Re-Examining the Linguistic-Savings Hypothesis within English: Evidence from Monolinguals[1]

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Abstract

Despite a growing body of literature supporting Chen's (2013) linguistic-savings hypothesis (LSH), direct causal evidence remains limited. Recent studies—including Chen, He, and Riyanto (2019) and Angerer et al. (2021)—administered linguistic manipulation on the use of the future tense within weak future-time-reference (w-FTR) languages to examine the LSH but found null results. One explanation for such results is that speakers of w-FTR languages may not be adequately "trained" to differentiate between present and future tenses. To address this concern, the present study re-examines the LSH within English, a strong future-time-reference language, using English monolinguals. Our design features a time preference task with two linguistic conditions: the FT condition uses future tense to describe delayed rewards, while the NFT condition uses present tense by omitting future tense marking. The descriptions in both conditions are grammatically correct and sound natural to native speakers. Between the two linguistic conditions, however, we found no behavioral differences in the time preference task. Overall, the null results alongside previous studies reporting similar findings raise significant doubts about the validity of the LSH.

Keyword: time preference, future time reference, linguistic-savings hypothesis, English monolingual

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I. Introduction

The linguistic-savings hypothesis (LSH) proposed by M. Keith Chen (2013) posits that the grammatical marking of the future tense in a language affects people's perceptions of the future. Speakers of languages that require the use of future tense (i.e., strong future-time-reference [s-FTR] languages, such as English and Spanish) tend to view the future as more distant and thus exhibit less patience in future-oriented behaviors compared to speakers of "futureless" languages that do not require the use of future tense (i.e., weak future-time-reference [w-FTR] languages, such as Chinese and German). Since being published in the *American Economic Review* in 2013, Chen's paper has received over 800 citations on Google Scholar as of April 2023.

Many subsequent studies, primarily in economics, have provided ample empirical evidence supporting the LSH. However, a methodological caveat among the existing studies is that the analyses mainly rely on cross-cultural or cross-country comparisons while focusing on behavioral differences between speakers of w-FTR and s-FTR languages. The observed relationship could be driven by culture rather than the grammatical marking of the future per se (Roberts, Winters, and Chen, 2015). Some reseachers have provided more compelling evidence from controlled experiments by showing that bilingual individuals fluent in both w-FTR and s-FTR languages still exhibited a higher level of patience when instructed in a w-FTR language rather than a s-FTR language (Herz et al., 2021; Ayres, Katz, and Regev, 2023). Nevertheless, concerns about culture being a confounding factor remain due to the inherent cultural priming effect of languages (Li, 2017; Hong et al., 1997, Miller, 1984, Morris and Peng, 1994).

On the other hand, several recent experimental studies have taken the next step by directly mainipulating the use of future tense within a language to better test the LSH in a tightly controlled experimental setting. For example, Chen, He, and Riyanto (2019) take advantage of the possibility to refer to future events using present or future tense in Chinese. The researchers elicited 314 Chinese-speaking participants' time preferences while randomizing the language used to explain an incentivized intertemporal choice task to the participants. In the future-tense (FT) condition, researchers stated that the participants "will receive x dollars in y weeks," whereas in the non-future-tense (NFT) condition, the auxiliary verb "will" was omitted. The findings lend no support to the LSH in that participants who were exposed to the FT condition did not behave more impatiently than their NFT counterparts in

the time preference task. The null results have been replicated in German (Angerer et al., 2021). Jäggi et al. (2022) also found null results using a different design.

One interpretation for the null result found in studies using future tense linguistic manipulation within one language to test LSH is that speakers of w-FTR languages may not be as sensitive as speakers of s-FTR languages in distinguishing between the present and future according to the verb tenses presented. This lack of sensitivity could stem from insufficient exposure to the linguistic features, and as Chen, He, and Riyanto (2019) and Angerer et al. (2021) have noted, any measurable language effect may not be observable for a long time.

To address this gap in the literature, the present study aims to re-examine the LSH within English, an s-FTR language, using English monolinguals. We designed two linguistic conditions, future-tense (FT) and non-future-tense (NFT), and naturally embedded them in a time preference task where participants chose between an immediate, smaller reward and a delayed, larger reward. Specifically, in the FT condition, delayed rewards were described using future tense (i.e., X tokens will be paid in Y weeks), while in the NFT condition, rewards were described using present tense by omitting the future tense marking (i.e., X tokens paid in Y weeks). The descriptions in both conditions are grammatically correct and sound natural to native English speakers.

For this study, the experiment was pre-registered on the AEA RCT Registry and conducted with almost 600 English monolingual participants on Prolific. Consistent with previous studies by Chen, He, and Riyanto (2019) and Argerer et al. (2021), we did not observe any behavioral differences in the time preference task between the two linguistic conditions. Overall, this study presents what appears to be the most rigorous test thus far on how the future time reference affects intertemporal decision-making. Yet the null results alongside previous studies reporting similar findings raises substantial doubts about the validity of the LSH.

The rest of the paper is structured as follows: Section II describes our experimental design and procedures. We present and discuss the empirical results in Section III, and the last section concludes the paper.

