J. Child Lang. **30** (2003), 145–164. © 2003 Cambridge University Press
DOI: 10.1017/S0305000902005421 Printed in the United Kingdom

Lexical choice can lead to problems: what false-belief tests tell us about Greek alternative verbs of agency*

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(*Received* 23 *February* 2000. *Revised* 25 *February* 2002)

ABSTRACT

Verbs of agency denote relations between behavioural and mental states. Thus, 'Jim is looking **for** X' goes beyond a behavioural description, to take a mentalistic construal whereby Jim's desire for success, and his beliefs about how to search, explain his observed actions. Greek has two verbs of agency that can be used somewhat interchangeably by adults to mean 'to look for'. The hypothesis is that young children will obey the principle of contrast to diagnose that one verb is mentalistic and the other verb is to be construed behaviourally. Following a study of mothers' verb-use, two studies with 238 children aged three to five years confirmed that the verb preferred in home use gave below-chance performance on a false-belief test whilst the less-established verb gave above-chance success, with children giving appropriate justifications. Thus, Greek preschoolers seem sometimes to have an adult-type understanding and sometimes fail to match the adult understanding. The proposal is that the children initially convert an adult verb-use pragmatic difference into a semantic contrast.

[*] We express our appreciation to Irene Philippaki-Warburton, Georgia Katsimalis Dimitra Katis, Christopher Charalambakis and two anonymous reviewers for their helpful detailed comments on earlier versions of this paper. Address for correspondence: Norman Freeman, Department of Experimental Psychology, University of Bristol, 8 Woodland Road, Bristol BS8 1TN, UK. e-mail: n.freeman@bristol.ac.uk

INTRODUCTION

Most of the studies on children's acquisition of Greek concern syntactic development (Theophanopoulou-Kontou, 1973; Katis, 1984; Stephany, 1985; Tsimpli, 1992; Varlokosta, 1996; Stephany, 1997). Experimental work on the lexicon is limited. The single corpus in the CHILDES database (Stephany, 1997) contains speech recordings from four monolingual young children. Thus there are vast areas of child language where Greek researchers have to start from scratch with dictionary definitions and to test for the ascribed meanings. This paper does that for a pair of complement-taking action verbs that adults construe in terms of the mind of the agent who carries out the action. The question is how children between three and five years of age construe the relations between the pair of verbs. We predicted that the availability of two Greek verbs impels the children to assign the semantics of only one of the two verbs to a mentalistic rather than to a behavioural level. The ensuing question is which verb gets assigned to each level. Study 1 involves finding out if one of the verbs is the preferred form in the home; and Studies 2 and 3 record preschoolers' verb-interpretation. To anticipate the data, the differences in verb-interpretation fit well the perspective that adults offer children pragmatic directions about word meanings whence children construct semantic distinctions (see Clark, 1997). We follow the common formulation that 'Semantics and pragmatics are concerned with complementary and overlapping aspects of the study of meaning' (O'Grady, 1996). The data we document reveal children taking an adult pragmatic difference in emphasis one step too far, and mistakenly constructing a semantic contrast.

The background to the research is that many researchers have independently documented an intimate relation between semantic acquisition and the child's processing of social–pragmatic cues to a speaker's perspective (e.g. Baldwin, 1993; Tomasello, 1995; Clark, 1997; Baldwin & Tomasello, 1998; Astington & Jenkins, 1999; Cutting & Dunn, 1999; Tomasello, 1999; Bloom, 2000; Bloom & Tinker, 2001). For example, Sabbagh & Baldwin (2001) showed that four-year-olds, but not three-year-olds, showed faster name-learning for a new object when the speaker claimed to have made the new object herself than when she said that it had been made by a friend. The children took the pragmatic cue to infer how knowledgeable the speaker was likely to be, and the inference guided acquisition. The vigorous line of research is revealing the extent to which 'early word learning receives important support from children's theory-of-mind skills' (Sabbagh & Baldwin, 2001). In reciprocal fashion, theory-of-mind skills are facilitated by language that focuses attention on mentalistic concepts (Dunn, Brown, Slomkowski, Tesla & Youngblade, 1991; Bartsch & Wellman, 1995; de Villiers & de Villiers, 2000). Facilitation is an effect that falls under the purview not only of semantics but also of pragmatics governing 'how the meaning that the speaker

intends to communicate by using a particular utterance in a particular context is understood by the addressee' (O'Grady, 1996).

The central argument of Bloom (2000) is that children acquire a large part of their vocabulary, both open-class and closed-class words, through accessing meanings *via* an interpretation of speakers' intentions. Bloom's model incorporates the principle of lexical contrast when children discriminate between alternative intentional construals. That is, the model involves children (a) deploying a theory of mind, and (b) processing the theory-of-mind result through a contrastive device to segregate referential meanings (thus 'tidying up language', as Clark (1987) put it). Let us give two brief formulations of the two terms in the model: theory-of-mind and contrast.

