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Early Acquisition of Semantic Type Meanings of Modal Verbs in Mandarin-Speaking Children

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Abstract

Modal verbs serve as the primary grammatical means for expressing modality in Mandarin Chinese. From the perspective of semantic types, modality is commonly classified into three categories: dynamic modality, which conveys volition or ability; deontic modality, which relates to obligation or permission; and epistemic modality, which reflects judgments of possibility or necessity. Investigating how young children acquire these semantic type meanings offers important insights into their linguistic and socio-cognitive development. This study, based on the "Mandarin Children's Multimodal Spoken Corpus", provides a comprehensive analysis of how three Mandarin-speaking children aged 1 to 4 acquire the semantics of modal verbs through naturalistic interaction. Modal acquisition is examined across three semantic types, with a detailed case analysis of the polysemous modal verb *yào* to explore the developmental trajectory of both root and epistemic meanings. Findings reveal that children's acquisition of modal semantics in early language development is systematic and robust. Between the ages of 1;6 and 3;3, the three children gradually acquired nearly all modal verbs under investigation and developed modal meanings across all semantic types. Their acquisition followed a clear developmental pattern: dynamic modality emerged first and appeared most frequently, followed by deontic modality, and finally epistemic modality. In acquiring *yào*, the children first produced the dynamic meaning of volition, then the deontic meaning of obligation, and lastly the epistemic meaning of necessity. This acquisition sequence closely parallels the diachronic semantic evolution of modal verbs in Mandarin. Moreover, the semantic acquisition of *yào* was found to be shaped not only by semantic categories, but also by temporal reference and syntactic context. By investigating the development of children's modal semantics, this study highlights the cognitive process of subjectification in language acquisition and offers empirical evidence for the coordinated development of language and cognition in early childhood.

Keywords: Modal Verbs, Semantic Type Meanings, Modality Acquisition, Subjectification

Introduction

Modality—defined as the speaker's subjective attitude towards the truth value of a proposition or the factual status of an event (Peng, 2007)—constitutes a markedly subjective semantic and functional category. Its diverse formal realisations, attested across the world's languages, have long attracted sustained attention in philosophy, logic, cognition and linguistics. As Perkins (1983) vividly observes, probing modality is akin to embarking on a journey through the mysteries of the human mind. Owing to its intrinsic complexity, subtlety and intimate tie to cognition, scholars have investigated modality from multiple perspectives, moving from formal and logical concerns to semantic and functional ones, and continually uncovering fresh insights and findings.

In Modern Mandarin, modality can be conveyed by modal verbs, modal adverbs, sentence-final particles, nouns and intonation, among which modal verbs play the most salient role. Yet Mandarin modal verbs display great variability and abstraction at the morphological, syntactic, semantic and pragmatic levels, posing considerable challenges for children who must both acquire modal meanings and deploy them appropriately. Understanding how children initially acquire modal knowledge is therefore a compelling topic in child-language research because it sheds light on their linguistic as well as socio-cognitive development (Choi, 2006). In stark contrast to the rich body of work on English, research on Mandarin children's acquisition of modality remains sparse.

As the cornerstone of the modal-theoretical framework (Zhang, 2021), modal verbs encode the fullest range of modal semantics. With respect to semantic **type meanings**, modality is commonly divided into **dynamic** (volition/ability), **deontic** (obligation/permission) and **epistemic** (judgements of possibility/necessity) categories. Scholarly work on children's acquisition has concentrated on these type meanings, employing either experimental tasks to probe comprehension across age groups or naturalistic corpora to trace the emergence of modal elements and meanings. Studies of English-speaking children show that between 1;10[1] and 2;6 years they gradually acquire modal verbs, with *can*, *can't*, *will* and *won't* appearing first; negative forms are not invariably acquired before their affirmative counterparts; moreover *can* and *will* emerge early and are used frequently (Pea & Mawby, 1981; Shatz & Wilcox, 1991; Stephany, 1986; Wells, 1979). Children first master dynamic or deontic meanings of modal verbs before epistemic meanings (Wells, 1985; Sweetser, 1990). French data likewise reveal that dynamic modality is most frequent (44 %), followed by deontic (39 %) and epistemic (17 %) (Bassano, 1996). Parallel findings have been reported for German (Stephany, 1986) and Korean (Choi, 1991).