II. Experimental Design and Procedures

We used a modified version of the multiple-price-list method (Frederick, Loewenstein, and O'Donoghue 2002; Chen and He, 2021) to elicit intertemporal decisions. The task consisted of 24 rounds. In each round, participants were asked if they would like to switch from

receiving 100 tokens[2] on the day of the session to a larger amount to be paid in *m* weeks, where *m* was equal to 1, 4, and 12, to represent the delay durations. The larger delayed rewards started from 105, 110, 115, ……, to 135 and 140 tokens, a total of 8 different values. The decision items were assigned to the participants in random order.[3] Participants had to pass a 3-item comprehension quiz before proceeding to the decision-making stage.

Following Chen, He, and Riyanto's (2019) design, we administered linguistic manipulation on the use of future time reference in two conditions—FT and NFT—and naturally embedded the linguistic cues in the message used to convey the delayed rewards. Participants were randomly assigned into one of the two conditions. In the FT condition, the message read as "X tokens will be paid in m weeks," while in the NFT condition, the grammatical marking of future tense—will be—is omitted, and thus the message read as "X tokens paid in m weeks."

Our experimental design features three distinct advantages. Firstly, we only present delayed rewards in the decision-making task, without visually displaying the immediate reward of 100 tokens. This approach enables us to cleanly test whether the use of future time reference affects an individual's valuation of a delayed award by drawing participants' attention to the delayed rewards. Particularly, the description of immediate rewards, if displayed, may cause disturbances in the decision-making process. Secondly, using present tense to future rewards is typically grammatically incorrect using an s-FTR language (For example, "I receive X tokens in m weeks." is not grammatically correct in English). Our design avoids this grammatical limitation by describing the monetary payoffs using a passive voice. Thirdly, we restrict our participant pool to English monolinguals only as bilinguals or multilinguals may be influenced by their exposure to other w-FTR languages, which could potentially bias the results.

The study was approved by the National Taiwan University Institutional Review Board and pre-registered on AEA RCT Registry (AEARCTR-0010709). We recruited participants using Prolific (www.prolific.co), a widely used platform for online research. As indicated in our pre-registration, a total of 596 participants successfully completed the study. The experiment took place on Jan 24, 2023 (GMT).[4] The majority of the participants took less than 15 minutes to complete the experiment, including instructions, decision-making task, and an

[2] Tokens were converted into British pound using the 40 tokens=£1 rate.
[3] The order of *m* was randomized, while the delayed amount was presented to the participants in an increasing order, starting at 105 tokens and increasing in 5 tokens increments.
[4] All participants were recruited and completed the experiment during 13:06-15:45 on Jan 24, 2023 (GMT).

exit survey. Participants received a guaranteed participation fee of £2.25 on the day of the session and an incentive payment based on the randomly chosen round in the time preference task, both of which was were administered through the payment system on Prolific. The experiment was programmed using oTree (Chen, Schonger, and Wickens, 2016). Please see Online Appendix for experimental materials, including instructions, the decision-making task, and exit survey.

III. Results

Table 1 summarizes the demographics of the study participants. Almost half of the sample (48%) consists of male participants, and the average age is 42 years. *Education* is an ordinal variable that takes the value 1 for primary/secondary school or equivalent, 2 for bachelor's degree, 3 for master's degree, and 4 for doctorate degree. The mean *Education* is 1.87. Almost all of the participants (98%) are monolingual English speakers.[5] We conducted pairwise proportion tests and t-tests to compare the means between the two treatment conditions for each demographic variable. None of the means were significantly different at the 10% level, indicating that the random assignment was valid.

Table 1: Descriptive statistics of demographic variables

	FT	NFT	All Participants
Male	0.47	0.49	0.48
	(0.50)	(0.50)	(0.50)
Age	41.76	41.53	41.64
	(13.09)	(13.13)	(13.10)
Education	1.86	1.88	1.87
	(0.75)	(0.76)	(0.76)
Monolingual	0.98	0.98	0.98
	(0.15)	(0.15)	(0.15)
No. of obs.	286	310	596

Note: Standard deviations are reported in parentheses. Pairwise proportion tests were used to test the difference of means for *Male* and *Monolingual* and t-tests were used to test the difference of means for *Age* and *Education*. None of the means are significantly different at the 10% level. *Male* is a dummy that equals 1 if the participant is male and 0 otherwise. *Age* indicates the participant's age in years. *Education* is an ordinal variable that takes the value 1 for primary/secondary school or equivalent, 2 for bachelor's degree, 3 for master's degree, and 4 for doctorate degree. *Monolingual* is a dummy that equals 1 if the participant is an English-speaking monolingual and 0 otherwise.

We excluded observations from non-monolingual participants and observations exhibiting multiple-switch points, leaving us with 526 valid observations for data analysis.

[5] The majority of participants were located in the U.K., as they were recruited through the Prolific participant pool.

