

When Months Are Numbered While Days Are Not: Korean Children's Acquisition of Time Words

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1 Introduction

Although intuitively we may think that to know numbers and to master time sequences such as the days of the week (DOW) and the months of the year (MOY) are quite different abilities, previous studies in children's cognitive development show that the two processes might be closely related. Pollmann (2003), for example, claims that instead of mapping meaning-to-form for each word, children learn numbers and DOW words differently as they first memorize a set of unrelated names without exhibiting the ability to produce them until a later age. When learning the days' names, children "rote a list of

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at first meaningless word forms and detect in this list a repetitive structure that enables the learner to produce other items of the list..." (Pollman, 2003, p. 3). This sounds very much like the process of learning numbers, and the author further claims that the principles that govern a child's acquisition of numbers are the same as those which drive acquisition of the DOW.

Despite the similarity in the process of acquiring numbers and time concepts, children generally learned the latter ones at a later age. The difficulties that children have in thinking about time may result from the complexity of time as a concept, but it may also reflect the idiosyncrasies of particular calendar systems. Investigations into children's acquisition of time concepts by Kelly et al. (1999) and Liu (2010) have shown that Chinese children outperform English children in using the days of the week (DOW) and the months of the year (MOY) terms in problem solving—a result explained by the fact that Chinese encodes the DOW and the MOY using a numerical system (Monday is 'weekday one', January is 'month one', etc.), while English uses opaque names derived from planetary terms. Children learn basic number terms at about two to three years of age (Brandt, 1996), and the Chinese learner who has already learned small number terms can relate DOW or MOY terms to these other words that they already know. This might facilitate early learning of the temporal terms themselves, whereas to children learning and using English, the names are arbitrary symbols—there is no obvious reason why Friday or September have the names they do—and the learning must be committed to memory. In a word, these studies claim that the use of number terms facilitates the early mastery of time concepts.

Their results, however, could be alternatively attributed to other factors such as arithmetic ability, educational background, and cultural influences that differ between the two language groups. The current study finds a way to control these confounding factors by introducing a new testing language. Korean, as a 'hybrid' language that has both numerical and arbitrary time words, serves as a perfect candidate to test whether numerical transparency of time words truly affects children's acquisition of time concepts. The meanings of the Korean naming system of the days of the week refer to the sun, the moon, and five planets connected to the five elements in traditional East Asian philosophy. On the other hand, the months names in Korean have a simple numbering sequence, in the form of the number followed by 월 'month' (see Table 1).

English	Sunday	Monday	Tuesday
Korean	일요일 <i>Ir-yo-il</i>	월요일 <i>Wor-yo-il</i>	화요일 <i>Hwa-yo-il</i>
Translation	Day of sun	Day of moon	Day of fire
Wednesday	Thursday	Friday	Saturday
수요일 <i>Su-yo-il</i>	목요일 <i>Mog-yo-il</i>	금요일 <i>Geum-yo-il</i>	토요일 <i>To-yo-il</i>
Day of water	Day of wood	Day of metal	Day of earth

January	February	March	April	May	June
일월 <i>il-wol</i>	이월 <i>i-wol</i>	삼월 <i>sam-wol</i>	사월 <i>sa-wol</i>	오월 <i>o-wol</i>	유월 <i>yu-wol</i>
1 Month	2 Month	3 Month	4 Month	5 Month	6 Month
July	August	September	October	November	December
칠월 <i>chil-wol</i>	팔월 <i>pal-wol</i>	구월 <i>gu-wol</i>	시월 <i>si-wol</i>	십일월 <i>sip-il-wol</i>	십이월 <i>sip-i-wol</i>
7 Month	8 Month	9 Month	10 Month	11 Month	12 Month

Table 1. Korean Arbitrary DOW and Numerical MOY

If it is the numerical transparency of time terms that affects the age of acquisition, and not cultural factors, then Korean-speaking children should perform better on the transparent MOY naming system than on the arbitrary DOW system, *despite* the possibility that month terms occur with lower frequency and children have less exposure to them in daily life. As a result, the present study sought to investigate if the contrasting naming systems in Korean result in significant differences in the pace at which children acquire the terms of the DOW and the MOY.

