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Background

➤ Syntactic bootstrapping:

using syntactic frames as cues to acquire verb meaning is one of the core processes of typically developing (TD) children's language development.

➤ Syntactic bootstrapping in children with ASD:

English-acquiring and Hebrew-acquiring preschoolers with autism spectrum disorder (ASD) utilized syntactic frames to conjecture the meaning of novel verbs (Naigles et al., 2011; Horvath et al., 2018; Shulman & Guberman, 2007)

➤ Syntactic bootstrapping in Mandarin-acquiring children with ASD:

- Mandarin Chinese allows pervasive argument ellipsis and contains no morphosyntactic cue for the causative/non-causative distinction.
- These features may pose acquisition challenges for Mandarin-acquiring children with ASD, whose deficits in joint attention may incur difficulty in recovering omitted arguments, and thus might have less stable syntactic frames (Lee & Naigles, 2008).

Objectives

- This research investigated syntactic bootstrapping in Mandarin-acquiring children with and without ASD, i.e., whether children can map novel verbs in transitive frames onto causative meanings and those in intransitive frames onto non-causative meanings.

Methods

➤ IPL: Intermodal Preferential Looking paradigm (Fig.1)

➤ Participants:

31 Mandarin-exposed children with ASD and 29 younger Typically Developing (TD) children (Table 1).

➤ Standardized tests:

- PCDI: Putonghua Communicative Development Inventory measures children's language production abilities through caregiver report
- ABC: Autism Behavior Checklist confirms children's diagnoses by the caregiver rating scale, with the cut-off score of 31.

➤ Materials:

All children heard 2 novel verbs (*pou4* and *ban2*) presented and tested in the transitive audio, followed by a screensaver and then 2 additional novel verbs (*gun1* and *chei*) presented and tested in the intransitive audio (Fig 2 and Table 2).

Table 1: Participants Description

	TD (n=29)	ASD (n=31)	t
Age(month)	31.38±5.27	63.39±8.78	17.25***
Expressive vocabulary scores	613.72±201.60	408.03±275.97	3.31**
MLU3(w/u)	5.08±1.99	3.41±2.34	2.90**
ABC scores	9.31±9.60	60.06±23.93	10.91***

Note.; MLU3, Mean Length of Three Longest Utterances; ABC, Autism Behavior Checklist; T-test, *p<0.05, **p<0.01, ***p<0.001

