Cross-linguistic Gender Differences in EFL Learners' Pause Frequency and Duration

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Abstract

The present paper sought to investigate gender differences in the speech pauses made by Iranian bilingual (L1: Turkish and L2: Persian) learners of English as a foreign language (EFL). To this end, the pauses made by males and females were compared. Via an Oxford Placement test, a convenient sample of 40 bilingual advanced EFL male and female learners were selected from several English language institutes in Tehran, Iran. Three reading passages (English, Persian, and Turkish) were used to measure students' fluency in terms of their speech pauses in the texts they read. As learners started to read the passages, their speeches were recorded. The collected data were analyzed by means of Praat Software. The data were analyzed in terms of the frequency and duration of the recorded pauses. The results indicated that that there were not any statistically significant differences between males and females regarding their pause frequency and duration across languages. Accordingly, the results represented more similarity than difference across the groups. The implications of the study results are discussed.

Keywords: Fluency, gender differences, pause duration, pause frequency

Introduction[#]

As is the case with several areas of society, in studies on language males are better studied than females. Much of what we have analyzed in the field of speech production comes from the samples collected from males (Henton, 1999; Klatt & Klatt, 1990; Titze, 1989). One explanation for speaking of females as a neglected group in the history of speech analysis is that examining females' speech requires more effort and energy. Women have a tendency to be more varied in their speech than men. This is appealing in that it is most probably the reason why female speech has been considered harder to analyze (Henton, 1999). Since the early 1990s, a new wave of interest in studying the gender gap has emerged. Men and women were depicted as aliens in many popular books on psychology, namely *Men Are from Mars, Women Are from Venus* authored by John Gray (1992). The belief that women are somehow different in many aspects,

and more importantly for this essay in their speeches, was started by early analyses of male and female speech differences by the work of Lakoff (1975) concluding that men and women communicate with language in fundamentally different ways. A variety of explanations have been put forward to illuminate the differences between male and female speeches. In fact, overall physical differences in the vocal organs of men and women clarify some of these variations. However, there are also additional reasons which are rooted in social aspects (Spender, 1998; Tannen, 1996; West & Zimmerman, 1977). Moreover, pauses are regarded as a significant part of human speech which in turn are used to determine overall fluency and oral proficiency (Eisler, 1968; Fletcher, 2010; Ullakonoja, 2008). Following the review of the literature, the aims of the present study are presented below.

A few studies have been done investigating gender differences in the production of pauses. Some of them have indicated that women tend to make greater use of speech pauses compared to men, while others have demonstrated a slower speed rate in speaking or reading with an overall longer sentence duration for

women (Samuelsson, 2006). For example, in a study, Whiteside (1996) investigating the relationship between gender and pausing phenomenon found that there was a significant connection between speaker sexes and pauses they produced. The results showed that women paused more than men in their small group, including 3 men and 3 women. Additionally, when a pause occurred in a sentence, the duration of the word and phonetic segments preceding the pause increased as well.

In another study, Acton (2011) conducted research in order to investigate the differences between males and females regarding the use of filled pauses such as *uh*, and *uhm*. Analyzing the data collected from the large corpora of English spoken in the United States, Acton came to the conclusion that the average *um/uh* ratio among women was 2.5 times more than that of men.

Khojastehrad (2012), in another investigation, examined the hesitation strategies of 12 EFL Iranian students in Kuala Lumpur, Malaysia using an oral L2 test. The results showed that both men and women hesitated most frequently in answering general questions. However, there was a difference between the two groups as females hesitated more in picture description task than males in giving explanation about what they had read. Overall, describing a picture was more challenging than explaining a passage for women, whereas males used more hesitation markers while speaking about a passage rather than a picture.

Despite a few number of studies in SLA focusing on the differences between females and males regarding their use of hesitation markers, especially pauses, to the best of the present researchers' knowledge, almost nothing has been done on the differences between females and males on the frequency and duration of their pauses in the reading speech. Therefore, the present study mainly focused on finding out whether there is any significant difference between men and women in the production of pauses. Besides, as this relationship can be influenced by a number of linguistic factors like the language under inspection (Kendall, 2009), a group of bilingual learners constituted the participants of the study to see the effects of different languages on this relationship. Thus, the following questions were addressed in the current study:

1. Do female EFL learners differ from their male counterparts in the frequency of the pauses produced when they are reading English, Persian, and Turkish passages?

2. Do female EFL learners differ from their male counterparts in the duration of the pauses produced when they are reading English, Persian, and Turkish passages?