2 Method

Fifty Korean monolingual children between the ages of three and seven participated in the experiment. The 3-year-old participants (7 females, 3 males) ranged in age from 3;01 to 3;11 ($M = 3;70$, $SD = 0.31$). The 4-year-olds' (5 females and 5 males) ages ranged from 4;02 to 4;11 ($M = 4;06$, $SD = 0.24$). The 5-year-old participants (3 females, 7 males) ranged in age from 5;02 to 5;09 ($M = 5;06$, $SD = 0.19$). The 6-year-old participants (4 females, 6 males) ranged in age from 6;01 to 6;11 ($M = 6;04$, $SD = 0.28$). The 7-year-old participants (9 females, 1 male) ranged in age from 7;02 to 7;11 ($M = 7;07$, $SD = 0.24$).

The experiment has two parts, testing children's knowledge and ability to use the DOW and MOY terms respectively. The first part of the experiment was conducted using seven picture cards of the cartoon character Winnie the Pooh, each corresponding to a day of the week. The order of the cards implied the order of the days of the week and together, these cards formed a story involving Winnie the Pooh's activities on each day of the week (see Appendix A for a graphic representation of the actual picture cards). First, the researcher laid out the story cards in front of the participant one card at a time while telling the story of Pooh's daily activity, for instance, 'On Tuesday, Winnie the Pooh flies a balloon.' Each card was revealed as the story unfolded. While the cards were left spread out in order in front of the participant, s/he was asked a total of twenty-five questions with five levels of complexity to assess what level of mastery s/he had attained in comprehending and using time terms.

Level of Complexity	Description	Sample Question
1. Basic Composition	Knowledge of the week as an entity of time that has parts	How many days are there in a week?
2. Name Recognition	Knowledge of and the ability to distinguish the specific names of the days of the week	On what day does Winnie the Pooh go swimming?
3. Adjacency Relationships	Knowledge that days are sequentially related and the ability to solve problems that involve days that occur next to each other	Today is Tuesday and Winnie goes swimming. What will he do tomorrow?
4. Within-week Distance	Ability to recognize, compute, and verbalize the temporal relationship of days that are not adjacent, but are still within the scope of the same target week	Today is Sunday and Winnie eats some honey. On Tuesday he will fly a balloon. How many days must he wait to fly a balloon?
5. Cross-week Distance	Ability to recognize, compute, and verbalize the temporal relationship of days that cross the boundaries of a conventional 7-day week as configured in the speaker's native language	Today is Friday and Winnie goes swimming. Next Monday he will ride in a boat. How many days must he wait to ride in a boat?

Table 2. Description of Complexity Levels and Sample Questions in DOW

The five levels progressively tested the participants' ability to perform sophisticated manipulations of the abstract time concepts. The questions elicited the participants' brief descriptions of the story cards or short responses. For example, the researcher would ask *On what day does Winnie the Pooh ride in a boat?* (Level 2), or *Today is Friday and Pooh goes swimming. On Wednesday Pooh read a book. How many days ago did he read a book?*(Level 5). One point was given for each correct answer; thus, the maximum possible score was twenty-five. Table 2 shows sample questions from each of the five levels (See Appendix B for a full list of questions). In the second part of the experiment, the same children were tested with five levels of questions about MOY, based on another set of twelve picture cards describing Mickey Mouse's annual activities. Therefore, each child was sequentially tested with the two sets of questions, DOW and MOY (See Appendices C and D). The testing order was counter-balanced across participants.