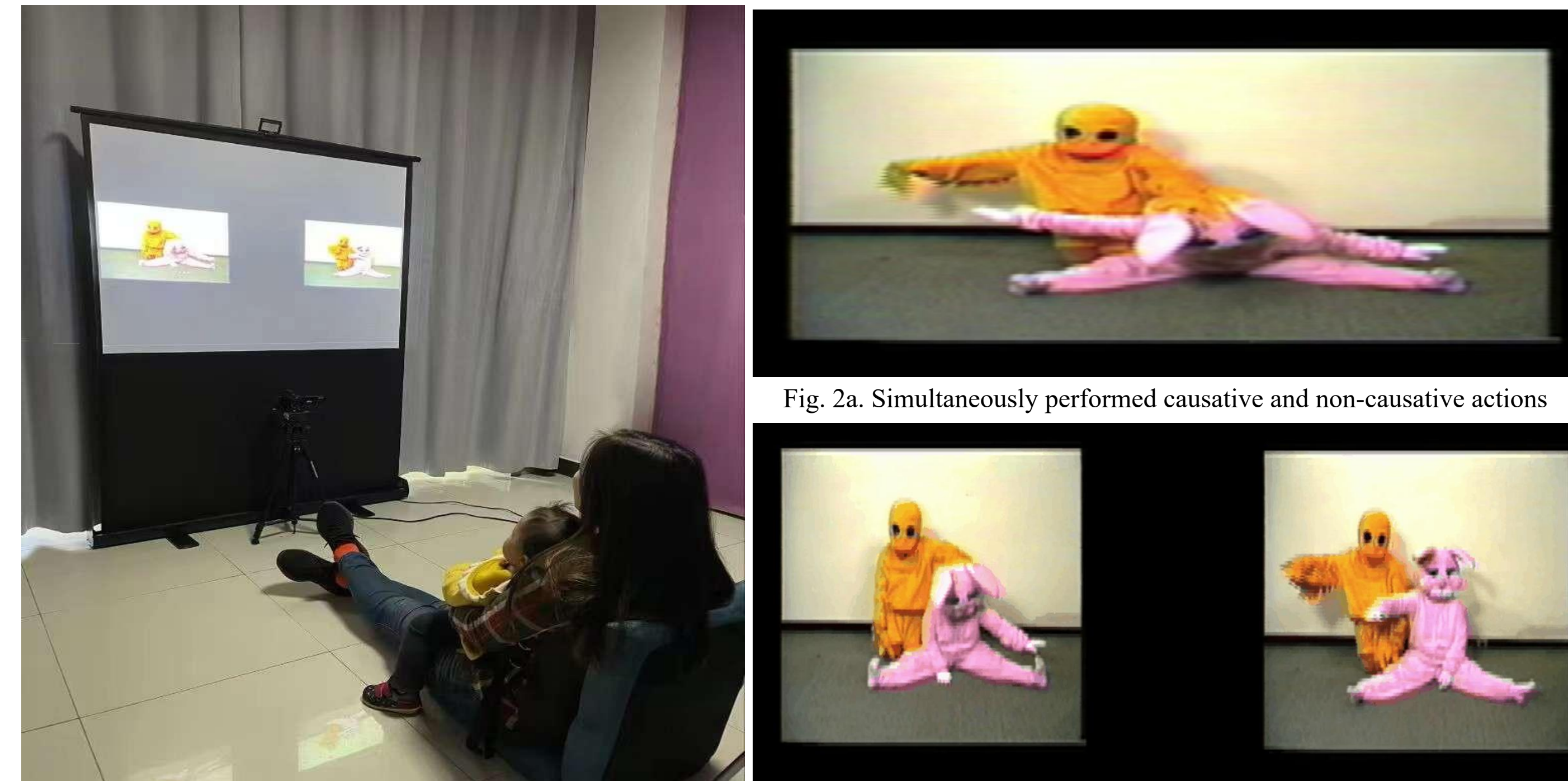


Figure 1. IPL set up

Fig. 2b. Causative and non-causative actions separated side by side

Table 2: Sample Layout of Syntactic Bootstrapping Video (Adapted from Naigles et al., 2011)

Trial	Video 1	Audio	Video 2
characters calibration	Duck waves	鸭子在哪里? Where's the duck?	Bunny waves
	Duck waves	兔子在哪里? Where is the bunny?	Bunny waves
Training-- Transitive	Duck pushes Bunny down, both flex arms	看, 鸭子在 <i>pou4</i> 兔子! Look, the duck is <i>pou4</i> (ing) the bunny	Duck pushes Bunny down, both flex arms
Training-- Intransitive	Duck pushes Bunny down, both flex arms	看, 鸭子和兔子在 <i>gun1</i> ! Look, the duck and the bunny are <i>gun1</i> (ing)!	Duck pushes Bunny down, both flex arms
Control	Duck pushes Bunny down	哦, 他们不一样了! Oh, they are different now!	Duck and Bunny flex arms
Interval	Blank	<i>pou4/ gun1</i> 在哪里? Where's <i>pou4</i> (ing)/ <i>gun1</i> (ing) now?	Blank
Test (1 st and 2 nd halves)	Duck pushes Bunny down	找 <i>pou4/ gun1</i> ! Find <i>pou4</i> (ing)/ <i>gun1</i> (ing)!	Duck and Bunny flex arms