3. Does language affect the relationship between gender and pauses?

Accordingly, the following hypotheses were formulated:

H_1: Female EFL learners differ from their male counterparts in the frequency of the pauses produced when they are reading English, Persian, and Turkish passages.

H_2: Female EFL learners differ from their male counterparts in the duration of the pauses produced when they are reading English, Persian, and Turkish passages.

H_3: Language affects the relationship between genders and pauses.

Method

The research design of this study was a kind of non-experimental one as the subjects were not randomly assigned. This type of research is often performed in cases where a control group cannot be created or random selection cannot be performed. To identify the relationship between variables of the study and to draw plausible conclusions from the statistical analyses, an ex post facto non-experimental design was used to explore the differences between monolingual and bilingual learners as well as the relationship among L1, L2, and L3 pausing patterns. Specifically, the relationship between gender and pausing patterns was taken into account.

The adoption of this design is well-suited to the objective of the study that it making comparisons between two groups without the direct manipulation of any independent variables. These groups composed of subjects who were similar on all characteristics except one in each research question which might influence the outcome of interest. Accordingly, a quantitative research method was designed to collect the data as this method focuses on gathering numerical data and generalizing the results across groups of people to explain a particular phenomenon.

Participants

For the present study, the sample included 40 Iranian bilingual learners, both males and females. Using convenient random sampling, the participants were selected among 100 students in Shokouh and Enekas institutes in Tehran. They were bilingual EFL learners whose first language was Turkish and their second language was Persian. They were considered as L3 (third language) learners of English. It is worth mentioning that Persian is taught at school from age 7

onwards. Moreover, English is added to the curriculum at age 13. However, Turkish is acquired naturally without any formal instruction. Since all the participants of this study were M.A or Ph.D. students, they enjoyed a long exposure to both Persian and English languages. But in order to ensure that all of them were at an advanced level of English (i.e. learners scored 48 to 60), the participants took the Oxford Quick Placement Test. The 40 learners were then divided evenly into males and females.

Instruments

As mentioned earlier, the objective of the present study was to investigate the role of gender in L1, L2, and L3 pauses. To this end, a number of instruments which enabled the researcher to collect the required data were used. These instruments included: Oxford Placement Test, and three reading passage tests (Appendix I). The Oxford Placement Test was used to select the participants for the study, and the reading passage tests were used to measure students' fluency in terms of their pauses. Three passages were chosen from TOEFL iBT tests to measure students' fluency. In line with the objectives of the study and in order to compare students' pauses in their L1, L2, and L3, two of the passages were translated into Persian and Turkish controlling for the number of words and difficulty of sentences. As TOEFL is a widely-used English language test in the world, the reliability (Wainer & Lukhele, 1997) and validity (Ling, Powers, & Adler, 2014) of this test are well documented and robustly confirmed. However, to ensure the content validity of the texts, the selected passages were sent to 4 experts in the field. The experts were PhD holders in Applied Linguistics and had demonstrated significant expertise in second language research in general and text analysis in particular. The instruments were confirmed by all four experts. Having selected the texts, the passages were further checked by 4 experienced Persian and Turkish translators to ensure the accuracy and clarity of the texts.

Procedure

In the first step, the Oxford Placement Test was administered to the participants to ensure homogeneity in terms of their level of proficiency. Having selected 40 advanced learners, the reading passage texts were distributed among them to gather the required data. As learners started to read the passages, their productions were recorded. Then, the collected data were analyzed by Praat Software (Boersma & Weenink, 2014). In this regard, the frequency and duration of the participants' pauses were taken into account.

In order to identify speaking time and pauses, a script was produced by using Praat which distinguished segments of silent pauses lasting longer than 250 ms. As hesitations shorter than 250 ms do not indicate meaningful planning pauses (Goldman-Eisler, 1972), they were not taken into account. Moments of speech and hesitation were depicted by the markings on each participant's spectrogram created by the script. Then, these intervals were automatically measured for length. The last step involved a comparison of the males' and females' pauses in their L1, L2, and L3.

Findings

Analysis of the Data: First Research Question

One of the objectives of the study was to find the difference between males and females in the frequency of pauses they produced in English, Persian, and Turkish. In order to determine how different the two groups were, the researchers compared the mean performance across male and female participants of the study in order to explore whether the difference was statistically significant or not. Table 1 shows the descriptive results of the study regarding the mean scores of the two groups in terms of the frequency of pauses per minute. The mean score of males was 25.07 (SD = 1.67), while the mean score of the females was 24.94 (SD = 1.52) with a mean difference of .12 in English. But in Persian, the mean score of males was 23.33 (SD = .80), while the mean score of the females was 23.39 (SD = .88) with a mean difference of .06. Meanwhile, in Turkish, the mean score of males was 22.08 (SD = .62), and that of the females was 22.38 (SD = .59) with a mean difference of .29.