First, a third-person theory of mind 'could equally well be called having a theory of agency' (Russell, 1996). A theory of agency tells one when to distinguish mentalistic construals from behavioural construals of what people say. Thus, 'Jim is looking **for** his microscope' is heavily mentalistic in denoting Jim's striving to meet success conditions, in contrast with the more behavioural 'Jim is looking **at** his microscope' where the success condition is presupposed as having been met. 'Jim is looking **for** X' goes beyond a behavioural description, to take a mentalistic construal whereby Jim's desire for success, and his beliefs about how to search, explain his observed actions. English makes heavy use of both function words and content words in directing attention to mentalistic emphases or to behavioural emphases with verbs of agency.

Secondly, contrast 'is a linguistically important psychological fact' (Miller & Johnson-Laird, 1976). The proposal that contrast is a 'basic building block of lexical and conceptual memory' (Miller & Johnson-Laird, 1976) has been used by many researchers in specifying acquisition. Contrast was propounded by Clark (1987) as a general acquisition principle: 'every two forms contrast in meaning' (Clark, 1987) so there are almost no fully identical synonyms (see Lyons, 1981). The empirical consequence of contrast is that 'Children assign contrasting meanings to distinct forms, but they don't always hit on the conventional adult contrasts' (Clark, 1987). That is the case we examine for a mentalistic vs. behavioural contrast between the two Greek verbs.

In English, the verb 'to look for' is used by adults in the unexpected-transfer false-belief task in order to ask preschoolers where Jannis will look for his ball that he had put at location A and did not see being moved to location B. That is a standard test of an understanding of Jannis as an agent who will look at A, because his false belief directs him there, away from the success condition (see Perner, 1991, for representational analyses of agency). Syntactically, such a verb is characterized by a particular type of complement structure that includes specifying a target. The proposition 'Jannis **is looking for** Frosso' specifies finding Frosso as a success condition that has not yet been met,

alerting the hearer that Jannis has a reason for whatever pattern of behaviour he is showing. The core of de Villiers & de Villiers' (2000) analysis of both 'verbs of communication' (e.g. 'tell') and mental-state verbs (e.g. 'think') is that their sentential complement structures allows a false proposition to be embedded under a verb and the whole sentence nevertheless remain true. Verbs like 'tell' and 'think' embody the propositional attitude realized in the whole sentence. Whether or not Jannis realizes that his ball has gone missing, it can still be true (a) that 'Jannis **believes** that he still has his ball' (mental-state verb), and (b) that 'Jannis **tells** Frosso that he still has his ball' (verb of communication). So 'acquiring the language of complementation is prerequisite for being able to reason about false beliefs' (de Villiers & de Villiers, 2000, p. 219). de Villiers & de Villiers not only provide a principled explanation of the empirical association between theory of mind and general language skills (e.g. Astington & Jenkins, 1999; Cutting & Dunn, 1999), they also cite data to show that an understanding of sentential complements precedes a grasp of false belief.

In order to study the acquisition of verbs of agency, standard false-belief tests can be used to diagnose children's progress in language. Consider the above-mentioned unexpected-transfer test where an agent does not know where his ball is and the child is asked where the agent will look for the ball. The semantics of 'look for' were discussed by Miller & Johnson-Laird (1976): someone looks for *x* if they intend a causal relation between the implemented action and the success condition of gaining perceptual access to *x*. The formulation is unified in terms of agency: it is the agent who does the search, and intends it to yield the success which in turn is defined by the agent's access to *x*. The right answer in the unexpected-transfer test is that the agent will look where *x* is not present because she falsely thinks *x* to be there. A child who gives a right answer can be credited with accepting the language of questioning to focus attention on a mentalistic explanation of the agent's predicted behaviour. The wrong answer in the test, that the agent will look where the hidden object is in reality, would indicate that the question 'Where will she look for it?' has been construed by the child as a factive reference to success conditions (see Perner, 1991). The child answers in behavioural terms: what the agent has to do in order to achieve the intended success. The comprehension error could stem from a conceptual deficit (Perner, 1991), misunderstanding the pragmatics of the question in task context (Siegal, 1997) or a failure grasp the sentential complement structure (de Villiers & de Villiers, 2000). For the present let us note that the de Villiers' suggestion raises a need to investigate different terms taking the same complement structure. Greek has two such ways to lexicalize semantic components of 'looking for'.

Each of two Greek verbs, 'kitazo' (=look) and 'psahno' (=search) can be used with the complement 'na vro', which itself literally means 'to find', to ask

the critical question 'Where will X look for Y?'. 'Na vro' denotes the success condition, and either 'kitazo' or 'psahno' denotes the attempt. The word 'na' in the constructions 'kitazo na vro' and 'psahno na vro' is not like the English 'to', but is a subjunctive particle. The verb in the sentential complement 'na vro' is a finite form (Greek verbs do not have non-finites). We next propose that 'kitazo na vro' is used as in English with a range from mentalistic loading to behavioural, whilst 'psahno na vro' is restricted to giving a purposive ascription to an overt, often intense, action.

