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Age- and ability-related differences in young readers' use of conjunctions*

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ABSTRACT

Two studies investigating young readers' use of conjunctions are reported. In Study One, 145 eight- to ten-year-olds completed one of two narrative cloze tasks in which different types of conjunction were deleted. Performance for additive conjunctions was not affected by age in this study, but older children were more likely to select the target conjunction than were younger children for temporal, causal, and adversative terms. Performance was superior in the cloze task in which they were given a restricted choice of responses (three vs. seven). In Study Two, 35 eight- and nine-year-old good and poor comprehenders completed the three-choice cloze task. The poor comprehenders were less likely to select the target terms in general. Sentence-level comprehension skills did not account for their poor performance. The results indicate that understanding of the semantic relations expressed by conjunctions is still developing long after these terms are used correctly

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in children's speech. The findings are discussed in relation to the role of conjunctions in text comprehension.

INTRODUCTION

Conjunctions are cohesive devices that indicate the semantic relations between different propositions and sentences (Halliday & Hasan, 1976). For example, a dependent or causal relation is indicated by the conjunction *so*: 'Sue was late, *so* she took the bus'. Other types of conjunction may simply signal continuity of two events that are not dependent on one another, e.g. 'Sue was going to a party *and* she was taking the bus' or the temporal order of events, e.g. 'Sue left the barbecue *after* it started to rain'. Adult readers use these cues to aid integration of clauses to guide their interpretation of a text's meaning (Segal, Duchan & Scott, 1991; Gernsbacher, 1997; Murray, 1997). In this way, conjunctions may help to reduce processing load and be a useful aid to comprehension.

Children use a range of conjunctions that signal different semantic relations in their everyday speech by about 5;0 (Kail & Weisssenborn, 1991). The sequence of acquisition is fairly stable across languages: additive conjunctions such as *and* are usually acquired first, followed by terms that specifically express temporal, causal or adversative relations, e.g. *before*, *because*, *but* (e.g. Bloom, Lahey, Hood, Lifter & Fiess, 1980). In contrast to most other conjunctions, the meaning expressed by *and* is flexible and the term can be used to encode a temporal, causal and/or adversative link between two clauses, as well as an additive one. Nine-year-olds are as likely as three-year-olds to use *and* in this flexible way (Peterson & McCabe, 1987). There are significant improvements between 3;0–9;0 in the appropriate use of adversative conjunctions, which signal contrast, such as *but* (Peterson, 1986), but appropriate use of causal conjunctions, e.g. *because* and *so*, is evident by 5;0 (McCabe & Peterson, 1985).

Age-related differences in the comprehension of conjunctions are apparent after these terms appear (and are used correctly) in children's natural utterances. In assessments of spoken language comprehension, 6-year-olds reveal less than perfect understanding of temporal terms such as *before* and *after*, particularly when the order of mention and order of occurrence conflict (Amidon & Carey, 1972; Johnson, 1975, Stevenson & Pollitt, 1987). In written tests, third-graders are less likely than eighth-graders to encode the causal relation expressed by *because* (Irwin & Pulver, 1984) and children's (grades 4–8) interpretation of the adversative terms *but* and *although* differs from that of adults (McClure & Geva, 1983). To date, there have been no systematic comparisons of different age groups' understanding of conjunctions that specify this range of different relations.

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Thus, we do not know the extent and nature of any developmental differences in the comprehension of different types of conjunction.

Conjunctions mark the semantic relations between different propositions in a discourse, so it is perhaps not surprising that individual differences in reading ability are related to their use and comprehension. Poorer readers are less likely to select the appropriate conjunctions in cloze tasks (Bridge & Winograd, 1982; Geva & Ryan, 1985) and are less able to answer questions that tap their understanding of causal relations expressed by *because* (Irwin & Pulver, 1984). Poor readers also experience problems in the comprehension of clauses linked by temporal conjunctions, such as *before* and *after*, particularly when the memory demands are high (Crain, Shankweiler, Macaruso & Bar-Shalom, 1990). However, our interpretation of these findings is limited because the measures of reading ability used in this research confound word-reading skill with text comprehension and assessment of grammatical knowledge was not reported. Thus it is not clear whether the poor readers' impaired performance on these tasks was due to a specific problem with their understanding of interclausal relations or difficulties in reading the texts *per se*.