3 Results

As Table 3 shows, the mean score for the MOY test is higher than that for the DOW test for each age group. And the score difference is shown graphically in Figure 1. A repeated measures ANOVA, with Age as a categorical within-subject factor and Test-type as a between-subject factor, showed a main effect of Test-type, $F(1,45) = 9.656, p < 0.001$, confirming that the Korean-speaking children generally scored higher on the MOY test. Age also had a main effect, $F(1,45) = 45.78, p < 0.001$, and regressions showed that the scores produced by different age groups were different, both for DOW questions, $R^2 = 0.74, F(1,48) = 139.66, p < 0.001$, and MOY questions, $R^2 = 0.72, F(1,48) = 120.51, p < 0.001$. The results can be explained as a consequence of the numerical transparency of the MOY terms in contrast to the opacity of the terms for DOW.

	3 yrs (N = 10)	4 yrs (N = 10)	5 yrs (N = 10)	6 yrs (N = 10)	7 yrs (N = 10)
DOW	3.9 (SD = 2.0)	10.5 (SD = 6.0)	17.8 (SD = 3.7)	19.6 (SD = 3.3)	22.8 (SD = 2.1)
MOY	6.2 (SD = 4.1)	10.6 (SD = 5.9)	19.9 (SD = 4.3)	21.2 (SD = 3.2)	23.9 (SD = 1.5)

Table 3. Mean Scores of DOW and MOY Tests in Each Age Group

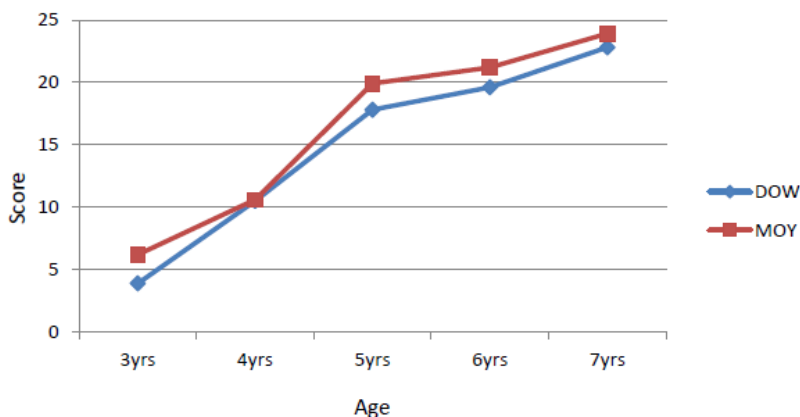


Figure 1. Mean Scores in DOW and MOY Tests in Each Age Group

It is worth noting that in the terms for ‘June’ and ‘October’, the final consonant of the numerical form is unpredictably lost (*yu-wol* instead of *yuk-wol* for ‘June’; *si-wol* instead of *sip-wol* for ‘October’; see Table 1). Although this sound change which is a sign for grammaticalization, results in non-transparent month names of June and October, children tested didn’t show more difficulty with questions involving these two terms than with questions involving the other month names. This shows that children might be able to relate the two month names with the corresponding numerals despite the idiosyncratic pronunciation of the month names.

4 Conclusion

The present study demonstrates that Korean-speaking children better comprehend and use a numerical months-of-the-year system than an arbitrary days-of-the-week system. The results of the DOW and the MOY tests with Korean-speaking children cannot have been affected by cultural and educational factors. Therefore, the results suggest that it is the numerically transparent naming system that facilitates the early acquisition of time concepts. The study provides strong evidence for the hypothesis that a symbolic system (such as language) has an effect on children’s acquisition of concept systems (such as time), even within one language system. More specifically, a numerically transparent naming system can contribute positively to the early acquisition of time concepts.