Without the complement, 'kitazo' is defined as 'to look, to observe, to regard, to watch' (Madeson, 1995). It can be used, therefore, deictically to mean 'look at', particularly in drawing the listener's attention to an object or a person, and it also can mean 'to attend' or even 'to take care of' whatever is being attended to. Thus, 'kitazo' in its various usages is close to the English 'look', 'look at', and, with the complement 'na vro', 'look for'.

With the complement, 'psahno' becomes an intensified alternative rendition of 'look for'. A typical dictionary entry for 'psahno' is 'to look for, to search for, to try to find' (Madeson, 1995). 'Psahno' thus conveys an agentive and striving meaning. Because 'na vro' on its own means 'to find', 'psahno na vro' is fairly rendered as a striving to meet an as-yet unfulfilled success. We now consider uses of the verbs, bearing in mind that many uses may be outside the range of received and produced speech at the preschool phase.

The prototypical meaning of the verb 'kitazo' can be found in the context of noun phrase complements, as in

(1) kitazo ton Janni
look-1-sg the John
'I am looking at John'

(2) kitazo ton ilio
look-1-sg the sun
'I am looking at the sun'

'Kitazo' can be also used with a **NA**-sentence (subjunctive complement clause) thereby differing from its original meaning 'to look (at)'. It alternates between a perceptual meaning and a mentalistic meaning according to the nature of the **NA**-predicate. Consider the examples:

(3) kitazi na vri to vivlio
look-3-sg subj-prt find-3sg the book
'S/he is looking to find the book'

(4) kitazo na mi sou lipsi tipote
look-1-sg subj-prt neg-prt you-clitic lack-3-sg anything
'I am looking so that you won't lack anything, I am taking care of your needs'

(5) kitazo na telioso ti dhiatrivi mu sindoma
look-1-sg subj-prt inish-1-sg the thesis my-clitic soon
'I am looking to finish my thesis soon, I am trying to finish my thesis soon'

(6) kitazo panda na eho metrita pano mu
look-1-sg always subj-prt have-1-sg cash on my-clitic
'I always look to have cash on me, I am always trying to have cash on me'

Note that in the (4), (5) and (6) structures, the embedded verb is restricted to activity predicates.

In daily communication, either of the following can express a direct command:

(7) kitakse na vris bala
look-2-sg subj find-2 ball
'Look for the ball'

(8) psakse na vris bala
search-2-sg subj-prt find-2-sg ball
'Search for the ball'

'Psakse na vris tin bala' differs from 'kitakse na vris tin bala' in that the former requires that specific actions must be taken by the hearer to find the ball whereas the latter is a suggestion or warning that the hearer find the ball one way or another.

The following structures are also available to express commands:

(9) ja kitakse na vris tin bala
for look-2-sg subj-prt find-2-sg the ball
'Look for the ball, will you?'

(10) ja psakse na vris tin bala
for search-2-sg subj-prt find-2-sg the ball
'Look for the ball, will you?'

(11) kitakse se parakalo na vris bala
look-2-sg you-clitic please-2-sg subj-prt find-2-sg ball
'Look for the ball, please'

(12) psakse se parakalo na vris bala
search-2-sg you-clitic please-2-sg subj-prt find-2-sg ball
'Search for the ball, please.'

In the above examples, 'ja' or 'se parakalo' are used optionally to express a more polite form of command. These imperative forms are not to be confused

with the following:

(13) kitakse na ise kala
look-2-sg subj-prt be-2-sg well
'Take care so that you are well'

The meaning conveyed by the above example is that of 'be well'. Here, 'kitakse' is used to indicate the friendly disposition of the speaker. This structure, however, is ungrammatical with the verb 'psahno'.

When 'kitazo' and 'psahno' are used with the complement 'na vro' in wh-questions as the ones shown below, they are structurally different.

(14) *ti kitazi na dhiavasi/pari
what look-3- subj-p read/take-3-sg
'What is s/he planning/trying to read/take?'

(15) ti psahni na dhiavasi/pari
what search-3-sg subj-prt read/take-3-sg
'What is s/he looking for to read/take?'

The structure in (14) above is ungrammatical: 'kitazo' blocks the formulation of a constituent question involving the object of the infinitive, i.e. the object of the NA-sentence cannot be extracted and moved to sentence-initial position.