Table 2 presents the average number of delayed options by treatment group. The average number of delayed options chosen are 5.35, 3.36, and 2.10 for 1-, 4-, and 12-week delay duration, respectively, showing that individuals discounted more heavily the delayed options in the distant future than those in the near future. To examine the treatment effect of our main interest, we compare the average number of delayed options chosen in the two conditions. Using the two-sided t-test and Mann-Whitney test, the differences in the means are not statistically significant for all three delay durations. The results indicate that, in contrast to LSH's prediction, the degree of future time reference does not impact intertemporal decision-making among English monolinguals.

Table 2: Comparison of the number of delayed options by treatment

Treatment	FT	NFT	All Participants
1 week	5.23	5.45	5.35
	(0.18)	(0.16)	(0.12)
4 weeks	3.24	3.46	3.36
	(0.19)	(0.17)	(0.13)
12 weeks	2.20	1.99	2.10
	(0.18)	(0.16)	(0.12)
No. of obs.	251	275	526

Note: The table presents the average number of delayed options by treatment in each of the three delay durations (i.e., 1-, 4-, and 12-weeks). Observations from non-monolingual participants and observations exhibiting multiple-switch points were excluded. Standard deviations are reported in parentheses.

Given that each participant made 24 binary decisions (3 delayed durations*8 delayed rewards) between the immediate and delayed options, we obtained balanced panel data. We performed probit regressions to estimate the treatment effect and present the average marginal effects in Table 3. Standard errors were clustered at the individual level. The dependent variable is a binary variable that equals 1 if the participant chose the delayed option and 0 if the participant chose the immediate option. In Column (1), we regressed the dependent variable on the treatment dummy only. *Future tense* representing the treatment dummy takes the value of 1 if the participants were in the FT condition and 0 otherwise. Corroborating with the results in Table 2, the coefficient of *Future tense* is negative but not significant, meaning that participants in the FT condition did not discount delayed rewards more heavily than their counterparts in the NFT condition, as predicted by LSH. In Column (2), we added controls for delay durations (*Delay in weeks*), the amount of the delayed reward specified in a round (*Reward amount*), and a set of demographic variables, including *Male*, *Age*, and *Education*. We predicted a negative association between *Delay in weeks* and the dependent variable since people typically give a greater discount to the delayed options when waiting longer to receive

the incentive. Furthermore, when the incentive size increases, people are more likely to choose the delayed option, so we predicted a positive coefficient of *Reward amount*. As expected, we observed a significantly negative coefficient of *Delay in weeks* and a significantly positive coefficient of *Reward amount*. The coefficient of *Male* was not significant, while the coefficients of *Age* and *Education* were both positive and significant, indicating that older and more educated participants exhibited a higher level of patience than their corresponding counterparts. After the inclusion of these control variables, the coefficient of *Future tense* remained insignificant. Overall, our results demonstrate that the use of future time reference does not impact intertemporal decision-making among English monolinguals.

Table 3: Regression results

	(1)	(2)
Future tense	-0.010	-0.010
	(0.027)	(0.003)
Delay in weeks		-0.040***
		(0.002)
Reward amount		0.017***
		(0.000)
Male		-0.004
		(0.033)
Age		0.005***
		(0.001)
Education		0.073***
		(0.021)
No. of obs.	12624	12624
No. of clusters	526	526

Note: Probit estimation. Reported results are average marginal effects. Robust standard errors corrected for clustering on the individual level are in parentheses. The dependent variable is a dummy that equals 1 if the participant chose the delayed option and 0 otherwise. *Future tense* is the treatment dummy that equals 1 if the participant is in the *future tense* condition where the instruction phrase is *will be paid* and 0 otherwise. *Delay in weeks* indicates the duration of delay in weeks. *Reward amount* is the amount of money the participant is paid. *Male* is a dummy that equals 1 if the participant is male and 0 otherwise. *Age* is the participant's age in years. *Education* is an ordinal variable that takes the value 1 for primary/secondary school or equivalent, 2 for bachelor's degree, 3 for master's degree, and 4 for doctorate degree. Observations from non-monolingual participants and observations exhibiting multiple switch points in any durations of delay were excluded. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

IV. Conclusion

The LSH proposed by Chen (2013) has gained much attention over the past decade with over 800 citations on Google Scholar. While subsequent studies have largely supported the hypothesis, direct causal evidence remains limited, except for a few recent studies like Chen et al. (2019) and Argerer (2021) that administered linguistic manipulation on the use of future tense within w-FTR languages, including Chinese and German, and found null results. One

possible explanation for the null results is that speakers of w-FTR languages may not be sufficiently “trained” to differentiate between the present and future. To address this concern, the present study examines the LSH within English, a s-FTR language, using English monolinguals. The study utilized a time preference task with two linguistic conditions, "will" and "no will." The "will" condition used future tense to describe delayed rewards, while the "no will" condition used present tense by omitting future tense marking. The results were consistent with previous studies by Chen, He, and Riyanto (2019) and Argerer et al. (2021), showing no behavioral differences in the time preference task between the two linguistic conditions. Overall, this study presents the most rigorous test to date of the effect of future time reference on intertemporal decision-making. The null results, along with previous studies reporting similar findings, cast significant doubt on the validity of the LSH. While additional research is necessary to further examine the robustness and validity of the LSH, researchers should exercise caution in interpreting their results, particularly for analyses that rely on cross-country and cross-language comparisons.

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