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Appendix A

Picture Cards for Korean DOW

월요일	화요일	수요일	목요일	금요일	토요일	일요일
						
보트를 타요	풍선을 타요	춤 춰요	책을 읽어요	수영을 해요	나무에 올라가요	과일을 먹어요

Appendix B

Stimuli Questions for Korean DOW

Part 1 Levels 1–3

1. 일주일에는 총 며칠이 있지?
2. 푸우가 나무에 올라가는 날은 무슨 요일이지?
3. 너가 학교 가는 날은 일주일에 총 몇 번이지?
4. 푸우가 풍선을 타는 날은 무슨 요일이지?
5. 푸우가 책을 읽는 날은 무슨 요일이지?
6. 너가 집에 있는 날은 일주일에 총 몇 번이지?
7. 오늘은 화요일이고 푸우가 풍선을 타는 날이야. 푸우가 내일은 무엇을 하지?
8. 푸우가 춤을 추는 날은 무슨 요일이지?
9. 너희 아버지가 일하러 가시는 날은 일주일에 총 몇 번이지?
10. 푸우가 과일을 먹는 날은 무슨 요일이지?

11. 오늘은 금요일이고 푸우가 수영을 하는 날이야. 푸우가 내일은 무엇을 하지?
12. 오늘은 화요일이고 푸우가 풍선을 타는 날이야. 푸우가 어제는 무엇을 했지?
13. 너가 일주일 중에서 이름을 아는 요일은 총 몇 개이지?
14. 오늘은 수요일이고 푸우가 책을 읽는 날이야. 푸우가 내일은 무엇을 하지?
15. 오늘은 일요일이고 푸우가 꿀을 먹는 날이야. 푸우가 어제는 무엇을 했지?

Part 2 Level 4-5

16. 오늘은 수요일이고 푸우가 책을 읽는 날이야. 토요일은 푸우가 나무에 올라가는 날이야. 푸우가 나무에 올라가려면 며칠을 기다려야 하지?
17. 오늘은 화요일이고 푸우가 풍선을 타는 날이야. 목요일은 푸우가 춤을 추는 날이야. 푸우가 춤을 추려면 며칠을 기다려야 하지?
18. 오늘은 목요일이고 푸우가 춤을 추는 날이야. 푸우가 춤을 또 추려면 며칠을 기다려야 하지?
19. 오늘은 일요일이고 푸우가 꿀을 먹는 날이야. 금요일에 푸우는 수영을 했었어. 푸우는 며칠전에 수영을 했었지?
20. 오늘은 월요일이고 푸우가 배를 타는 날이야. 수요일은 푸우가 책을 읽는 날이야. 푸우가 책을 읽으려면 며칠을 기다려야 하지?
21. 오늘은 토요일이고 푸우가 나무에 올라가는 날이야. 다음주 월요일은 푸우가 배를 타는 날이야. 푸우가 배를 타려면 며칠을 기다려야 하지?
22. 오늘은 토요일이고 푸우가 나무에 올라가는 날이야. 목요일은 푸우가 춤을 쳤어. 며칠 전에 푸우가 춤을 쳤지?
23. 오늘은 일요일이고 푸우가 꿀을 먹는 날이야. 다음주 화요일은 푸우가 풍선을 타는 날이야. 푸우가 풍선을 타려면 며칠을 기다려야 하지?
24. 오늘은 금요일이고 푸우가 수영을 하는 날이야. 다음주 수요일은 푸우가 책을 읽는 날이야. 푸우가 책을 읽으려면 며칠을 기다려야 하지?
25. 오늘은 토요일이고 푸우가 나무에 올라가는 날이야. 다음주 화요일은 푸우가 풍선을 타는 날이야. 푸우가 풍선을 타려면 며칠을 기다려야 하지?