Research on the acquisition of modal verbs in Mandarin have also reached similar conclusions. Guo (1995) documented that children acquire the dynamic meaning of *néng* before its deontic meaning, and the deontic before the epistemic. Case studies by Yang & Dong (2014) further confirmed that epistemic meanings emerge later than dynamic and deontic ones. Peng (2007) provided evidence supporting the diachronic semantic development of modal verb types, noting that children acquire deontic meanings before epistemic ones. Similarly, Fan (2007), based on an analysis of language data from children under the age of 2;5, found that modal verbs first appear in Mandarin-speaking children's speech around the age of 1;4, with *huì* and

[1] "1;10" represents the child's age: 1 year, and 10 months. The same format applies below.

néng acquired first, and that root modalities precede epistemic modality. Complementing longitudinal work, experimental studies have sought additional evidence: Liu (2021) tested three- to six-year-olds with truth-value judgement and picture-selection tasks on *yào* and *yīnggāi*, revealing an acquisition order of dynamic > deontic > epistemic and a bias to interpret ambiguous *yīnggāi* as deontic in neutral contexts.

Cross-linguistic research, whether experimental or corpus-based, converges on a common pattern: irrespective of absolute chronological age, children invariably master **root modality** before **epistemic modality**, charting a developmental pathway from root to epistemic meanings. Existing studies have offered preliminary explanations from various perspectives, including cognitive development, theory of mind, input frequency, and the Merge-Control model. These common patterns and theoretical interpretations provide a foundation and point of reference for the present study. However, several issues remain inadequately addressed. For instance, research on the acquisition of modal verb semantics tends to be illustrative rather than comprehensive, often limited to brief discussions of a few Mandarin modal verbs and their usage. Moreover, the widely adopted corpus-based approach still suffers from limitations such as small sample sizes and low data density.

Based on this, this study utilizes the "Mandarin Children's Multimodal Spoken Corpus" at Linyi University, selecting natural speech data from three children aged 1 to 4 years, and observes the dynamic, continuous, and holistic process of semantic acquisition of modal verbs during early development. The three children include two girls (abbreviated as GYC and SWK) and one boy (abbreviated as WMX). All three children were born and reside in Linyi City, Shandong Province, China. They exhibit normal intelligence and listening-speaking abilities, with no cognitive impairments, and their physical functions are well-developed. The data collection was conducted weekly for one uninterrupted hour, and the recorded videos were transcribed using the multimodal linguistic software ELAN (EUDICO Linguistic Annotator).

This study conducts a systematic analysis of Mandarin-speaking children's acquisition of modal verbs across three semantic types: dynamic, deontic, and epistemic modality. It offers a comprehensive examination of the developmental trajectory of modal verb acquisition in early childhood, focusing on the characteristic patterns and features of how children acquire root modality and epistemic modality. The study further explores the pathways through which modal semantic meanings expand and provides empirical evidence for the subjectification process underlying children's language development.

Overview of the Acquisition of Modal Verbs

Following Peng's (2007) classification, the present study examined the acquisition of **20 Mandarin modal verbs** in the child corpus. As shown in Table 1, during the observation period the three children produced **17** of these modal verbs: seven **typical**, six **moderately typical**, and four **atypical** verbs. All of the typical and moderately typical modal verbs were acquired, while 3 of the atypical ones—*dé* (得, be allowed), *lèyì* (乐意, be willing), and *qíngyuàn* (情愿, be inclined)—were not produced. The 17 acquired verbs emerged successively between **1;6** and **3;3**.

Table 1

Overview of Acquisition Timing and Token Frequency of Modal Verbs in Children

Typicality (Total Number /Total Frequency)	Modal Verb	GYC (Acquisition Time/Frequency)	SWK (Acquisition Time/Frequency)	WMX (Acquisition Time/Frequency)
Typical Modals（7/9155）	*néng*/nénggòu (能/能够, be able)	1;8;14[2]/573	1;9;14/521	2;2;01/399
	yào (要, want/need/will)	1;6;20/1452	1;6;08/2280	1;6;30/1097
	huì (会, know how/can)	1;8;01/245	1;10;14/394	1;11;02/503
	yīnggāi/yīngdāng (应该/应当, should)	2;5;13/36	2;6;07/74	2;3;25/75
	kěyǐ/kě (可以/可, may/can)	1;8;14/352	1;10;14/825	1;10;25/644
	kěn (肯, be willing)	—[3]	3;1;18/1	—
	gǎn (敢, dare)	2;0;06/38	1;9;20/14	2;2;14/26
Moderately Typical Modals（6/4231）	*děi* (得 děi, have to)	2;0;06/209	1;9;27/152	2;0;29/301
	gāi (该, ought to)	2;3;18/40	1;9;27/40	2;2;14/123
	kěnéng (可能, may/might)	2;10;01/13	2;2;24/34	2;2;14/55
	xiǎng (想, want to)	1;8;22/528	1;8;04/1435	1;10;25/1234
	yídìng (一定, certainly)	2;10;16/6	2;10;19/27	3;2;20/15
	zhǔn (准, be allowed)	3;3;25/8	2;2;10/10	2;3;05/1
Atypical Modals（4/151）	*bìxū* (必须, must)	*2;8;27/2*	*2;5;22/38*	*3;0;13/1*
	kěndìng (肯定, surely)	2;8;20/22	2;1;23/24	2;7;22/21
	xǔ (许, allow)	*2;6;19/11*	*2;1;15/5*	2;3;11/4
	yuànyì (愿意, be willing)	*2;2;22/6*	*2;7;05/13*	*2;4;15/4*