In sum, as stated earlier, 'kitazo na vro' is used as in English within a range of speech acts with a span from mentalistic loading to behavioural; whilst 'psahno na vro' is restricted to giving a purposive ascription to an overt, often intense, action. The question is what effect on acquisition arises from having two forms of 'look for'. At this point if one were working with English, it would be natural to turn to data-bases tabulating frequency of uses (Bartsch & Wellman, 1995). For two reasons, CHILDES (see Stephany, 1997) cannot be used here. First, the speech recordings are of children younger than those in the present study; and secondly, the records make no reference to 'kitazo na vro' and 'psahno na vro'. So it was necessary to run Study 1 which questioned mothers about the uses of the verb forms. Following a report of that study, we then specify the developmental problem, and then Studies 2 and 3 test the hypothesis that mothers' choice between the two verb forms has the unintended effect on young children of treating the two verbs as a lexical contrast. To anticipate, the results disconfirmed four possible alternative explanations to a contrast pragmatics account.

STUDY 1

This study was constructed to identify which of the two verbs mothers would choose when asking their child to find an object, and to assess verb interchangeability.

METHOD

Participants

The mothers of 42 nursery school children from 2 private nursery care centres in Rethymnon, Crete, were interviewed. The age of the children was 3;5 to 4;6. Parental social status was largely white-collar.

Procedure

Each mother was asked to fill in a questionnaire in the order in which items appeared as follows (questionnaires in Greek can be obtained from the first author):

1. Suppose that your child has lost an object, for example a toy. How would you ask him/her to go and find it?
2. In what circumstances might you use each of the following?
   (a) 'kitazo na vro' (b) 'psahno na vro'
3. Which of the following do you use more often in order to ask your child to find a lost object?
   (a) 'psahno na vro' (b) 'kitazo na vro'
4. How does your child ask you to find her/him an object (e.g. a toy) he/she lost?

RESULTS AND DISCUSSION

The mothers' responses to the questions revealed a clear pattern.

The first question of how the mother would tell the child to search, favoured 'psahno' by 39 to 3.

The third question giving a forced choice between the frequency of the two verbs, also favoured 'psahno na vro' by 38 to 4.

The fourth question of how the child would tell the mother to search also favoured 'psahno na vro', by 38 to 4. In the absence of corpus data, we assume the mothers' reports to be accurate enough for the present purpose.

The second question asked for more complex information, requiring the mothers to specify their contexts of usage for each of the verbs. Content analysis confirmed that 'psahno na vro' was the expression of choice for a simple request for search for 40 mothers (administrative oversight lost the 2 remaining data-points). 'Kitazo na vro' turned out to be a phrase of intensification: 37 mothers said that they would use 'kitazo na vro' to ask their children to look carefully, and the remaining 5 said that they would use 'kitazo na vro' when warning the children that if they did not search they would be in trouble.

In sum, 'kitazo na vro' alerts the listener to be both assiduous and effective as a searcher, whilst 'psahno na vro' is restricted to giving a purposive ascription to an overt action. Mothers' use 'psahno na vro' as the default value for 'look for', whilst the 'kitazo na vro' equivalent is pragmatically intensified

with a care for success. Adults interpret both terms as mentalistic: we asked 32 adults (in education class at Athens University) to answer test questions in the unexpected-transfer test described below, and all correctly identified the protagonist's false belief as directing where she would look for her ball.

There are implications for acquisition. It is possible that preschool children acquire both verbs together, but that would fail to take into account the economical tendency of young children to set up or exaggerate contrasts (e.g. Clark, 1987; Markman & Wachtel, 1988; Markman, 1994; Bloom, 2000). It is possible that one of the terms will displace the other, so children will give a mentalistic construal of one term and a behaviouristic construal of the other term. Evidence on that has to come from using a theory-of-mind test to diagnose children's construal of the terms. To which of the two terms would children assign a mentalistic construal? As pointed out above, an equivalent of the English 'look for' is 'kitazo na vro', so one might expect success on the unexpected-transfer false-belief test with 'kitazo na vro' to correlate with success on other false-belief tests that do not involve verbs of action (as described below). Contrast here would lead the 'psahno na vro' to be assigned only a behavioural construal. Any verb acquired before the child has a concept of false belief would be assigned only a behavioural interpretation (or, to use the term of Perner, 1991, a 'situational' success-condition interpretation). If the mothers' reports signify that 'psahno' is the default-value form apart from intensified contexts, then 'psahno' would continue to receive a behavioural interpretation, leaving 'kitazo' free to receive a mentalistic interpretation once children developed to the appropriate theory-of-mind phase. Previous work with 'kitazo na vro' had found above-chance mentalistic construal in three-year-olds (Lewis, Freeman, Kyriakidou, Maridaki-Kassotaki & Berridge, 1996), so the strongest results would be for a question with 'psahno na vro' to yield below-chance performance.

STUDY 2

The task is to administer both verbs in a false-belief test to see whether there is any sign of the hypothesized difference in construal.

METHOD

Participants

There were 24 nursery school children from three private nursery schools in Athens, randomly assigned to two age-matched groups of 12 children between 3;3 and 4;5 years. Parental social status was largely white-collar.

