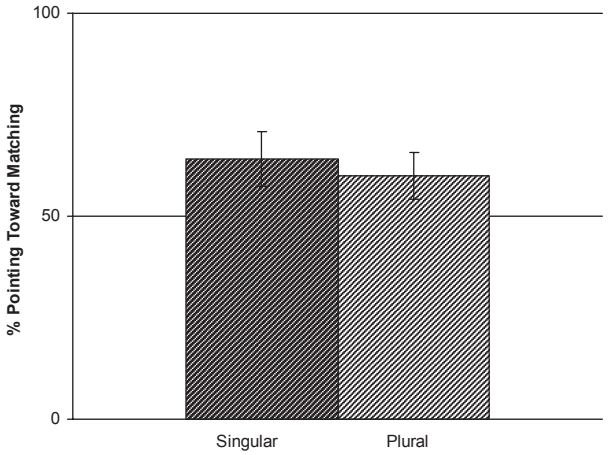

Figure 4. Mean percent pointing (and *SE*s) toward the matching video at test, broken down by the number of the target, at 30 months of age.

30-month-olds have the same level of comprehension of singular *il* and plural *ils*: Ninety percent of the 30-month-olds in Experiment 2 (compared to 96% in Experiment 1) were reported to understand *il* versus 80% for *ils* (compared with 88% in Experiment 1). Note that both groups of 30-month-olds are clearly at the same level of acquisition of these third-person subject pronouns, both for *il*, $\chi^2(1, N = 27) = .16$, $p = .69$, $\phi = -.08$, and *ils*, $\chi^2(1, N = 27) = .34$, $p = .56$, $\phi = -.11$.

As in Experiment 1, we also performed correlation analyses between children's performance (three variables: overall score, score on singular trials, score on plural trials) and MCDI data (six variables: total number of words/verbs/pronouns understood or produced). There was a significant positive correlation between overall performance and total number of verbs understood, $r(11) = .59$, $p = .04$, and a marginal positive correlation between performance on singular trials and total number of verbs understood, $r(11) = .55$, $p = .06$. Again, these results suggest a rather weak link between lexical acquisition and comprehension of agreement, although caution is required in interpreting the present data given the small numbers of participants.

Overall, Experiment 2 shows that increasing the decisional and motor burden on 30-month-olds does not hinder children's performance. Thirty-month-old children were able to distinguish between third-person singular and plural and match the plural and singular expressions of liaison to the target visual stimuli. Moreover, no asymmetry between children's performance in the singular versus plural conditions was revealed by the analyses. Representations of subject–verb agreement for

the forms tested, thus, appear to be rather stable at 30 months of age.

The results of Experiments 1 and 2 raise the issue of whether children's performance is closely or loosely tied to properties of the adult input. Recall that Childers et al. (2001) suggested that Spanish-learning children's preference for singular agreement forms in a pointing task was paralleled by a singular bias in the adult input, albeit in different varieties of Spanish. Does a similar pattern extend to French or not? The experimental results in Experiment 1 and 2 show no singular–plural asymmetry. Is such an asymmetry also absent in French adult input? We analyzed large samples in Experiment 3 to determine the frequencies of singular and plural bare pronoun + verb combinations similar to those used in our stimuli and tested the hypothesis put forward by Childers et al. (2001).

Experiment 3

We analyzed the occurrence in child-directed speech and in spontaneous child production of the type of third-person subject pronoun + verb combinations we used in our experimental stimuli.

Method

For our analysis of the frequency of use of the third-person singular and plural subject pronouns in adult input, we used the Child Language Data Exchange System (MacWhinney, 2000) data of spontaneous speech by native French mothers of 5 monolingual, normally developing children acquiring (Parisian) French for a total of more than 54,000 utterances: dizygotic twins Camille and Pierre, ages 15–25 months and 16–27 months, respectively (Hunkeler, 2005); Pauline, age 14–30 months (Bassano & Mendes-Maillochon, 1994); Anne, age 22–30 months (Plunkett, 2002); and Grégoire, age 21–29 months (Champaud corpus).