We report two studies investigating age- and ability-related differences in young children's knowledge and use of conjunctions in written texts. In both studies we investigated children's ability to choose the appropriate conjunction in two cloze tasks. The conjunctions comprised the range of relations studied in previous work: additive, temporal, causal, and adversative. The age range (8;0–10;0) was chosen to cover the range included in much of the previous research. It also corresponded to the period when children are introduced to the function and range of conjunctions in written contexts within the National Literacy Strategy Framework for Teaching used throughout schools in England.

STUDY 1

The specific research question addressed was: are age-related differences apparent in children's selection of different types of conjunction in a written task? We compared the ability of three age-groups: 7;0–8;0, 8;0–9;0, and 9;0–10;0, to select the appropriate conjunction in a cloze task. On the basis of previous research we predicted no age-differences in the appropriate use of *and*, but developmental improvements in the use of adversative terms were expected (Peterson, 1986; Peterson & McCabe, 1987).

We also predicted age-related improvements in the correct selection of causal and temporal terms. Although production tasks indicate early competency in the appropriate use of causal conjunctions (McCabe & Peterson, 1985) written language tasks reveal age-related differences (Irwin & Pulver, 1984). Similarly, comprehension of temporal conjunctions is still

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developing after 5;0 (Amidon & Carey, 1972; Johnson, 1975, Stevenson & Pollitt, 1987). Analysis of errors was conducted to identify whether incorrect selection followed systematic preferences or random choice by the different age groups.

Participants

Three different age groups participated in this study. There were 43 eight-year-olds ($M = 8;5$, 21 boys, 22 girls), 51 nine-year-olds ($M = 9;5$, 29 boys, 22 girls), and 51 ten-year-olds ($M = 10;4$, 23 boys, 28 girls).

Materials

Two narratives were constructed for this task: one narrative was about giraffes and how they acquired their spots and the other was about a starfish who thought he was a star that had fallen out of the sky. The giraffe story was 779 words in length with a Flesch-Kincaid reading grade of 4·5 and Flesch reading ease value of 86·9%. The starfish story was slightly longer, 836 words, with a Flesh-Kincaid grade level = 3·9 and Flesch reading ease of 88·4%.

The narratives presented to children each contained six deleted instances of *and* and three deleted instances each of six other conjunctions: *then*, *when*, and *before* expressed temporal relations, *because* and *so*, expressed causal relations, and *but* expressed an adversative relation. These items were selected after pilot work with adults from stories containing ten deleted instances of *and* and four instances of each other conjunction. Items for which at least ten out of twelve adults selected the target response (from the choice of seven: *and*, *then*, *when*, *before*, *because*, *so*, *but*) were chosen and it was ensured that the conjunction types were distributed throughout the text with no more than three items appearing in a single paragraph.

Two cloze versions of each story were constructed for use with children. In one cloze version, the target word was replaced with a blank and the seven conjunctions that could be inserted were printed at the bottom of the page. In the other version, three choices were provided for each of the target conjunctions: the target response and two others from the pool of conjunctions used in this study. In each story, the target response occurred in the first, second, and third position twice for *and* and once in each position for the six other conjunctions. When used as a distractor, *and* appeared six times (once each for the different conjunctions) and all other conjunctions appeared seven times (twice when *and* was the target, and once for the five other conjunctions). There were two sets of materials: set one comprised the Giraffe story in the choices condition and the Starfish story in the blanks version, and set two comprised the Giraffe story in the blanks condition and the Starfish story in the choices condition.

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We predicted main effects of age and conjunction, as stated earlier, qualified by an interaction between these two factors. Previous work outlined in the introduction reports comparable use of the additive conjunction *and* within this age range, but developmental improvements in the comprehension and use of other types of conjunction. We also predicted a main effect of task: specifically, poorer performance on the blanks task. The blanks version of the cloze task provided a greater range of response options (seven) from which to choose than did the choices task (three options). If children experience difficulties in their use and comprehension of particular conjunctions, they should perform more poorly when they have a greater number of options to choose from and their chance of selecting the correct response is out of seven rather than three options. The blanks task was included in this study to allow examination of the errors that children made, across the full range of conjunctions under consideration.