Procedure

The unexpected-transfer test (following Wimmer & Perner, 1983) was enacted with a classroom scene made out of toy furniture and two dolls. One doll,

Andreas, put his ball onto a table and left. In his absence the other doll moved the ball into a cupboard. Half the children were asked 'Where will Andreas look to find his ball?':

(16) Pu tha psaksi o Andreas na vri tin
Where fut-prt search-3-sg he Andreas subj-part find-3-sg the
bala tu?
ball his-clitic

while half were asked the same question but substituting 'kitaksi' for 'psaksi'.

Both groups were also asked the following counterbalanced control questions:

(17) pu afise o Andreas tin bala tu
where put-3-sg the Andreas the ball his-clitic
'Where did Andreas put his ball?' [memory control]

(17) pu ine I bala tora
where be-3-sg The ball now
'Where is the ball now?' [reality control]

RESULTS AND DISCUSSION

The majority of the children (9/12) in the 'kitazo' group passed the test question as expected (above chance, binomial $p = 0{\cdot}046$, $1-T$), while the majority (10/12) in the 'psahno' group failed (below chance: binomial, $p = 0{\cdot}019$, $1-T$). The age range of the sample made it feasible to run logistic regression with age forced into the regression first, followed by group. As expected, age was significant, ($\chi^2_{(1,\ N=24)} = 7{\cdot}96$, $p < 0{\cdot}01$ with $R^2 = 0{\cdot}4$); and question-type accounted for significant unique variance in performance ($\chi^2_{(1,\ N=24)} = 4{\cdot}56$, $p < 0{\cdot}05$, with partialled $R^2 = 0{\cdot}23$).

This pattern of results confirms that the unexpected-transfer procedure can be used to test for a difference in children's understanding of the two verb forms. The next step is to see whether the results bear large-scale replication, to add more tests to diagnose children's mentalistic construals, and to test for explicit awareness of why the agent would act in the way that the child predicts on the unexpected-transfer test.

STUDY 3

The sample was enlarged, and the age-range was expanded so the younger age group overlapped with the older ones tested in Study 2 and the older group was securely above the age at which false-belief test success is expected. Two additional false-belief tasks were given. As in Study 2, the unexpected-transfer test allowed the two verbs to be compared. If even five-year-olds demonstrate

an unsure grasp of the unexpected-transfer task involving 'psahno', this would underline a persistence of a semantic problem which their younger counterparts have. Children were asked to justify their response in the unexpected-transfer test, so their interpretation of 'psahno na vro' and 'kitazo na vro' was directly addressed.

METHOD

Participants

There were 214 children aged 4;3 to 5;4 years, in six state kindergartens (two in Athens and four in Crete), who were predominantly from white collar families.

Procedure

Each child was individually given the three theory-of-mind tasks in a quiet room. Order of presentation was determined by Latin square.

[1] The DECEPTIVE-BOX TEST (Perner, Leekam & Wimmer, 1987) involved showing the child a familiar sweet box (Smarties). The child was asked what was inside the box (each child reported the brand name or 'chocolate'). When the box was opened, the child discovered that it contained only pencils. The lid was replaced. The test question was:

ti nomizes oti ihe mesa kuti
what thought-3-sg that had-3-sg inside box
'What did you think was inside the box?'

The reality control question was then asked as follows:

boris na thimithis ti ihe mesa to kuti
can-2-sg subj-prt remember-2-sg what had-3-sg inside the box
'Can you remember what was inside the box?'

[2] The DECEPTIVE-OBJECT TASK (following Gopnik & Astington, 1988) involved showing the child what looked like a bread roll, and asking the child to identify it:

ti nomizis ine afto
what think-2-sg be-3-sg this
'What do you think this is?'

All children gave an appropriate label. The child was told to squeeze the roll, discovering that it was a plastic squeaky toy. The child was then asked to identify her/his previous belief as follows:

ti nomizes oti ine afto
what thought-2-sg that be-3-sg this
'What did you think it was?'

The reality control question was:

ti ine alithia
what be-3sg reality
'What is it really?'

[3] The UNEXPECTED-TRANSFER TEST was identical to that in Study 2, with the addition of asking children to justify their response to the test question. The sample was randomly divided into two groups. One group, comprising 47 four-year-olds and 59 five-year-olds, was given the unexpected-transfer test with 'psahno na vro'. The other group, consisting of 48 four-year-olds and 60 five-year-olds was given 'kitazo na vro'.

RESULTS AND DISCUSSION

In two of the false-belief tasks the children performed as would be expected, with even the younger group assigning mentalistic meanings in the deceptive-box task (73% success) and deceptive-object task (76% success). The five-year-olds were even more successful and were significantly better than the younger children at the deceptive-box task. The successes were matched by 'kitazo' within the unexpected-transfer test, so the contrast with 'psahno' is striking: in the older group, 80% passed with 'kitazo', but 67% failed with 'psahno'. Thus well into the sixth year 'psahno' is given a behavioural interpretation. Table 1 shows the response types in the two age groups, 4;0 to 4;11 and 5;0 to 5;4. There was consistent success above chance in every case (each binomial, $p < 0{\cdot}001$, $2-T$), except for 'psahno' on the unexpected-transfer test being below chance (binomial, $p < 0{\cdot}001$, $2-T$).