We coded all occurrences (full and reduced) of the third-person singular pronoun *il* (/il/ or /i/) and third-person plural pronoun *ils* (/il/, /ilz/, /iz/) in the absence of a full NP subject, distinguishing eight types of verb forms, depending on: (a) number (singular or plural), (b) whether the verb starts with a vowel or a consonant (which determines the actual pronunciation of the pronoun), and (c) whether the verb has a regular ending or form (Class I) or irregular (other classes).

If the verb is regular and starts with a vowel (Type A), marking of number is carried by the preverbal pronoun only (*Il embrasse* /i**l**ãbras/ ''He kisses'' vs. *Ils embrassent* /i(l)**z**ãbras/ ''They kiss''). This is the combination type used in Experiments 1 and 2. Three other types are found in French. If the verb is regular and starts with a consonant (Type B) number distinctions are all silent; the default form /i(l)/ is used (e.g., *Il(s) danse(nt)* /i(l)dãs/ ''He or they dance''). If the verb is irregular and starts with a vowel (Type C), number is redundantly marked by the pronoun and the verb root or ending (e.g., *Il a* /ila/ ''He has'' vs. *Ils ont* /i(l)zõ/ ''They have''). If the verb is irregular and starts with a consonant (Type D), marking of number is carried by the ending or root only, the distinction between *il* and *ils* being silent again (e.g., *Il prend* /i(l)prã/ ''He takes'' vs. *Ils prennent* /i(l)prɛn/ ''They take'').

Results and Discussion

The results are displayed in Table 1 with some specific points of comparison of the adult input with the stimuli used in Experiments 1 and 2.

The percentage of child-directed utterances containing any bare third-person pronoun + verb combination out of the total number of child-directed utterances varies across children (from 4% to 18%) but it remains overall quite low. The percentage of singular combinations out of all third-person pronoun + verb combinations is always higher than plural combinations, ranging from 62% for Pierre to 92% for Grégoire and disproportionally so for four of five children. Overall, this means that French-learning children are not systematically exposed to a large proportion of third-person pronoun + verb combinations compared to other types of utterances (e.g., noun + verb, first- or second-person subject pronoun + verb). Nor are they systematically exposed to any morphophonological contrast between third-person singular and plural pronoun + verb combinations, regardless of verbal type given the marked asymmetry in favor of singular forms.

Type A forms (in bold) are similar to the forms used in our comprehension stimuli. As shown in Table 1, Type A forms are relatively rare in the adult input (except for Camille, 39%) compared to other types of verb forms, both in the singular (2%–8%, out of all singular combinations) and in the plural (0%–12%, out of all plural combinations).

A parallel analysis of spontaneous child production in the same corpora is displayed in Table 2. Up to 30 months of age, children vary in their overall level of spontaneous production of bare third-person pronoun + verb combinations. Yet

Table 1
Frequency of Adult Third-Person Pronoun + Verb Combinations in Adult Input (Type A = Combinations Used in Experimental Stimuli)

Corpus and age in months	Camille (15–25)	Pierre (16–27)	Pauline (14–30)	Anne (22–30)	Grégoire (21–29)
Total adult utterances	1,875	1,558	8,873	35,480	6,430
Total singular and plural combinations, Types A–D (out of all adult utterances)	8% (151/1,875)	18% (279/1,558)	5% (421/8,873)	4% (1,374/35,480)	10% (639/6,430)
Singular combinations, Types A–D (out of all combinations)	91% (137/151)	62% (174/279)	90% (381/421)	82% (1,130/1,374)	92% (589/639)
Singular combinations, Type A (out of all singular combinations)	39% (53/137)	2% (3/174)	8% (30/381)	7% (79/1,130)	8% (45/589)
Plural combinations, Type A (out of all plural combinations)	0% (0/14)	1% (1/105)	5% (2/40)	6% (14/244)	12% (6/50)