RESULTS

Initial inspection of these data indicated that the children found some items particularly hard. Two additional groups of adults (undergraduate students, $N=15$ for both) completed the blanks task and the choices task for both stories. These adults' responses corresponded largely with those produced in the pilot work, with at least 13 adults choosing the target conjunction for the following conjunctions: *when*, *before*, *because* and *but*. There was one instance of *so* in the starfish story for which five and four adults gave a non-target response in the choices and blanks versions, respectively, and one instance of *and* for which four adults produced a non-target response. These items were excluded from the analysis of the children's scores because we were interested in their performance for items which skilled adult readers found unambiguous. In addition, responses to 'then' were excluded from the analysis because adults found several of these items ambiguous.[1]

The mean proportion of target responses was calculated for the additive (and), temporal (when, before), causal (so, because) and adversative (but) conjunctions for each story. These data were analysed in a mixed-design Analysis of Variance with the following factors: age group (8;0, 9;0, 10;0) and set (A: blanks-giraffe, choices-starfish; B: blanks-starfish, choices-giraffe) varied between-subjects, conjunction type (additive, temporal,

[1] It proved difficult to construct texts with unambiguous instances of 'then' that occurred between clauses, e.g. '*Jenny waited until her mother was distracted one afternoon then* the little giraffe ran out into the field to play with her brothers.' rather than between the subject and verb, e.g. '*After the old giraffe had watched everyone playing in the sun for a few minutes he then* went to find Jenny's father.'

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TABLE 1. *Study One: mean proportionate scores (and standard deviations) by age, group, task and conjunction type*

		additive	temporal	causal	adversative
Year three	blanks	0·792 (0·24)	0·388 (0·27)	0·384 (0·30)	0·589 (0·35)
	choices	0·830 (0·22)	0·682 (0·24)	0·680 (0·23)	0·783 (0·32)
Year four	blanks	0·829 (0·21)	0·454 (0·31)	0·395 (0·29)	0·667 (0·30)
	choices	0·826 (0·20)	0·677 (0·24)	0·706 (0·21)	0·856 (0·22)
Year five	blanks	0·793 (0·20)	0·549 (0·29)	0·569 (0·28)	0·669 (0·32)
	choices	0·884 (0·20)	0·787 (0·22)	0·776 (0·24)	0·860 (0·25)

causal, adversative) and task (choices, blanks) varied within-subjects. The mean data (collapsed over set) are reported in Table 1. For brevity, only significant ($p<0·05$) effects and interactions are reported. Partial η^2 is reported as the measure of effect size for all significant effects.

The predicted main effects of age group, task, and conjunction were all significant. The effect of age group, $F(2, 139)=5·78$, $p<0·01$ (partial $\eta^2=0·074$), arose because the older children provided more target responses than the two younger groups (Ms in order of increasing age = 64·0%, 67·6%, 75·4%, respectively). The effect of task, $F(1, 139)=232·74$, $p<0·001$ (partial $\eta^2=0·626$), demonstrated that scores were higher in the choices task (78·5%) than in the blanks task (59·5%). The effect of conjunction, $F(3, 417)=91·81$, $p<0·001$ (partial $\eta^2=0·398$), was due to the production of a greater number of target responses for additive ($M=82·5$%) than either temporal ($M=58·9$%), causal ($M=58·5$%) or adversative ($M=76·0$%) conjunctions.