Three logistic regressions were carried out on the GLIM4 package (Francis, Green & Payne, 1993) on success vs. failure in each false-belief task as the outcome measure, with the explanatory variables (a) *psahno* vs. *kitazo* in the unexpected-transfer test, and (b) age: four- vs. five-year-olds. On the deceptive-object tasks there were no significant effects of age, group, or interaction of the two explanatory variables ($\chi^2 =$ or < 1 in each case). For the deceptive-box test there was a significant effect of age (as measured by the change in deviance from the null model in the χ^2 value below), accounting for 83% of the predicted change in variance ($\chi^2_{(1,\ N=214)} = 4{\cdot}12$, $p < 0{\cdot}05$). In the unexpected-transfer test there was no main effect or interaction involving age, but there was a highly significant effect for 'kitazo' vs. 'psahno' ($\chi^2_{(1,\ N=214)} = 55{\cdot}18$, $p < 0{\cdot}0001$), accounting for a highly satisfactory 97% of the change in deviance from the null model.

Next, children's justifications of the protagonist's action in the unexpected-transfer test were divided into five categories: [1] the object had been moved (e.g. 'because Andreas' mother hid it there'); [2] the object's current location (e.g. 'because it is there'); [3] the object's former location (e.g. 'because it was

TABLE 1. *Performance in the three false-belief tasks by age*

	Group A*		Group B†	
	Four year-olds ($N=47$)	Five year-olds ($N=59$)	Four year-olds ($N=48$)	Five year-olds ($N=60$)
Deceptive box task				
pass	35	47	37	47
fail	12	12	11	13
Deceptive object task				
pass	36	49	33	51
fail	11	10	15	9
Unexpected transfer task				
pass	11	20	37	48
fail	36	39	11	12

Question formats for all children were identical in the deceptive box test and the deceptive object test.
* All 106 children forming this group were asked the unexpected transfer test question with the construction 'psahno na vro'.
† All 108 children forming this group were asked the unexpected transfer test question with the construction 'kitazo na vro'.

there'); [4] Andreas' action (e.g. 'Andreas had left the ball there to go out to play'); [5] other responses (mainly 'I don't know', but also, e.g. 'because I know it'; 'because Andreas' Mum wants the ball to be in the cupboard'). Two judges independently assessed the 214 justifications. Agreement on each of the five categories was excellent, with the lowest kappa value being 0·97.

Table 2 shows numbers of responses within each of the five justification categories. Most children who failed the unexpected-transfer test gave a reality-based response, or mentioned the transfer of the object, or the fact that it was hidden in the cupboard, irrespective of whether they had been asked with 'kitazo na vro' or 'psahno na vro'. In contrast, children who passed the test mentioned either the object's original location or Andreas' action of leaving the object at the first place.

The justifications suggest that there are three main ways in which children account for Andreas' actions. The first concerns the present location of the object, a reality bias (Mitchell, 1997). Such a focus on the success conditions for search appeared in most children's justifications when they failed with either question-type. The second and third types of justification, identification of the object's former location and the protagonist's action, occurred exclusively in children who made correct predictions of Andreas' behaviour. Again question-type was not exclusively linked with these justifications.

The only (minor) anomaly concerns the second justification type in Table 2, the use of the current location of the object. Ten children seemed to mark the current location of the object after having answered the test question with

TABLE 2. *Justifications for the protagonist's selection of the location in Study 3 : broken down by group, age and success on unexpected transfer test question*

	Group A*				Group B†			
	Four-year-olds		Five-year-olds		Four-year-olds		Five-year-olds	
Justification	Pass $N=11$	Fail $N=36$	Pass $N=20$	Fail $N=39$	Pass $N=37$	Fail $N=11$	Pass $N=48$	Fail $N=12$
[1] The object had been moved or hidden	0	26	0	30	0	6	0	8
[2] The object's current location	2	0	0	0	5	3	5	3
[3] The object's former location	4	0	11	0	16	0	21	0
[4] Explicit mention of Andreas' action	4	0	9	0	12	0	14	0
[5] Other responses	1	10	0	9	4	2	8	1

* All 106 children forming this group were asked the unexpected transfer test question with the construction 'psahno na vro'.
† All 108 children forming this group were asked the unexpected transfer test question with the construction 'kitazo na vro'.