In terms of acquisition timing and order, ***yào*** was the earliest modal verb acquired by all three children, with each of them beginning to produce it around the age of **1;6**. Following the emergence of *yào*, the acquisition sequences showed some individual variation. **GYC** acquired *huì*, *néng*, *kěyǐ*, and *xiǎng* successively between **1;8** and **1;9**; **SWK** mastered *xiǎng*, *néng*, *gǎn*, *děi*, *gāi*, *huì*, and *kěyǐ* between **1;8** and **1;10**, with a particularly dense period of modal

[2] "1;8;14" represents the child's age: 1 year, 8 months, and 14 days. The same format applies below.
[3] This indicates "not acquired".

acquisition at **1;9**; **WMX**, by contrast, exhibited a slightly later pattern, acquiring *kěyǐ*, *xiǎng*, and *huì* between **1;10** and **1;11**. Before the age of two, the modal verbs predominantly acquired by all three children were *yào*, *huì*, *kěyǐ*, and *xiǎng*. After age two, acquisition shifted toward more moderately typical and atypical modals such as *kěnéng*, *yídìng*, and *bìxū*.

With respect to frequency of use, ***yào*** was by far the most frequently produced modal verb across all three children, each exceeding **1,000** occurrences, with **SWK** reaching the highest count at **2,280** tokens. In addition, **GYC** made frequent use of *néng* (573 tokens), *xiǎng* (528), *kěyǐ* (352), *huì* (245), and *děi* (209); **SWK**'s most frequent modals included *xiǎng* (1,435), *kěyǐ* (825), *néng* (521), and *huì* (394); for **WMX**, *xiǎng* (1,234), *kěyǐ* (644), *huì* (503), *néng* (399), and *děi* (301) were used with higher frequency. These high-frequency modal verbs largely correspond to those acquired before the age of two.

By contrast, several modal verbs were produced with notably low frequency. For example, *zhǔn* had a total of **19** occurrences across the entire corpus. The four atypical modal verbs—*bìxū*, *kěndìng*, *xǔ*, and *yuànyì*—were produced a total of only **151** times. The modal *kěn* appeared only once, in the speech of a single child. Moreover, **WMX** produced just one token each of *zhǔn* and *bìxū*. These low-frequency verbs generally emerged later in development and, in some cases, had not yet appeared in the spontaneous speech of certain children by the end of the observation period.

Overview of the Acquisition of Modal Verbs by Semantic Types
Among the 17 modal verbs acquired by the children, 7 were **monosemous** modal verbs[4]. These included four expressing **dynamic modality** (*kěn*, *gǎn*, *xiǎng*, *yuànyì*), two expressing **deontic modality** (*bìxū*, *xǔ*), and one expressing **epistemic modality** (*kěnéng*).

In addition, 10 modal verbs were classified as **polysemous**, including *yào*, *huì*, *néng*, *yīnggāi*, *kěyǐ*, *děi*, *gāi*, *zhǔn*, *yídìng*, and *kěndìng*. These verbs could express dynamic and/or deontic meanings as well as epistemic meanings. In the acquisition inventory (Table 2), polysemous modals were categorised according to the specific semantic type they conveyed in each instance. For example, *néng* was tallied under dynamic, deontic, and epistemic modality depending on its contextual meaning, and *yīnggāi* was counted under both deontic and epistemic modality.

As the verbs *dé*, *lèyì*, and *qíngyuàn* were not acquired by any of the three children during the observation period, and *kěn* appeared only once in the speech of a single child, these four verbs are excluded from the following acquisition table.

[4] The distinction between monosemous and polysemous modals, as well as the categorisation of semantic types in Table 2, follows the criteria proposed by Peng (2007).