There were two interactions of theoretical interest. The first, between age and conjunction, $F(6, 417)=2·16$, $p<0·05$ (partial $\eta^2=0·030$), is depicted in Figure 1. Analysis of Simple Main effects revealed no group differences for additive conjunctions, $F(2, 556)<1·0$, but significant differences for temporal, $F(2, 556)=5·11$, $p<0·01$, causal, $F(2, 556)=6·16$, $p<0·01$, and adversative, $F(2, 556)=5·52$, $p<0·01$, terms. There was also a highly significant interaction between task and conjunction, $F(3, 417)=24·24$, $p<0·001$ (partial $\eta^2=0·149$). Analysis of Simple Main effects revealed that the difference in performance for additive conjunctions on the choices and blanks tasks did not reach conventional levels of significance ($F(1, 556)=3·61$, $p=0·058$, Ms = 84·7% and 80·7%). Significant advantages for performance in the choices relative to the blanks task were apparent for the three other types of conjunction: temporal, ($F(1, 556)=127·92$, $p<0·001$, Ms = 71·7% and 46·8%); causal, $F(1, 556)=49·99$, $p<0·001$, Ms = 72·2% and 45·3%); adversative, $F(1, 556)=74·83$, $p<0·001$, Ms = 86·0% and 67·0%).

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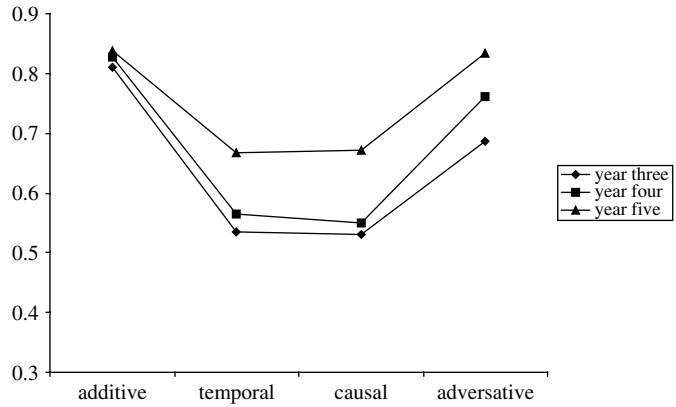


Fig. 1. Study one: interaction between age group and conjunction (proportionate scores).

Finally, there was an unpredicted two-way interaction between set and conjunction that was qualified by an unpredicted three-way interaction between these two factors and task, $F(3, 417) = 4{\cdot}92$, $p < 0{\cdot}01$ ($\eta^2 = 0{\cdot}034$). Analysis of Simple Main effects revealed that the source of this interaction was an advantage for the additive conjunctions in the choices task relative to the blanks task for set B (choices giraffe, blanks starfish), $F(1, 139) = 4{\cdot}23$, $p < 0{\cdot}04$ (Ms = 90·0% and 82·8%). This advantage was not apparent for set A (choices starfish, blanks giraffe), $F < 1{\cdot}0$ (Ms = 79·5% and 78·3%). For temporal, causal and adversative conjunctions performance was significantly better in the choices task relative to the blanks task, regardless of set, all Fs $(1,139) > 9{\cdot}80$, all ps $< 0{\cdot}01$.

Incorrect responses

In the blanks cloze task, participants had a choice of seven conjunctions, one of which was correct. The distribution of non-target (hereafter incorrect) responses made by each group was examined by type to determine whether the groups performed differently. For example, a greater number of different incorrect choices by younger than by older children could be interpreted as more random selection by the younger group.

First, we examined the data to determine whether children had simply responded with *and* instead of the correct target conjunction for temporal, causal, and adversative items. This incorrect response made up 43·2% of the eight-year-olds' errors, and 39·1% and 34·4% of the nine-year-olds' and ten-year-olds' errors, for these categories respectively. Although an age trend was evident, *and* clearly did not constitute all errors. Consequently,

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the mean number of different incorrect conjunctions was calculated for each age group for each category (additive, temporal, causal, adversative). These means do not take into account the number in each group who chose a particular incorrect response, simply how many different incorrect response types were made.

As expected, there were fewer different incorrect items chosen for the additive and adversative target items, because performance was generally higher for these two types of conjunction. Where an incorrect response was given for *and* the older children selected a greater number of different responses than did the younger groups (*M*s by increasing age: 2·2, 2·3, and 2·8). For adversatives, the youngest and oldest children selected a comparable number of different incorrect responses (*M*s by increasing age: 2·8, 3·5, and 2·8). Clear age trends were apparent for both temporal and causal conjunctions, with a reduction in the different number of non-target responses selected with increasing age (*M*s, temporal: 4·3, 4·4, and 3·7; causal: 4·2, 3·7, and 3·6).