Table 1.
Independent Samples t-Test for Pause Frequency in English, Persian, and Turkish across genders

Pause Frequency	gender	N	Mean	SD	Std. Error Mean	t	df	Sig.
English	Male	20	25.07	1.67	.37	.243	38	.80
	Female	20	24.94	1.52	.34			
Persian	Male	20	23.32	.80	.17	-.224	38	.82
	Female	20	23.38	.88	.19			
Turkish	Male	20	22.08	.62	.13	-1.52	38	.13
	Female	20	22.38	.58	.13			

Three independent-samples t-tests were conducted to explore the differences between males and females regarding pause frequency across languages. An examination of the data indicated that there was no violation of the normality assumption. The Levene's test for equality of variances further indicated the homogeneity of the variance ($p > .05$) was met. The obtained results show that males' performance was similar to those of females in all three languages. So the results obtained, as depicted in Table 1, show that there were not statistically significant differences between the mean scores of males and females in English [$t(38) = .24$, $p = .80$], Persian[$t(38) = .22$, $p = .82$], and Turkish [$t(38) = 1.52$, $p = .13$]. The effect size for the independent-samples t-test was calculated showing a small effect size in English and Persian, but a moderate effect size in Turkish (eta squared = .001, .001, and .05 respectively).

Analysis of the Data: Second Research Question

The second question of the study aimed to investigate the differences between males and females in the duration of pauses they produced across the three languages. To find out how different the two groups were, the researchers used the relevant statistical analysis.

Descriptive statistics of males and females in pause duration across three languages shown in Table 2 indicate that the mean score of males was 11.93 ($SD = 1.55$), while that of the females was 11.939 ($SD = 1.50$) with a mean difference of .002 in English. But in Persian, the mean score of males was 10.01 ($SD = .47$), whereas that of the females was 10.24 ($SD = .41$) with a mean difference of .23. Meanwhile, in Turkish, the mean score of males was 9.53 ($SD = .35$), and the mean score of the females was 9.43 ($SD = .43$) with a mean difference of .09.

Table 2.
Independent Samples t-Test for Pause Duration in English, Persian, and Turkish across Genders

Pause Duration	gender	N	Mean	SD	Std. Error Mean	t	df	Sig.
English	Male	20	11.93	1.55	.34	-.004	38	.99
	Female	20	11.93	1.49	.33			
Persian	Male	20	10.01	.46	.10	-1.63	38	.11
	female	20	10.24	.41	.09			
Turkish	Male	20	9.53	.34	.07	.788	38	.435
	Female	20	9.43	.43	.09			

To find out whether the differences between mean scores were significant or not, the researchers ran three independent-samples t-test to explore the differences between males and females regarding pause duration across languages. Preliminary analyses indicated that there were no violations of the normality assumption and homogeneity of the variance ($p > .05$). The obtained results showed that males' performance was not significantly different from that of females in any of the three languages. Table 2 shows that there was

not a statistically significant difference in the mean scores of males and females in English [$t(38) = .004$, $p = .99$], Persian [$t(38) = 1.63$, $p = .11$], and Turkish [$t(38) = .78$, $p = .43$]. The effect size for the independent-samples t-test was calculated showing a small effect size in English and Persian, but a moderate effect size in Turkish (eta squared = .000, .006, and .015, respectively).

Analysis of the Data: Third Research Question

As there was no difference between men and women either in pause frequency or pause duration across the three languages, it can be inferred that even by considering the languages under inspection the pattern remains homogeneous. Therefore, it can be deduced from Tables 3 and 4 that language has no effect on the gender and pause relationship (p = .631 & .782, for pause frequency and duration respectively).

Table 3.

Two-Way ANOVA for the Interaction between Language and Gender with Regard to Pause Frequency

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	154.39	5	30.87	25.5	.000
Intercept	66508.50	1	66508.50	54977.79	.000
Gender	.26	1	.26	.221	.639
Language	153.00	2	76.50	63.240	.000
Gender * Language	1.12	2	.56	.463	.631
Error	137.91	114	1.21		
Total	66800.80	120			
Corrected Total	292.30	119			

Table 4.