Table 2
Frequency of Spontaneous Child Third-Person Pronoun + Verb Combinations (Type A = Combinations Used in Experimental Stimuli)

Corpus and age in months	Camille (15–25)	Pierre (16–27)	Pauline (14–30)	Anne (22–30)	Grégoire (21–29)
Total child utterances	1,334	1,057	3,943	5,468	4,037
Total singular and plural combinations, Types A–D (out of all adult utterances)	0% (0/1,334)	0% (0/1,057)	1% (46/3,943)	3% (150/5,468)	3% (133/4,037)
Singular combinations, Types A–D (out of all combinations)	0% (0/0)	0% (0/0)	89% (41/46)	83% (125/150)	94% (125/133)
Singular combinations, Type A (out of all singular combinations)	0% (0/0)	0% (0/0)	0% (0/41)	2% (3/125)	3% (4/125)
Plural combinations, Type A (out of all plural combinations)	0% (0/0)	0% (0/0)	0% (0/5)	0% (0/25)	0% (0/8)

they are systematically found to produce more singular than plural forms if they produce any (ranging from 83% to 94%), and very few vowel-initial verbs.

In sum, the analysis of five corpora provides a clear picture of the particular verbal forms of the language French-learning children are generally exposed to. First, they are exposed to a much higher proportion of singular than plural third-person pronoun + verb combinations across all types of morphophonological instantiations. Second, vowel-initial verbs varying in the singular versus plural because of liaison constitute an infrequent morphophonological subclass in the adult input. Therefore, French-learning children are rarely exposed to the type of stimuli we used in comprehension Experiments 1 and 2, a situation different from the relatively frequent subject–verb agreement forms studied in Spanish, and to a lesser extent, English. Moreover, like its Spanish counterpart, the French adult input displays a singular bias; however, such a bias was not reflected in our comprehension results, contrary to the singular bias found in Spanish by Childers et al. (2001).

General Discussion

The main finding of the present study is that French-learning 30-month-olds distinguish singular versus plural subject–verb agreement forms signaled in the plural by a /z/ sound at the onset of the second syllable of a simple verbal utterance and use them to guide looking or pointing to events

with singular or plural agents. While 24-month-olds did not succeed at the preferential looking task, 30-month-olds were able to match the same visual scene with a corresponding verbal stimulus in two different experimental tasks, with and without added decisional and motor planning with no incidence on the results (the often reported increased sensitivity of looking over pointing tasks is thus not found in our study). This suggests that 30-month-olds have knowledge of subject–verb agreement, and that this knowledge is independent of the demands of the task and therefore robust.

While early sensitivity to number agreement cues may be present in English-learning children as young as 16 months (Soderstrom et al., 2007) and comprehension of singular–plural morphology has been found in 24-month-olds provided it is lexicalized and occurs in combination with nominal cues (Kouider et al., 2006; Wood et al., 2009), comprehension of bound singular–plural morphology had not been found before the age of 3 or 5, depending on the study (Childers et al., 2001; cf. Johnson et al., 2005; Pérez-Leroux, 2005). To the best of our knowledge the results of Experiments 1 and 2 are the first to date that point to an earlier age—30 months—for comprehension of bound number morphology in the verbal domain in the absence of any additional cue.

Why do we find such a difference in age of comprehension of subject–verb agreement in French versus English and Spanish? Our main hypothesis relates it to the different encoding of number in the languages investigated: suffixal in English and Spanish versus ''prefixal'' in French. In some speech perception and word recognition/learning tasks, children have been shown to process consonants better in onset position than in coda position (Swingley, 2003; Zamuner, 2006; though see Nazzi & Bertoncini, 2009; Swingley, 2009, for findings failing to find an onset/coda asymmetry). Accordingly, if the /z/ consonant that marks plural agreement in French through the phenomenon of liaison was treated as an onset consonant (a likely possibility that will have to be directly investigated in the future), it might explain why we found better/earlier processing than for the –/s/ and –/n/ coda consonants marking agreement in English and Spanish, respectively. It is as if agreement marking earlier in the word entails that it is heard precisely at the time children are considering an interpretation of the verb (as onset consonants seem to have more influence on processing in early word recognition tasks; Swingley, 2003).