A similar examination of responses was performed for the choices cloze task. Here, slight age trends in the same direction were apparent for all types of conjunction with the youngest group obtaining higher mean number of incorrect response choices (maximum = 2) than the older groups. Means in order of increasing age, additive = 1·5, 1·0, 0·9; temporal = 1·7, 1·7, 1·4; causal = 1·9, 1·6, 1·5; adversative = 1·7, 1·5, 1·5. Thus is seems that where incorrect responses were selected, the younger children were more likely to choose either option than were the older groups.

SUMMARY AND DISCUSSION

The results indicate that eight- to ten-year-olds are poor at selecting the target conjunction, particularly when they are provided with several possible options as in the blanks version of our cloze task. Using partial η^2 as the measure of effect size, the task variable accounted for over 60% of variability in the data. The difference in performance in two tasks may have arisen because there was a greater probability of selecting the correct response by chance in the choices task relative to the blanks task, because of the number of response options. The cognitive processing load required to compare the different options may also have contributed to poorer performance when seven rather than three options were available.

Performance was dependent on conjunction type: each age group's ability to choose the target additive conjunction was similar to that of the adults in our pilot work (79% or higher for all age groups). Contrary to expectations, performance on the adversative conjunctions was also good for each age group, but children's ability to choose the target temporal and causal conjunctions was poor. All groups performed above chance, but only the

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nine- to-ten-year-olds achieved performance levels of more than 50% correct. Thus, even though children are using temporal and causal conjunctions correctly in their speech by about 5;0, their comprehension of these terms at 10;0 is still incomplete. The effect of age only explained about 7·5% of the variability in scores (partial η^2) but the effect of conjunction type was sizeable (partial $\eta^2 = 0{\cdot}398$).

The unpredicted 3-way interaction between conjunction, task, and set indicated that the materials were not perfectly matched. However, the source of the interaction arose because of the pattern of responses to the additive term *and*, for which performance was uniformly high. In addition, the effect size measure indicated that this interaction did not account for a substantial proportion of the variance (3·4%). The effects of most interest and importance concerning age differences and conjunction type are not diminished by this unpredicted result.

The particularly poor performance by the youngest age group on the causal conjunctions concurs with Irwin & Pulver's (1984) finding that Grade 3 children's comprehension of the terms *because* and *so* was poor. Performance on the temporal terms was also poor. Previous research has demonstrated that memory demands affect children's processing of sentences with temporal conjunctions (e.g. Crain *et al.*, 1990). However, in this study the conjunction *when*, which signals a concurrent action, resulted in a comparable number of errors to the conjunction *before*.

We predicted superior performance for the additive conjunction *and* because it is acquired early. However, we must consider the fact that *and* serves a variety of pragmatic functions (Peterson & McCabe, 1987). As such, children could simply have a response bias for *and*, which would lead to superior performance for this conjunction. The examination of errors in the blanks cloze task, where all seven conjunctions were available responses, revealed that children did not routinely insert *and* for incorrect responses. The high accuracy rate for *and* reflects better understanding of this conjunction in this study. However, age effects for the use of additive conjunctions may occur at an earlier age not represented by this sample.

There was considerable variation within each age group for all types of conjunction in both tasks. Thus, some factor other than age appears to have a considerable effect on children's ability to choose the appropriate term to express the relation between two clauses. In study two, we set out to explore ability-related differences in relation to use of conjunctions to determine what accounts for this range in performance.

STUDY 2

Our starting point for Study Two was the body of research demonstrating a link between reading ability and tasks tapping knowledge of conjunctions

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(Bridge & Winograd, 1982; Irwin & Pulver, 1984; Geva & Ryan, 1985; Crain *et al.*, 1990). A limitation of these studies is that the measures of reading ability used confound word reading skill with text comprehension. If conjunctions signal the semantic relation between two clauses and, therefore, help to structure the mental representation of a text (e.g. Segal *et al.*, 1991), we would expect children with text comprehension problems to show impaired ability to select appropriate conjunctions. However, one possible strategy for completing our cloze tasks was to focus on each sentence individually. Research investigating the association between text-level and sentence-level comprehension has yielded contradictory findings. Some children with discourse-level comprehension problems demonstrate deficits in syntactic knowledge (Stothard & Hulme, 1992) whilst others do not (Yuill & Oakhill, 1991). Therefore it was not clear whether performance on our cloze task would be related to text comprehension.