Two-Way ANOVA for the Interaction between Language and Gender with Regard to Pause Duration

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	128.453[a]	5	25.691	28.64	.000
Intercept	13287.182	1	13287.182	14815.75	.000
Gender	.108	1	.108	.12	.729
Language	127.903	2	63.951	71.30	.000
Gender * Language	.442	2	.221	.24	.782
Error	102.238	114	.897		
Total	13517.873	120			
Corrected Total	230.692	119			

Discussion and Conclusion

The first research question was to find the difference between males and females in the frequency of pauses they produced in English, Persian, and Turkish. Demonstrating no statistically significant difference in the mean scores of males and females in English, Persian, or Turkish, the results showed that males' performance was similar to those of females in all three languages. Likewise, the first hypothesis put forward before is rejected.

Regarding the investigation of the difference between males and females on the duration of pauses they produced across the three languages, as mentioned in the second research question, the results showed that males' performance was not significantly different from that of females in all three languages. As a consequence, the second hypothesis is refuted.

Finally, the last aim of the present study was to explore the interaction between language and gender which was considered through the third research question. The obtained results showed that both for pause frequency and pause duration, males' performance was similar to those of females in all the three languages. As discussed above, concerning the language factor, no statistically significant interaction effect was found. Consequently, the third hypothesis is rejected.

One possible explanation for the lack of a significant difference between males and females either in pause frequency or pause duration across the three languages can be attributed to the type of the test used in this study. Speech fluency can be evaluated through spontaneous or prepared speech, but it should be noted that there are some similarities and differences between these two modes of speech. Howell and Kadi-Hanifi (1991) compared the speeches produced in spontaneous speech and prepared mode such as reading. Two groups participated in this study, the first one, called "original

speakers" (p. 165), was speakers producing spontaneous speech who were asked to read the passage again after 3 months and the second group was speakers, named "new speakers" (p. 166) reading the same material. The results of this study indicated significant differences between spontaneous speech and the reading mode, but an almost homogeneous pattern was found for readers. It was revealed that readers tended to drop a large number of the pauses which were present in spontaneous speech. There were fewer pauses in read speech, and the location of these differed among readers. What the findings imply mainly was that materials which were used for read speech could not be considered as representative of spontaneous speech. Even though there has been some work done on the analysis of the relationship between gender and speech, it is readily apparent that the principal focus has been on the spontaneous mode, because in spontaneous speech, unlike the prepared mode, the effect of gender on speech production is such that it may be more obvious.

Moreover, Whiteside (1996) investigated the relationship between gender and pausing phenomenon and found that females have a tendency to pause more than males in read speech which is in contrast with the results of the current study. Although, the small sample size of males and females could affect the generalizability of the results since there were only 6 participants in the study, another explanation is also possible based on Hyde (2005). Reviewing the experiments in a meta-analysis, with various kinds of male-female differences as the focal point, Hyde (2005) came to the conclusion that the overall differences between men and women were not noticeable nearly in every case. In a similar vein, Cameron (2007) put forward that beliefs in gender differences may originate from a selective and inaccurate reading of the relevant linguistic evidence. Chambers (2009) referred to another problem with such generalizations by emphasizing the fact that these general abstractions undermine the magnitude of the variability that exists within males or females. Supporting his claim, Liberman (2006) remarked that variation which is present within each gender group, i.e. either among women or among men, will eventually be notably greater than what cross-gender differences end up to be. It should be noted that there are not many studies done on the relationship between pauses and gender; hence, considering the few number of studies done so far, this area is yet in need for further exploration.

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Appendix I

A: English Reading Passage Test

Agriculture, Iron, and the Bantu People

There is evidence of agriculture in Africa prior to 3000 B.C. It may have developed independently, but many scholars believe that the spread of agriculture and iron throughout Africa linked it to the major centers of the Near East and the Mediterranean world. The drying up of what is now the Sahara desert had pushed many people to the south into sub-Saharan Africa. These people settled at first in scattered hunting-and-gathering bands, although in some places near lakes and rivers, people who fished with a more secure food supply lived in larger population concentrations. Agriculture seems to have reached these people from the Near East since the first domesticated crops were millet and sorghum whose origins are not African but West Asian. Once the idea of planting diffused, Africans began to develop their own crops such as certain varieties of rice, and they demonstrated a continued receptiveness to new imports. The proposed areas of the domestication of African crops lie in a band that extends from Ethiopia across southern Sudan to West Africa. Subsequently, other crops such as bananas were introduced from Southeast Asia.