'kitazo' correctly, while two did so in response to the question with 'psahno'. These 12 children used the present tense of the verb 'to be' ('ine'). A problem in interpreting these results is that this Greek tense can be used to denote the simple present ('it is') and the present continuous ('it is being'). Many of the children whose responses fitted this category simply answered 'because it's there'. It is impossible to distinguish between responses which refer to the actual location of the object and those which refer to Andreas' mind's eye (i.e. as far as Andreas is concerned it's there).

GENERAL DISCUSSION

All English–Greek dictionaries' entry for 'to look for' is 'psahno'; and although mothers in Study 1 reported that that was how children used the term, children in studies 2 and 3 did not treat 'psahno' as mentalistic 'look for' since it dissociated both from a matched question involving 'kitazo', and also from alternative tasks using 'think'. What meaning does 'psahno na vro' have for young children? Their interpretation appears to be instrumental, focused upon success condition of behaviour, rather than on the agency inherent in action. The single lexeme in English that achieves mentalistic interpretation in preschool is split in Greek into mentalistic and behavioural denotations. The split persists in many Greek children in their sixth year, and is only overcome some time later when children begin treating both verbs as mentalistic. Before considering this, we note four hypotheses that the data disconfirmed.

The first possibility is that the verb-plus-complement which adults use most frequently in addressing children in the target context is the one that gives children greater access to how semantics maps onto syntax in sentences with mental-state terms. In fact the result was the reverse. The more common term interfered with epistemic attribution in Study 3. While Study 1 is based upon maternal report, it seems unlikely that the mothers would report the term which the children do not use as the term which they do use. We are forced to conclude that high frequency is not a positive predictor of mentalistic meaning.

The second possibility is that the success with 'kitazo na vro' does not mean that children have reached the phase where they can assign mentalistic interpretations. Mothers had reported using 'kitazo na vro' as an intensified form with the presupposition that the object is findable. But this usage should tempt children to concentrate upon looking at the object and should thus promote errors. Perhaps, then, children interpret 'kitazo na vro' to denote the action of careful searching, and if Andreas has only two places available, maybe the children say that he will search at the wrong location to distinguish between finding the object (denoted by 'psahno na vro') and trying to find the object ('kitazo na vro'). But the successes in the mentalistic deceptive-box test and deceptive-object test militate against the possibility, and so do the justifications the children offered.

The third possibility is that children might simply misinterpret 'psahno na vro' to mean 'to find'. To do this they would have to strip the verb of its complement and take the question to refer to the location of the object. We can reject this as the prime explanation of the results because it does not account for why the children did not give identical responses to the matching question containing 'kitazo na vro'. It does not seem plausible to suggest that the children should overlook the structure of clauses of a more common verb form, when they appear to grasp the complement attached to a less common form which is often used deictically and saliently without any complement.

Finally, children might interpret both verbs behaviourally. In this case, they would ignore the sentential complements of 'kitazo' and 'psahno'. Stripped of the complements, the meaning of 'psahno' involves searching for things which are hidden, and the meaning of 'kitazo' involves looking AT things, as noted in the Introduction. We should expect children to take 'psahno na vro' as searching for the ball in the cupboard; but that is just what they did not do. On the other hand, we should expect children to take the construction 'kitazo na vro' to denote looking AT something, and not to denote looking FOR something. The two conclusions are thus (a) that one verb was construed as mentalistic and the other verb as behavioural, not that both verbs were construed as behavioural, and (b) that the stripped-meaning hypothesis makes precisely the reverse prediction to that which was upheld.

Given the patterns of results, we propose that the research task indeed comes down to explaining the persistent failure of children with 'psahno na vro' in terms of relative success with 'kitazo na vro'. The indication is that being exposed to two ways of describing the act of looking for an object is registered by Greek preschoolers as a clear lexical contrast. The equivalent of dictionary entries for early child language would clarify that 'psahno' refers to the act of finding the object while 'kitazo' directs attention to the searcher's wide perspective on looking. The contrast continues well after the preschool period, despite the child receiving input in which 'psahno' may be used in the same way as the English 'look for' (as shown in the Study 1 data).

What does the pattern of results in Studies 2 and 3 tell us about the nature of children's understanding of verbs which take a complement? In the de Villiers' (2000) account, understanding of belief is based on an ability to grasp complementation. The data presented here suggest that in addition to understanding the general properties of verbs which take a complement, children engage in setting up semantic distinctions like those between the two verbs explored here. It has been customary to assume that belief understanding as a part of a theory of mind develops in a stage-like way and that an understanding of verbs like 'think' develops at the same time as the child's grasp of 'to look for' (though see Freeman, 1994). The distinction between 'kitazo na vro' and 'psahno na vro' might be a special case, caused by a semantic distinction which is clear to children, but not to their parents. However, the fact

that the semantic differentiation persists well beyond the four year watershed provides support for Nelson's (1996) claim that simple stage-like assumptions are at best premature: 'Through using and interpreting the words within their representations of the situation, children come to some preliminary understandings of the senses of the word – its meaning. But it may be months or even years before children's grasp of meaning accords with the conventional meaning of the term in adult language' (Nelson, 1996).