Appendix C

Picture Cards for Korean MOY

일월	이월	삼월	사월	오월	유월
 눈사람을 만들어요	 기차를 타요	 축구를 해요	 그림을 그려요	 운전을 해요	 꽃을 선물해요
칠월	팔월	구월	시월	십일월	십이월
 물개랑 놀아요	 빗속을 걸어요	 장난감을 만들어요	 산책을 해요	 영화를 만들어요	 선물을 배달해요

Appendix D

Stimuli Questions for Korean MOY

Part 1 Levels 1-3

1. 일년에는 총 몇 개월이 있지?
2. 미키 마우스가 산책을 하는 달은 몇 월이지?
3. 너가 일년에 학교 가는 달은 총 몇 개월이지?
4. 미키 마우스가 축구를 하는 달은 몇 월이지?
5. 미키 마우스가 운전을 하는 달은 몇 월이지?
6. 너가 일년에 학교에 안가고 집에 있는 달은 총 몇 개월이지?
7. 지금은 사월이고 미키 마우스가 그림을 그리는 달이야. 다음달에는 미키 마우스가 무엇을 하지?
8. 미키 마우스가 꽃을 선물하는 달은 몇 월이지?
9. 너희 아버지는 일년에 총 몇 개월 일하시지?
10. 미키 마우스가 영화를 만드는 달은 몇 월이지?
11. 지금 칠월이고, 미키 마우스가 물개랑 노는 달이야. 다음달에는 미키 마우스가 무엇을 하지?
12. 지금은 삼월이고 미키 마우스가 축구를 하는 달이야. 지난달에는 미키 마우스가 무엇을 했지?
13. 너가 이름을 말할 수있는 달은 일년 중 총 몇 개월이지?
14. 지금은 오월이고, 미키 마우스가 운전을 하는 달이야. 다음달에는 미키 마우스가 무엇을 하지?
15. 지금은 십이월이고 미키 마우스가 선물을 배달하는 달이야. 지난달에는 미키 마우스가 무엇을 했지?

Part 2 Levels 4-5

16. 지금은 오월이고 미키 마우스가 운전을 하는 달이야. 구월에는 미키 마우스가 장난감을 만들거야. 장난감을 만드려면 미키 마우스는 몇 개월을 기다려야 하지?
17. 지금은 사월이고 미키 마우스가 그림을 그리는 달이야. 칠월에는 미키 마우스가 물개랑 놀거야. 물개랑 놀려면 미키 마우스는 몇 개월을 기다려야 하지?
18. 지금은 유월이고 미키 마우스가 꽃을 선물하는 달이야. 미키 마우스가 꽃을 또 선물하려면 몇 개월을 기다려야 하지?
19. 지금은 십일월이고 미키 마우스가 영화를 만드는 달이야. 삼월에는 미키 마우스가 축구를 했어. 몇 개월 전에 미키 마우스가 축구를 했지?
20. 지금은 일월이고 미키 마우스가 눈사람을 만드는 달이야. 오월에는 미키 마우스가 운전을 할 거야. 미키 마우스가 운전을 하려면 몇 개월을 기다려야 하지?
21. 지금은 구월이고 미키 마우스가 장난감을 만드는 달이야. 내년 이월에는 미키 마우스가 기차를 탈 거야. 미키 마우스가 기차를 타려면 몇 개월을 기다려야 하지?
22. 지금은 시월이고 미키 마우스가 산책을 하는 달이야. 칠월에는 미키 마우스가 물개랑 놀았어. 몇 개월 전에 미키 마우스가 물개랑 놀았지?
23. 지금은 십이월이고 미키 마우스가 선물을 배달하는 달이야. 내년 사월에는 미키 마우스가 그림을 그릴 거야. 미키 마우스가 그림을 그리려면 몇 개월을 기다려야 하지?
24. 지금은 유월이고 미키 마우스가 꽃을 선물하는 달이야. 내년 일월에는 미키 마우스가 눈사람을 만들 거야. 미키 마우스가 눈사람을 만들려면 몇 개월을 기다려야 하지?
25. 지금은 시월이고 미키 마우스가 산책을 하는 달이야. 내년 삼월에는 미키 마우스가 축구를 할 거야. 미키 마우스가 축구를 하려면 몇 개월을 기다려야 하지?