As an initial test of the hypothesis that use of conjunctions is related to comprehension skill, we gave 111 seven- to nine-year-olds both stories in the 'choices' condition and compared their performance with that obtained on a group-administered measure of listening comprehension. Because of the high levels of performance by children in Year 5, we only included children in Years 3 and 4 in this study. First we replicated the main effect of conjunction in Study One: children were more likely to produce the target conjunction for the additive ($M=0{\cdot}83$, $S.D.=0{\cdot}20$) than for temporal ($M=0{\cdot}65$, $S.D.=0{\cdot}22$), causal ($M=0{\cdot}65$, $S.D.=0{\cdot}21$) and adversative terms ($M=0{\cdot}78$, $S.D.=0{\cdot}26$). Of interest, significant correlations with listening comprehension scores were obtained for each type of conjunction: additive, $r=0{\cdot}465$, temporal, $r=0{\cdot}430$, causal $r=0{\cdot}336$, adversative, $r=0{\cdot}311$, all ps $<0{\cdot}001$. These findings indicated a relation between text comprehension and the ability to select the correct conjunction to link two clauses, which we explored further.

To overcome the confound between word reading ability and text comprehension noted in previous work, we examined the ability to select the correct conjunctions in groups of children who differed in text comprehension but who were matched for word reading ability and vocabulary knowledge. In this way, any group differences that arose simply through difficulty in reading the cloze texts or understanding the individual words could be ruled out.

METHOD

Materials and procedure

Each participant saw the two stories in the version of the cloze task that had three choices for each target item. The stories were administered in the

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classroom and were presented in separate sessions, each lasting approximately 30 minutes.

Participants

Two groups of seven- to nine-year-olds participated in this study: 17 skilled comprehenders (9 girls, 8 boys) and 18 less-skilled comprehenders (10 girls, 8 boys). Participants were recruited from three suburban schools with socially-mixed catchment areas in the East of England. The majority of participants were from lower middle-class families.

Two tests were used to select participants: a listening comprehension test and a receptive vocabulary test. The listening comprehension test was modified from the *Neale analysis of reading ability – revised* (*NARA-II*: Neale, 1997) to make it suitable for group administration. The first three stories from Form 2 were read out to the children, who followed each story in their own booklet. After each story they answered the prescribed set of questions, designed to test their memory for and understanding of the story. For each question they were required to choose one out of three printed answers: the correct answer and two incorrect responses, selected from responses that children had given in previous pilot work. Responses were scored as either correct or incorrect and the maximum possible score was 20. The receptive vocabulary test was a modified version of the *British picture vocabulary scale – second edition* (Dunn, Dunn, Whetton & Burley, 1997). Children were presented with 34 items in individual booklets. The experimenter read out the word and the child ticked the corresponding picture in their booklet. One point was awarded for each correct answer. The reliability of both measures was assessed by calculating Chronbach's alpha over items. Reliability was acceptable for both tests, listening comprehension $\alpha = 0{\cdot}65$, receptive vocabulary, $\alpha = 0{\cdot}75$.

Word reading was assessed using a short-form of the *British ability scales – revised* word reading test (*BAS* – Elliot, 1983). Children had to read set A, comprising 18 words. Testing stopped when five consecutive errors were made. An additional assessment of sentence comprehension was given, a shortened form of the *Test for reception of grammar* (*TROG*, Bishop, 1982) in which children were presented with two items each from blocks L, N, O, Q, R, S, and T, blocks which discriminate normally developing children in this age group. The maximum possible score was 14. This measure was included to determine whether group differences on the conjunction task were associated with impoverished syntactic knowledge. The BAS and TROG were administered to children individually.