Table 2
Overview of Acquisition Timing and Token Frequency of Modal Verb Semantics in Children

Semantic Type	Modal Verb	Semantic Subtype	GYC (Acquisition Time/Frequency)	SWK (Acquisition Time/Frequency)	WMX (Acquisition Time/Frequency)
Dynamic Modality	*yào*	[Volition]	1;6;20/918	1;6;08/1455	1;6;30/638
	huì	[Ability]	1;8;01/195	1;10;14/145	1;11;02/298
	néng	[Ability]	1;8;14/364	1;9;14/288	2;2;01/195
	kěyǐ	[Ability]	1;8;14/209	1;10;14/546	1;10;25/462
	gǎn	[Courage]	2;0;06/38	1;9;20/14	2;2;14/26
	xiǎng	[Volition]	1;8;22/528	1;8;04/1468	1;10;25/1234
	yuànyì	[Volition]	*2;2;22/6*	*2;7;05/13*	*2;4;15/4*
Deontic Modality	*yào*	[Obligation]	1;11;16/221	1;9;27/475	1;11;11/161
	huì	[Obligation]	3;2;07/6	2;10;26/16	2;6;18/10
	néng	[Permission]	1;11;09/162	1;10;06/156	2;4;15/137
	yīnggāi	[Obligation]	2;7;25/25	2;11;09/27	2;4;02/47
	kěyǐ	[Permission]	1;11;09/143	2;0;07/279	2;0;19/182
	děi	[Necessity]	2;0;06/209	1;9;27/182	2;0;29/301
	gāi	[Obligation]	2;3;18/29	1;9;27/35	2;2;14/107
	zhǔn	[Permission]	3;3;25/8	2;2;10/10	2;3;05/1
	yídìng	[Necessity]	3;3;18/2	3;4;25/8	3;2;20/3
	kěndìng	[Necessity]	—	—	—
	bìxū	[Necessity]	*2;8;27/2*	*2;5;22/38*	*3;0;13/1*
Epistemic Modality	*yào*	[Necessity]	2;0;06/313	1;11;21/350	2;2;01/298
	huì	[Probability]	2;4;23/44	2;1;23/233	2;1;03/195
	néng	[Possibility]	2;5;01/47	2;5;22/77	2;8;28/67

	yīnggāi	[Probability]	2;5;13/11	2;6;07/47	2;3;25/28
	děi	[Necessity]	—	—	—
	gāi	[Probability]	2;9;05/11	2;6;28/5	2;6;24/16
	zhǔn	[Necessity]	—	—	—
	kěnéng	[Possibility]	2;10;01/13	2;2;24/34	2;2;14/55
	yídìng	[Necessity]	2;10;16/4	2;10;19/19	3;3;12/12
	kěndìng	[Necessity]	2;8;20/22	2;1;23/24	2;7;22/21

In terms of acquisition timing, modal verbs expressing **dynamic modality** were acquired between 1;6 and 2;7. Among these, *yào* (expressing volition) was the earliest to emerge, with all three children producing it by age 1;6. Modal verbs denoting ability, such as *huì*, *néng*, and *kěyǐ*, as well as *xiǎng* (volition), also appeared relatively early in children's speech, with acquisition concentrated between 1;8 and 2;2. In contrast, *gǎn* (courage) and *yuànyì* (volition) emerged slightly later.

The acquisition of **deontic modality** occurred primarily between 1;9 and 3;4. The earliest deontic modal verb acquired was *yào* (obligation), with an onset age similar to that of its dynamic usage. Other frequently observed deontic modals, such as *néng* (permission), *kěyǐ* (permission), *yīnggāi* (obligation), and *děi* (necessity), were acquired between 1;9 and 2;7. By comparison, *zhǔn* (permission), *yídìng* (necessity), and *bìxū* (necessity) were acquired later and used infrequently.

Epistemic modality was acquired relatively later, between 1;11 and 3;3. Among these, *yào* (necessity) and *huì* (probability) emerged earlier, around 2;0 and 2;1 respectively. *Néng* and *kěnéng* (both indicating possibility) were acquired between 2;2 and 2;10, while *yīnggāi* and *gāi* (both indicating probability) appeared between 2;3 and 2;9. In contrast, *yídìng* and *kěndìng* (both indicating necessity) were acquired much later, with the latest emergence observed at 3;3.