A process that could account for the data can be identified by starting with the principle of conventionality whereby 'the existing lexicon plays an important role in shaping future word learning' (Sabbagh & Baldwin, 2001). Before children have a representational understanding of agency, the high-frequency established 'psahno' would be understood as a behavioural term. The onset of a mentalistic understanding of agency would thus be applied to the less-established 'kitazo'. That is, both verbs receive an initial behavioural construal, but the exposure to the pair leads children to apply an explicit restriction rule when starting to engage in increasingly systematic thinking about agency. Further investigation would need close longitudinal study of language in the home, such as can be found in CHILDES order-of-acquisition records, along with repeated theory-of-mind tests.

Further research readily follows from our suggestion that children's mentalistic construal of 'kitazo' comes from mothers' use of the verb as a pragmatic intensifier to encourage the child to be active in searching. First, it is empirically straightforward to present children with a scenario in which an agent demonstrates a particular interest in the efficacy of search, and the experimenter demonstrates a particular interest in watching the search. Freeman, Lewis & Doherty (1991) transformed the unexpected-transfer test into a doll's hide-and-seek game: the agent was actively searching for a hider whom he cheated by peeping and saw the hider go to location A; the hider then moved to location B unseen by the agent. The child was asked to act out the searcher's movements by moving the doll. The intensification of the experimenter's concern with the hider's agency might sharpen the verb-contrast effect. Secondly, consider speech-act intensification of an interest in the search.[1] Mothers had reported in Study 1 that they used 'kitazo' imperatively to get the child to search carefully; thus implying that the utterances differed in their illocutionary force from utterances with 'psahno'. Further data would be needed to extract what Levinson (1983) termed 'illocutionary force identifying devices' (ifids). The instruction to move the doll who is searching for the hider can be put into either interrogative or imperative modality, with or without ifids such as 'please look for it' (or, as reported by five mothers, 'you'll be in trouble if you don't find it'). It will be interesting to rerun the questionnaire to the mothers, asking for their self-assessment and child-assessment

[1] We are indebted to an anonymous referee for raising the speech act issue.

of preferred speech-act modalities for the verbs and preferred ifids, then to conditionalize the results of the unexpected-transfer test on individual differences there. The most general formulation of the pragmatic-to-semantic conversion we have suggested serves to predict that the results will hold over speech-act modalities. Any restriction would impel a rethink and attention to the details of context-specific usages in maternal and child production data.

Is there a danger that the above discussion over-emphasizes children's pragmatic receptivity? We suggest that verb-acquisition demands adeptness in processing pragmatic cues. The poor temporal fit between verb-mention and the carrying out of an action or its observable results (Gleitman, 1990; Tomasello, 1992; Gleitman & Gleitman, 1997; Bloom, 2000), is particularly evident with commands to regulate the child's actions, future-tense mention to prepare the child for what might ensue, and questioning about past events. Such diversity of pragmatic contexts (see Reyna, 1987) 'seems to demand from children some fairly sophisticated abilities to understand a very wide array of social-pragmatic cues for determining adults' semantic intentions' (Tomasello, 1995).

Finally, we suggested that the verb-contrast effect was mediated by a conversion of a pragmatic difference into a semantic distinction in the child lexicon as a perlocutionary effect unintended by the adult. That is, although the adults do intend children to respond in assiduity of search to the pragmatic force of the different verbs, the adults do not intend the consequent semantic effect on the children. Let us return to some points made in the introduction. It was noted that English uses function words heavily in directing attention to the behavioural or mentalistic options. Function words are not the only such switching device. Cruse (1987) argued that the precise sense of many common terms like 'nod', 'pout', 'shrug', 'stamp', 'wave', is conveyed by a decision on whether to lexicalize a direct object. Cruse suggested that an expression like 'Celia shrugged her shoulders' (what else could she possibly shrug?) appears to be a simple pleonasm, but actually functions to direct attention to behavioural construal instead of mentalistic construal (see Cruse, 1987). It may be that when mothers preferentially use 'psahno na vro' with children, the mothers unwittingly direct attention to behavioural description, freeing up the less-established 'kitazo na vro' for immediate contrasting mentalistic construal.

In sum, Greek provides a window of opportunity to study how children convert an adult pragmatic distinction into a semantic contrast. Techniques developed largely with anglophones can be used as empirical tests to clarify problems that Greek dictionaries obscure. Imagine what would have happened if a researcher working in Greek should have consulted the dictionary and used 'psahno' in an unexpected-transfer test; the conclusion would have been that Greek children might lag behind their anglophone counterparts in

conceptual understanding. That is not the case. Maybe the case is the reverse; the excellent performance with 'kitazo' might even mean that the contrast promotes mentalistic understanding. It will be particularly interesting to test Greek–English bilingual children.

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