This difference in encoding may not, however, explain the size of the age gap (30 months/2 years and 6 months vs. 5 years of age). Potentially crucial procedural differences, in particular in the nature and quality of the stimuli used, may also have contributed to the results. In both the English and Spanish studies conducted by Johnson et al. (2005) and Pérez-Leroux (2005), children looked at static pictures of, say, one duck versus two ducks swimming. The pictorial representation of the action was necessarily abstract, with only a wavy line depicting water, and no representation of swimming per se. This may have resulted in insufficient salience of the verb causing subjects to focus on the subject for number information that was by design masked by using *s*-initial verbs (the stimuli used in Childers et al. (2001) appear to have been similar but full details of illustration are lacking). Using dynamic videos in the French study with actual children performing various actions may have had a facilitating effect.

However, it is also possible that the use of high-quality images rather than simplified, abstract pictures, and not the dynamic dimension of our stimuli per se, helped the 30-month-olds in our study. It could even be that the dynamic actions added some processing weight, as the discriminating elements between the singular and plural versions of the actions were only observable during a limited portion of the video. Then maybe the failure of the 24-month-olds is not due to the lack of abstract representations of subject–verb agreement but rather to difficulties at coprocessing the complex visually dynamic stimuli and the verbal stimulus within 6 s. If so, using high quality images extracted from actual videos, such as a representative frame of the singular and plural conditions, may achieve the goal of providing simpler stimuli while retaining the saliency of the action denoted by the verb and help 24-month-olds show comprehension of subject–verb agreement. On the contrary, should 24-month-olds fail to show comprehension under such conditions, then we would be closer to concluding that abstract representations of subject–verb agreement emerge somewhere between 24 and 30 months of age. In light of the results obtained by Kouider et al. (2006) and Wood et al. (2009), this would suggest that comprehension failure in 24-month-olds is tied instead to the nonredundant and nonlexical marking of number agreement contrasts in French.

The present findings have two implications for the acquisition of subject–verb agreement. First, comparing her Spanish results with English results by Johnson et al. (2005), Pérez-Leroux (2005) concluded that children show a preference for the

number category that is instantiated by overt morphology, namely, singular *–s* in English and plural *–n* in Spanish. This conclusion is challenged by our results. Children failed to show better performance on plural verbal forms than singular ones despite the fact that plural agreement is always signaled by /z/ with vowel-initial verbs in French. Second, Childers et al. (2001) attributed their finding that young Spanish-learning children show a significant preference for third-person singular verbal forms over plural forms to a disproportionate number of singular forms in the adult Spanish input. This interpretation is not supported by our results, as the French-learning children we tested did not display an overall preference for singular verbal forms, despite a singular bias in the adult input.

Our findings also bear on previous claims concerning the acquisition of liaison in French because the plural number agreement tested is phonologically realized through liaison. In a picture description task requiring children to produce pronoun + vowel-initial verb combinations like *Ils écrivent* ''They write'' after the prompt *Ici les garçons lisent et là?* ''Here the boys read and there?'' Gallot, Spinelli, and Chevrot (2008) showed that 31- to 46-month-olds produce correct, obligatory liaison only 68% of the time. Experiments 1 and 2 provide evidence for awareness of liaison in verbal contexts by 30 months, an age when children's production of liaison is not yet systematic. A possible explanation for this discrepancy relates to Gallot et al. (2008)'s use of a picture description task requiring children to cooperate and remember a prompt. This explanation is indirectly supported by independent studies having revealed a gap between production of *–s* marking in English in the context of a sentence completion with nonce verbs task (Berko, 1958) versus spontaneous production (Brown, 1973).