In terms of frequency, *xiǎng* (volition), a monosemous modal verb, was used most frequently, with a total of 3,230 occurrences. Other high-frequency modals included *néng*, *yào*, *huì*, *kěyǐ*, and *děi*—all of which are either typical or moderately typical polysemous modal verbs that were acquired relatively early, between 1;6 and 2;2.

From the perspective of semantic types, the children acquired all subtypes of dynamic, deontic, and epistemic modality. This includes [ability] (e.g., *huì*, *néng*, *kěyǐ*), [volition] (e.g., *yào*, *xiǎng*, *yuànyì*), and [courage] (e.g., *gǎn*) under dynamic modality; [permission] (e.g., *néng*, *kěyǐ*, *zhǔn*), [obligation] (e.g., *yīnggāi*, *děi*, *gāi*), and [necessity] (e.g., *bìxū*, *yídìng*) under deontic modality; and [possibility] (e.g., *néng*, *kěnéng*), [probability] (e.g., *huì*, *yīnggāi*, *gāi*), and [necessity] (e.g., *yào*, *yídìng*, *kěndìng*) under epistemic modality. Notably, not all semantic subtypes of each modal verb were successfully acquired. For instance, the deontic use of

kěndìng (necessity) was not observed, nor were the epistemic uses of *děi* (necessity) and *zhǔn* (necessity).

Overall, children in the early stages of language development had already formed a relatively complete system of modal semantics. The acquisition of modal meanings did not occur instantaneously but followed a dynamic, constructive process, demonstrating a developmental trajectory from dynamic to deontic and then to epistemic modality. Moreover, the modal verbs and semanticc meanings acquired earlier were also those with the highest frequency of use in discourse.

To more accurately and thoroughly describe children's acquisition of modal semantic types, this study focuses on **polysemous modal verbs**, which are mostly typical or moderately typical modals. These verbs provide abundant data in terms of acquisition timing, frequency, and semantic diversity. According to the criteria proposed by Peng (2007)—namely, the presence of both root and epistemic meanings, parallel frequency and relatively balanced distribution across meanings, and the absence of strict syntactic requirements—*yào*, *huì*, *néng*, and *yīnggāi* are identified as representative polysemous modals. Drawing on acquisition data from the three children, the present study takes *yào* as a representative example to investigate the semantic acquisition features of polysemous modal verbs. The details of *yào*'s acquisition are presented in Table 3.

Table 3
Overview of the Semantic Acquisition of Yào

Modal Verb	Semantic Type	GYC (Acquisition Time/Frequency)	SWK (Acquisition Time/Frequency)	WMX (Acquisition Time/Frequency)
yào	Dynamic Modality	1;6;20/918	1;6;08/1455	1;6;30/638
	Deontic Modality	1;11;16/221	1;9;27/475	1;11;11/161
	Epistemic Modality	2;5;01/313	2;2;10/350	2;2;01/298

Semantic Acquisition of **Yào**

Yào is one of the most frequently used modal verbs among Mandarin-speaking children (Erbaugh, 1982). The present study found that *yào* had the highest frequency of occurrence among all modal verbs in the data: 1,452 tokens for GYC, 2,280 for SWK, and 1,097 for WMX—far exceeding the frequency of other modal verbs. Moreover, *yào* was also the first modal verb acquired by all three children, with onset ages of 1;6;20 (GYC), 1;6;08 (SWK), and 1;6;30 (WMX), respectively. Functionally, *yào* serves as a polysemous modal, expressing dynamic, deontic, and epistemic meanings.

Acquisition of the Dynamic Meaning

Under the dynamic modality, *yào* expresses the meaning of [volition], indicating that the subject has the intention or desire for a certain event to occur (Peng, 2007). Its negated form is typically *búyào* ("don't want"). Alleton (1994) argues that [volition] is the basic meaning of *yào*, which conveys the speaker's strong will to perform an action (Lü, 1999). In daily usage, *yào* is most commonly used to express volition (Guo & Yin, 2008). The corpus analysis in this

study supports this observation, showing that the volitional sense accounted for 63.2%, 63.8%, and 58.2% of all tokens of *yào* by GYC, SWK, and WMX, respectively.

The data reveal that all three children began to acquire the volitional meaning of *yào* at the age of 1;6. This finding aligns with Kong et al. (2004), who similarly observed that children started using *yào* around 1;6, with the volitional sense being the earliest acquired.
(1) Mother is helping GYC put on socks. (1;6;20)
*CHI: Búyào búyào.
"Don't want, don't want."
(2) SWK's mother suggests building a tall tower. (1;6;08)
*CHI: Búyào búyào.
"Don't want, don't want."
(3) WMX is playing ball with his sister. (1;6;30)
*CHI: Wǒ wán #[5] wǒ yào.
"I play, I want to."