Results

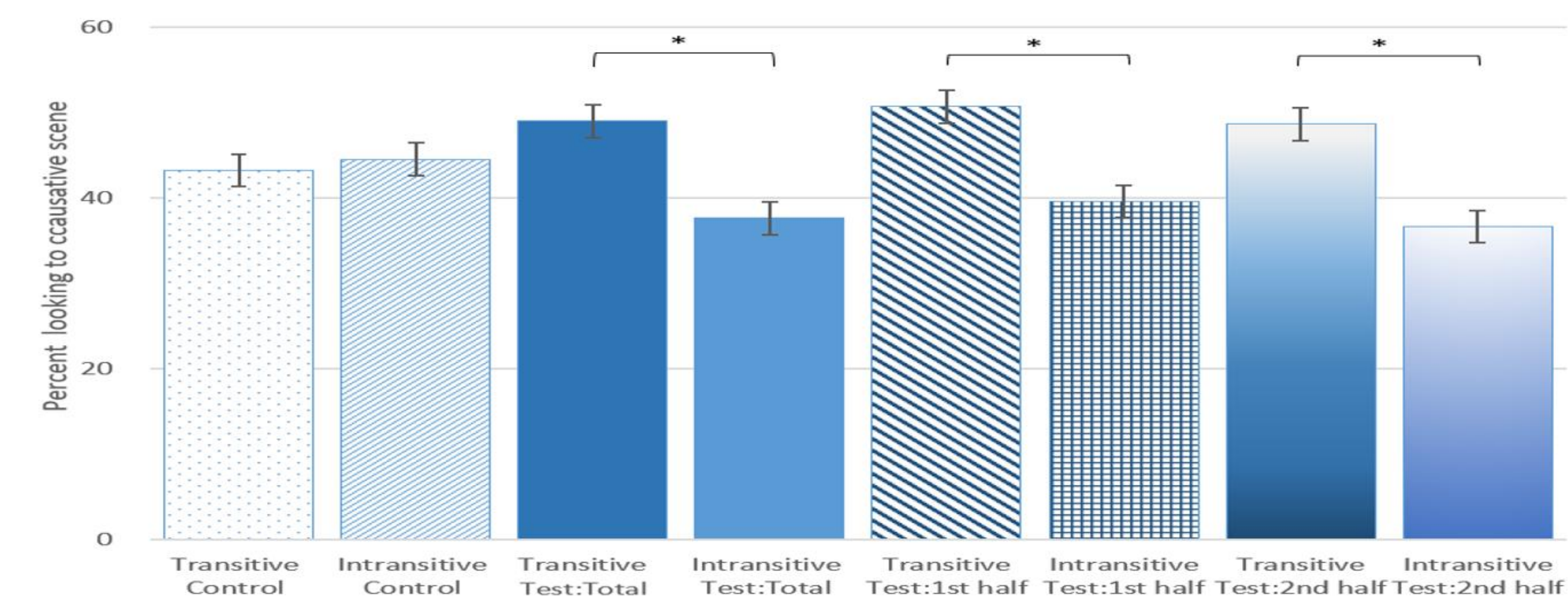
- The TD group did not provide clear results. Their looking patterns were similar to the ASD group but usually did not reach significance.
- Table 3: The ASD group shifted towards the match during the 1st halves of test trials compared to control trials in the Transitive condition, $t(30)=2.23$, $p<.05$.
- Figure 3: The ASD group looked towards the causative action for the Transitive audio, and away from the causative action for the Intransitive audio, for both the entire trial, $F(1,52) = 5.78$, $p<.05$, and the 2nd half of the trial $F(1,52) = 5.72$, $p<.05$.
- Number of children with ASD who shift towards the match for Transitive and Intransitive audios: 9/31.
- Children in the ASD with higher expressive vocabulary on the PCDI looked longer at **both** screens during the test trials, for **both** audios: Transitive condition, $r=0.385$, $p<.05$; Intransitive condition, $r=0.485$, $p<.01$. However, expressive language did not correlate with degree of shifting towards the matching screen.

Table 3. Children with ASD showed syntactic bootstrapping with the transitive frame during the 1st half of the trial

Measure	ASD (n=31)	
	Transitive	Intransitive
Total trial percent looking to match		
Control trials	43.22(13.22)	55.51 (13.69)
Test trials	48.95 (15.94) ⁺	62.38 (14.39) ⁺
First half percent looking to match		
Test trials	50.67 (17.91) [*]	60.41(18.11)
Second half percent looking to match		
Test trials	48.62(20.79)	63.36 (17.86) ⁺

Note.; Two-tailed t-test, ⁺p<0.1, ^{*}p<0.05

Figure 3. Children with ASD chose different actions for the verbs depending on whether the verbs are presented in the transitive or intransitive audio



Conclusion

- Mandarin-acquiring children with ASD demonstrated differential use of transitive and intransitive frames in syntactic bootstrapping to conjecture the meaning of novel verbs.
- These findings are similar to those of younger English-acquiring children with ASD (Naigles et al., 2011, Horvath et al., 2018).
- Expressive language levels of Mandarin-acquiring children with ASD may influence children's ability to retain their attention on the task, but not their performance of syntactic bootstrapping.
- It is puzzling that the TD children in this study did not demonstrate such robust syntactic bootstrapping. We conjecture that—
- Future work can explore relationships between Mandarin-acquiring children with ASD's use of syntactic bootstrapping and their language input (Xu et al. 2021) and their early knowledge of basic SVO word order (Su & Naigles, 2019).

References

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