The skilled and less-skilled comprehenders differed significantly on the measure of listening comprehension but did not differ on any of the other

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TABLE 2. *Means (and standard deviations) for skilled and less-skilled comprehenders on all group matching measures and conjunction task*

	Skilled comprehenders	Less-skilled comprehenders	*t*-test
Age in months	102·11 (6·43)	102·44 (6·38)	$t(33) = 0{\cdot}151$, ns
Listening comprehension	16·70 (0·98)	12·0 (1·18)	$t(33) = 12{\cdot}71$, $p < 0{\cdot}001$
BAS	15·88 (1·83)	14·89 (1·71)	$t(33) = 1{\cdot}66$, $p = 0{\cdot}11$
TROG	11·58 (1·32)	11·00 (1·64)	$t(33) = 0{\cdot}161$, ns
Vocabulary	23·23 (3·66)	22·39 (3·20)	$t(33) = 0{\cdot}729$, ns
Additive conjunction	0·874 (0·14)	0·739 (0·22)	
Temporal conjunctions	0·725 (0·15)	0·551 (0·20)	
Causal conjunctions	0·703 (0·19)	0·549 (0·16)	
Adversative conjunctions	0·828 (0·15)	0·704 (0·28)	

Age in whole months; listening comprehension (*max.* = 20); *BAS* (*max.* = 18); *TROG* (*max.* = 14); Vocabulary (*max.* = 34); All conjunctions expressed as mean proportion correct.

measures (see Table 2 for means). All spoke British English as their first language and had no known behavioural or learning difficulties.

RESULTS

The mean proportion of target responses was calculated for the additive (*and*), temporal (*when*, *before*), causal (*so*, *because*) and adversative (*but*) conjunctions summed over the two stories. These data were analysed in a mixed-design Analysis of Variance with skill group (skilled, less-skilled) as a between-subjects factor and conjunction type (additive, temporal, causal, adversative) as a within-subjects factor. Mean proportion correct for each type of conjunction is reported in Table 2.

There was a significant effect of skill group, $F(1, 33) = 8{\cdot}10$, $p < 0{\cdot}008$ (partial $\eta^2 = 0{\cdot}197$), because the skilled comprehenders produced more correct responses than the less-skilled group, and a highly significant effect of conjunction type $F(3, 99) = 14{\cdot}34$, $p < 0{\cdot}001$ (partial $\eta^2 = 0{\cdot}303$). The interaction between the two factors was not significant, $F(3, 99) < 1{\cdot}0$.

Error analysis

The two non-target responses for each cloze item were chosen during the construction of the materials to ensure a balance across all items. As a result of this procedure some non-target responses made sense, even though they were not considered to be the best choice by adults in the pilot work. The first author and two other adults rated the two non-target responses for each cloze sentence on a three-point scale: 'makes sense', 'not sure', 'does not make sense'. The sentences were presented in a randomized order

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in separate two booklets for each story so that the same sentences (with different non-target conjunctions) did not appear in the same booklet. There was a high level of agreement (94%) and all ratings were either 'makes sense' or 'does not make sense'. For each conjunction type, the percentage of errors that did not make sense was calculated for all items for which more than 30% of participants in one of the groups did not select the target response (to ensure a sufficient number of data points).

There were five instances of *and* that met the 30% or more error rate criterion. Of these, 63% of the skilled group's responses and 44% of the less-skilled group's responses were judged not to make sense. There were five instances each of *when*, *before*, *because*, and *so* where more than 30% of one group selected a non-target response. Collated across *when* and *before*, 43% of the skilled group's responses and 52% of the less-skilled group's responses to temporal terms were judged not to make sense. Collated over the causal terms, 26% of the skilled group's responses and 34% of the less-skilled group's responses were judged not to make sense. Overall performance was better for adversatives than for temporal and causal conjunctions and there were only 3 instances of *but* where more than 30% of participants in one of the skill groups selected a non-target response. The percentage of errors judged not to make sense were 17% and 37% for the skilled and less-skilled group, respectively.

SUMMARY AND DISCUSSION

Both groups obtained more correct responses for additive and adversative connectives than for temporal and causal terms. However, the poor comprehender group was generally less able to select the appropriate response. The analysis of errors suggests that, with the exception of *and*, poor comprehenders were more likely than good comprehenders to choose a completion that did not make sense in isolation. Thus, even if they were following a local sentence processing strategy and treating each sentence in isolation, they were poorer at the task. The reverse pattern found for the conjunction *and* might have arisen because so few incorrect responses were made by the skilled group (27 errors out of 204 responses). Thus, any interpretation of errors to *and* should be made with care.