In Examples (1) and (2), the children use the negative form *búyào* to clearly reject the actions of "putting on socks" and "building a tall tower". In Example (3), WMX uses the affirmative *yào* to strongly express the desire to play.

The use of *yào* to express dynamic modality displays a clear subject preference: it is predominantly used with first-person subjects (GYC: 772/918[6]; SWK: 1,214/1,455; WMX: 530/638). Usage with third-person subjects is less frequent, and with second-person subjects is rare (GYC: 6/918; SWK: 9/1,455; WMX: 6/638). Zhang (2017) argues that yào exemplifies the co-occurrence restrictions between person and modality. In neutral contexts, the first-person expression "wǒ(men) yào" typically conveys a sense of volition—"I/we want or need to"—which reflects dynamic modality. The second-person form "nǐ(men) yào" often expresses obligation—"you must"—and thus represents deontic modality. As for third-person subjects, whether *yào* expresses dynamic or deontic modality depends on broader contextual factors. The distribution of the two modal meanings of *yào*—[volition] and [obligation]—is partially determined by the relationship between the speaker and the agent (Alleton, 1994; Peng, 2007). This pattern of person-modality alignment effectively explains the predominance of first-person subjects in dynamic uses of *yào*.

Acquisition of the Deontic Meaning
When *yào* expresses a deontic meaning of [obligation], it is interpreted as "must" or "should" (Lü, 1999), indicating that the speaker is expressing a necessity for the realization of an event (Peng, 2007). The three children produced the deontic use of *yào* between 1;9 and 1;11, which is later than the acquisition of its dynamic meaning. The proportion of this usage among all tokens of *yào* was 15.2% for GYC, 20.8% for SWK, and 14.7% for WMX.
(1) The father built a sleeping house with toy blocks for GYC. (1;11;16)
*CHI: Tiān hēi hēi, bǎobǎo yào shuìjiào.
"It's dark, baby *must* sleep."

[5] "#" indicates a pause within the utterance.
[6] "772/918" indicates the ratio between the number of *yào* instances with a first-person subject and the total number of *yào* instances. The same format applies below.

(2) The mother and SWK are playing a garden baby game. (1;9;27)
*CHI: Bàba búyào dòng.
“Daddy *must not* move.”
(3) The mother told WMX that the sticker had fallen onto the floor. (1;11;11)
*CHI: Nà # nà # yào zhāi.
“Then (we) *must* remove it.”

In Example 1, GYC uses *yào* to express the necessity of sleeping when it gets dark. In Example 2, SWK uses the negative form *búyào* to prohibit the father from moving the toy train. In Example 3, WMX uses *yào* to state that the sticker on the floor must be picked up. In everyday discourse, *yào* often carries a directive function in its deontic use.

As discussed earlier, the distribution of dynamic and deontic meanings of *yào* is associated with the person of the subject. When the subject is in the first person, *yào* tends to express [volition]; when in the second person, it often expresses [obligation]; and for third-person subjects, the determination of whether *yào* expresses [volition] or [obligation] requires pragmatic analysis. In the three examples above, the subjects are all third-person referents. Based on the pragmatic function of each utterance, this study interprets the modal meaning of *yào* as conveying [obligation].
(4) The father is about to clean GYC’s ear. (1;9;28)
*CHI: Bié dòng.
“Don’t move.”
(5) The mother is about to find pants for SWK. (1;8;25)
*CHI: Bié qù.
“Don’t go.”
(6) WMX believes that his mother is about to leave the house. (1;11;11)
*CHI: Māma # bié zǒu.
“Mum, don’t go.”

In this study, a large number of utterances with *bié* were found in all three children’s corpora (GYC: 180 tokens; SWK: 155 tokens; WMX: 193 tokens). *Bié* is a variant of *búyào* and can substitute for the deontic use of *búyào* (Lü, 1999). For example, “Bàba búyào dòng” in Example 2 could also be expressed as “Bàba bié dòng”. The form *bié* is used to prohibit or dissuade an event from happening in a non-real situation, functioning as an imperative with a sense of prohibition or discouragement.