Our study also contributes to the growing literature on the role played by function words in acquiring language. Previous studies established that subject pronouns like *il* facilitate early segmentation of verbs and comprehension of verbs as denoting actions. Regarding segmentation, Marquis and Shi (2008) tested French-learning 11-month-olds on novel verb segmentation on passages containing two combinations of subject noun + verb and five combinations of a subject pronoun + verb, and found that these children at the onset of vocabulary learning were able to segment monosyllabic verbs out of two-word sequences. Regarding comprehension, Bernal et al. (2007), using a pointing task, taught novel verbs to 23-month-old French children watching a moving object within sentences consisting of the subject pronoun *il* + verb (e.g., *Il poune par là* ''It's pooning there'') and novel nouns to a control group (e.g., *Un poune est là* ''A poone is here'') with the same visual stimuli. These children were able to distinguish verb/actions from noun/objects on the basis of their syntactic environment, the pronoun *il* versus the determiner *un*. Our study adds to this body of research on function words by establishing that by 30 months of age, children comprehend number subject–verb agreement based on pronoun-related phonological form variations.

Finally, our study has implications for general theories of syntactic acquisition. One of the main current debates in first language acquisition focuses on whether early acquisition proceeds via item-based schemas closely tied to input frequency (e.g., Lieven, Pine, & Baldwin, 1997; Theakston & Lieven, 2005; Tomasello, 2000) or abstract representations largely independent of input frequency (e.g., Chomsky, 1981; Fisher, 2002; Lidz & Gleitman, 2004). Overall, the results of the present experimental studies combined with the corpus study challenge attempts at establishing a close connection between child performance and adult input, as children were clearly sensitive to both singular and plural agreement relations at an early age despite a pattern of infrequent and singular-dominant use of these forms by adults.

Although constructivist accounts do not make precise claims about the amount of input required for item-based learning of singular–plural marking, our results nevertheless indicate that very little input is needed to master the liaison-based subject–verb agreement system of French. Accordingly, we interpret our data as evidence that 30-month-old French-learning children have reached a milestone in the acquisition of subject–verb agreement in that they have acquired the abstract categories of singular/plural instantiated by a single cue, a third-person singular/plural pronoun triggering liaison, as well as the contrast between singular and plural. Their linguistic representations of number are abstract in kind rather than item-based, as well as robust. In a follow-up study, we plan to test whether these representations are robust enough to support comprehension in noun/verb variants of Experiments 1 and 2 in 30-month-olds.

To end on this issue, because language acquisition is not possible without linguistic input, the present results raise the question of how 30-month-olds have learned subject–verb agreement given the low frequency of the relevant forms in the adult input. We suspect that it is the cumulative effect of

acquiring the entire system of subject–verb agreement in French that makes it possible to learn all its expressions, ranging from the morphological marking of number on the subject NP, doubling by a pronoun, the verb itself if irregular, as well as liaison where appropriate. A particularity of spoken French including child-directed French (Culbertson & Legendre, 2008) may be relevant. Spoken French favors pronoun doubling or the co-occurrence of a subject NP and a pronoun agreeing in person and number (e.g., *Jean il est parti* ''John he left''; *Marie elle est partie* ''Mary she left''). Depending on whether the verb itself displays regular or irregular person/number marking, whether the verb is vowel or consonant initial, and whether the subject NP includes a determiner or not, a nonadjacent dependency results that may include up to four cues: ***L'anim**al **il a** une trompe* ''The animal it has a trunk'' versus ***Les** anim**aux ils ont** une trompe* ''The animals they have a trunk.'' The redundancy in morphophonological cues of number including two identically sounding liaisons marking plural (*Les animaux /***lez**animo/; *ils ont /*i(l)**z**õ/) may well be salient enough for abstract representations to follow and for the use of a single cue with low saliency in the interpretation of third-person singular versus plural subjects by 30-month-old children.

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