Comparisons cannot be made between the different conjunction types, because for some conjunctions, most non-target choices were judged to make sense by the raters when the sentence was presented in isolation. For example, 'All of the female giraffes stayed under the trees when/before/because the sun was shining', in which *when* was the completion preferred by the majority of adults. However, the comparisons between the good and poor comprehenders are informative: the poor comprehenders were less likely than the good comprehenders to select the target completions

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and when non-target responses were made, the poor comprehenders were less likely to choose a completion that made sense in a local sentence context.

GENERAL DISCUSSION

These two studies demonstrate that young children's understanding of conjunctions is still developing several years after correct usage has been observed in speech production tasks. One explanation for the time lag between spoken and written usage is that performance on experimental tasks will be limited by metalinguistic abilities, which may develop after knowledge of a linguistic structure (Kail & Weisssenborn, 1991). Performance on the cloze task was related to text-level comprehension, as well as age. The current findings extend our knowledge about the factors that limit children's ability to use conjunctions in written language, demonstrating both age- and ability-related differences across a range of conjunctions.

The superior performance by the older children may have arisen because of their greater experience with this type of written language task and/or their more advanced language and comprehension skills. The association between performance on the task and language comprehension skills in Study Two suggests that language competence facilitated the older children's ability to select the appropriate response.

The performance of the poor comprehenders in Study Two indicates a general delay rather than deviance: they were poorer on all types of conjunction. Interestingly, there was no evidence that they were adopting a different strategy to that of the good comprehenders, such as treating each sentence in isolation. If they had done so, the two groups should have obtained comparable levels of performance in the error analysis. Surprisingly, the poor comprehenders did not obtain lower scores on a measure of grammatical knowledge. One interpretation is that their sentence-level difficulties are selective. However, the measure of grammatical knowledge was modified because of time constraints. A longer, more sensitive, task might have detected subtle grammatical deficits.

The current study indicates that children's age and text comprehension skill are related to their selection of interclausal devices in a written cloze task. These findings are supported by previous research investigating children's selection of conjunctions in oral narrative production tasks, which shows that the appropriate use of causal conjunctions is more commonly found in stories that have coherent and causally integrated event structures. The relation between conjunction use and narrative structure is mediated by both age and reading comprehension level (Shapiro & Hudson, 1991; Cain, 2003).

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Adults use conjunctions to guide their reading, understanding and memory of the relations between sentences. For example, the presence of a causal or adversative conjunctions leads to faster reading of sentence that are causally or adversatively related to a preceding text (Haberlandt, 1982) and sentences connected by a causal conjunction are better recalled that those connected by a non-dependent conjunction (Caron, Micko & Thüring, 1988). The construction of the coherence relations between sentences appears to be directly affected by the presence of conjunctions.

Despite the prevailing view that connectives facilitate comprehension and numerous investigations into connective usage in children's oral language productions (e.g. Peterson & MacCabe, 1987), there is only one published study to date that has investigated how connectives might influence children's real-time processing of text (Mouchon, Fayol & Gaonac'h, 1995). In that study, the presence of the connectives *mais* (but) and *soudain* (suddenly) resulted in longer reading times for a subsequent statement relative to items for which no connective or *après* (afterwards) was present, for eight and ten-year-olds. Unfortunately, no measures were taken to determine whether the presence of a connective facilitated comprehension or memory for the text, neither was a range of different types of conjunctions investigated in relation to age or reading ability.

If children experience difficulty in selecting the appropriate conjunction in a self-paced cloze task, they may also be less likely to encode the appropriate semantic relation between two clauses (signalled by a conjunction) as they are reading. If so, their comprehension will suffer because conjunctions provide explicit cues to the dependent relations between events and help to establish structural coherence (Gernsbacher, 1997). The current findings are, therefore, of considerable interest, demonstrating both age- and ability-related differences in the use of these interclausal devices. Further work is now needed to explore whether the presence of conjunctions affects young children's comprehension and memory of texts that they read and hear.

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