For GYC and SWK, *bié* (Examples 4–5) appeared even earlier than the acquisition of the affirmative *yào* in deontic contexts (Examples 1–2), while for WMX, *bié* (Example 6) appeared around the same time as *yào* (Example 3). This suggests that in acquiring the deontic use of *yào*, children may first grasp the negative forms *búyào* or *bié*, and only later acquire the affirmative form *yào*. This supports the idea that children do not always build linguistic knowledge through a unidirectional or positive-form-first approach, but may develop negative expressions before affirmatives during language acquisition.

Acquisition of the Epistemic Meaning
In epistemic usage, ***yào*** expresses [necessity], reflecting the speaker’s inference about the truth of an event or proposition (Peng, 2007). Specifically, ***yào*** can indicate three senses:

possibility, futurity, and estimation in comparative constructions (Lü, 1999). The acquisition of epistemic ***yào*** was relatively late for all three children, with onset occurring after age 2: SWK and WMX began producing it at 2;2, while GYC first used it at 2;5. The proportion of epistemic ***yào*** among all ***yào*** tokens was 21.6% for GYC, 15.4% for SWK, and 27.1% for WMX—much lower than that of dynamic ***yào***.

All three children first acquired the **futurity** use (Examples 1–3), followed by the **possibility** use (Examples 6–8). During the observation period, no child used ***yào*** in comparative constructions to express estimation, which suggests that children under four may not yet possess the inferential capacity required to make necessity-based judgments in comparative contexts.

(1) GYC plays with a toy car on the table. (1;9;28)
*CHI: *Wǒ yào # wǒ yào lái le a.*
"I'm, I'm coming."
(2) SWK is imitating Qiaohu's speech. (2;2;10)
*CHI: *Yángnǎinai, shéi yào lái ya?*
"Granny Goat, who's coming?"
(3) WMX asks mum to open the door. (2;2;01)
*CHI: *Dǎkāi mén # wǒ yào jìnqù le.*
"Open the door, I'm going in."

Between 2;2 and 2;5, children began using ***yào*** to predict the occurrence of future events with a sense of necessity. In Example (1), GYC, speaking as the toy car, makes a strong prediction about "coming". In Example (2), SWK predicts that someone will arrive. In Example (3), WMX expresses certainty about his imminent action after the door is opened. Furthermore, the futurity reading of ***yào*** was often reinforced by adverbs such as ***kuài*** ("soon") or ***jiù*** ("right away") (Examples 4–5).

(4) GYC on a swing. (2;7;15)
*CHI: *Āi yōu yōu yōu yōu # wǒ kuài yào diào xiàqù le.*
"Oh no, I'm about to fall!"
(5) Mum reminds WMX about taking medicine soon. (3;2;01)
*CHI: *Mǎshàng jiù yào chī yào le.*
"About to take medicine soon."
Between 2;3 and 2;9, all three children acquired the **possibility** use of ***yào***, though with relatively few tokens (GYC: 18; SWK: 18; WMX: 16). In Example (6), GYC warns that a spoiled cake might attract bugs. In Example (7), SWK notices mum's unstable standing position and predicts she may fall, issuing a caution. In Example (8), WMX, unable to find the tablet, speculates that it might have fallen.

(6) GYC tells mum the cake is spoiling. (2;8;07)
*CHI: *Dà dàngāo yào huài le.*
*CHI: *Huài le yào zhāo chóngchóng le.*
"The big cake is going bad." "If it does, it'll attract bugs."

(7) SWK warns mum to be careful. (2;3;23)
*CHI: *Xiǎoxīn # nǐ yào diào xiàqù.*
"Be careful, you might fall."
(8) WMX tells mum he can't find the tablet. (2;9;11)
*CHI: *Māma zhège yào diào xiàlái le ma # zhège yào diào xiàlái le ba.*
"Mum, did this fall down? I think it might have."

This study also noted that epistemic ***yào*** frequently co-occurs with the aspect marker ***le***, indicating a close relationship with future-oriented meanings. GYC produced 91 tokens of ***yào + le***, SWK 125, and WMX 142, accounting for 29.1%, 35.7%, and 47.7% of their respective epistemic ***yào*** tokens. According to Peng (2007), when ***yào*** co-occurs with ***le***, it may either indicate a counterfactual necessity (hypothetical inference) or a factual prediction (forward inference). In this study, nearly all tokens belonged to the latter category—i.e., predicting what is about to happen (Examples 1–5). Only one case (Example 8) reflected counterfactual necessity: the child inferred the truth of a past event (i.e., the tablet had fallen), which represents a hypothetical inference.

Discussions

This study examined the longitudinal development of semantic types of modal verbs in three Mandarin-speaking children and used *yào*, a prototypical polysemous modal verb, as a case study to analyse their acquisition and development of dynamic, deontic, and epistemic meanings. The findings reveal that, in terms of modal verb acquisition, the development of children's modal semantics is both comprehensive and substantial. Dynamic modality emerged the earliest and was used with the highest frequency, with all three children acquiring it at the age of 1;6. Epistemic modality appeared the latest: two children acquired the probability meaning of *huì* at 2;1, followed by the emergence of the necessity meaning of *yào* at 2;2.

The earliest modal verb acquired by all three children was *yào*. Two of them first used it in the negative form, while one child used it in the affirmative. During the period from 1;6 to 3;3, the children gradually acquired various modal verbs, with the acquisition of prototypical modals largely concentrated between 1;6 and 2;6. In acquiring the polysemous *yào*, the children first mastered the simpler dynamic sense [volition], then the deontic sense [obligation], and finally the more cognitively demanding epistemic sense [necessity]. The semantic development of *yào* followed a strict trajectory from dynamic to deontic to epistemic, reflecting a developmental order of root modality > epistemic modality.

The study also found that the acquisition of modal verbs is influenced not only by semantic categories but also by temporal reference and syntactic environment. For instance, *yào* in its dynamic use typically takes a first-person subject, whereas its deontic use tends to occur with second-person subjects. In expressing epistemic meanings, *yào* is highly dependent on temporal reference, especially future time, and frequently co-occurs with the aspectual marker *le* at the end of the sentence.

It is generally believed that the modal verb *yào* originates from the corresponding lexical verb *yào*. Initially, this verb denoted a concrete action, but it later developed a dynamic modal meaning, and subsequently extended to deontic and epistemic modal meanings. To be

specific, *yào* evolved from a verb meaning "to request; to hope to obtain or retain; to ask or demand" (as defined in *The Contemporary Chinese Dictionary* [7th edition] and *Eight Hundred Words in Modern Chinese*) into a modal verb expressing "the intention to do something; should; must; need", and eventually developed into a marker of epistemic necessity. In this semantic evolution, the meanings became increasingly abstract, and subjectivity intensified. This grammaticalization process closely mirrors the order in which children acquire modal meanings. As Peng (2007) has pointed out, children's acquisition of different types of modal meanings parallels the diachronic development of modal verb semantics.

According to the modal semantic model proposed by Perkins (1983), dynamic modality pertains solely to the occurrence of events in the real or physical world; deontic modality requires an understanding of social rules or norms and is related to whether or not an action is performed and the consequences of such actions; epistemic modality stems from the speaker's reasoning and represents their judgment about the truth value of a proposition. In other words, dynamic and deontic modality respectively express the possibility and necessity in the natural and social worlds, while epistemic modality expresses the same concepts within the mental world. The latter is more abstract in meaning than the former. Therefore, in terms of both logical semantic features and semantic modeling, the level of complexity increases in the order: dynamic modality < deontic modality < epistemic modality. Naturally, children acquire less complex categories earlier and more complex ones later. They first develop an understanding of the "real/physical world", followed by a mixed understanding of the "physical and mental world", and ultimately achieve an understanding of the "mental/inferential world".

In the process of acquiring modal verbs, children exhibit a high degree of interaction between language and cognition. Core or basic meanings of modal verbs are acquired first, followed by extensions to derived meanings. This suggests that children first form an understanding of the core semantic sense and then gradually expand to more complex derived senses. The extension of senses in polysemous modal verbs is a common phenomenon of semantic expansion in language, and its central mechanism is metaphor. Through metaphor, different meanings of a single modal verb are progressively derived in terms of semantics. This observation supports findings from various grammatical frameworks regarding the origin and syntactic distribution of modal meanings. Children interpret the three modal senses of *yào* in a cognitive sequence, and these meanings—volition, obligation, and necessity—are metaphorically extended from "having a desire" to "having a possibility". This metaphorical path of semantic expansion corresponds closely to the general developmental trajectory of polysemous modal verbs, and cross-linguistic studies further support the universality of this acquisition pattern.

Conclusion

In conclusion, as children acquire modality, they gradually develop the ability to express subjective attitudes and judgments toward propositions. This involves a shift from less subjective dynamic or deontic modality to the more subjective epistemic modality. The process of increasing subjectivity reflects a deepening of children's linguistic expression as well as their cognitive understanding of the world and themselves. In language education, teachers should not only focus on enhancing children's linguistic abilities but also pay attention to the development of their cognitive capacities. Through activities such as

observation, reflection, and imagination, children's language and cognition can be jointly fostered.

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