Livestock also came from outside Africa. Cattle were introduced from Asia as probably were domestic sheep and goats. Horses were apparently introduced by the Hyksos invaders of Egypt (1780-1560 B.C.) and then spread across Sudan to West Africa. Rock paintings in the Sahara indicate that horses and chariots were used to traverse the desert and that by 300–200 B.C. there were trade routes across the Sahara. Horses were adopted by people of the West African Savannah and later their powerful cavalry forces allowed them to carve out large empires. Finally, the camel was introduced around the first century A.D. This was an important innovation because the camel's ability to thrive in harsh desert conditions and to carry large loads cheaply made it an effective and efficient means of transportation. The camel transformed the desert from a barrier into a still difficult, but more accessible route of trade and communication.

Iron came from West Asia, although its routes of diffusion were somewhat different than those of agriculture. Most of Africa presents a curious case in which societies moved directly from a technology of stone to iron without passing through the intermediate stage of copper or bronze metallurgy, although some early copper-working sites have been found in West Africa. Knowledge of iron making penetrated into the forests and Savannah of West Africa at roughly the same time that iron making was reaching Europe. Evidence of iron making has been found in Nigeria, Ghana, and Mali.

This technological shift caused profound changes in the complexity of African societies. Iron represented power. In West Africa, the blacksmith who made tools and weapons had an important place in society, often with special religious powers and functions. Iron hoes which made the land more productive and iron weapons which made the warrior more powerful had symbolic meaning in a number of West African societies. Those who knew the secrets of making iron gained ritual and sometimes political power.

Unlike in the America where metallurgy was a very late and limited development, Africans had iron from a relatively early date, developing ingenious furnaces to produce the high heat needed for production and to control the amount of air that reached the carbon and iron ore necessary for making iron. Much of Africa moved right into the Iron Age, taking the basic technology and adapting it to local conditions and resources.

The diffusion of agriculture and later of iron was accompanied by a great movement of people who may have carried these innovations. These people probably originated in eastern Nigeria. Their migration may have been set in motion by an increase in population caused by a movement of people fleeing the desiccation or drying up of the Sahara. They spoke a language, proto-Bantu ("bantu" means "the people"), which is the parent tongue of a large number of Bantu languages still spoken throughout sub-Saharan Africa. Why and how these people spread out into central and southern Africa remains a mystery, but archaeologists believe that their iron weapons allowed them to conquer their hunting-gathering opponents who still used stone implements. Still, the process is uncertain and peaceful migration—or simply rapid demographic growth—may have also caused the Bantu explosion.

B: Persian Reading Passage Test

آب جاری در مریخ؟

شواهد مبتنی بر عکس برداری گواهی می دهند که زمانی در سطح سیاره ی مریخ مقدار زیادی آب وجود داشته است. دو نوع از بخش های جریان های آب دیده شده عبارتند از مجراهای روان آب و برون ریز. مجراهای روان آب در مناطق کوهستانی جنوبی یافت می شوند. این بخش ها سلسله ی گسترده ای از مجراهای بهم پیوسته و درهم تنیده هستند که در هم ادغام می شوند و مجراهای بزرگتر و وسیع تری را می سازند. طول این سلسله ها در بعضی از مواقع به صدها کیلومتر هم می رسد. این بخش ها شباهت زیادی به سلسله های رودخانه ای در سطح زمین دارند و زمین شناسان معتقدند که حاصل خشک شدن بستر رودخانه هایی هستند که در زمان های قدیم حامل بارش جاری شده از کوه ها به سمت دره ها در مریخ بوده اند. مجراهای روان آب از چهار میلیون پیش سخن می گویند (عصر کوهستان های مریخی) زمانی که فشار جو غلیظتر، گرمای سطح بیشتر و آب مایع در همه جا گسترش یافته بود.

مجراهای برون ریز احتمالا باقیمانده ی سیلاب های مصیبت باری هستند که در زمان های گذشته در مریخ اتفاق می افتادند. این مجاری تنها در مناطق استوایی پدیدار می شوند و به طور کلی شبکه های بهم پیوسته و گسترده را تشکیل نمی دهند. در عوض آن ها مسیر هایی هستند که احتمالا توسط حجم عظیمی از آب طی می شدند که از کوهستان های جنوبی تخلیه و به مناطق مسطح شمالی وارد می شدند. آب در حال پیشروی که از این سیلاب های ناگهانی برمی خیزد همچنین می تواند منجر به تشکیل جزایر عجیب اشکی شکلی (مشابه با نسخه های مینیاتوری دیده شده در شن های مرطوب هنگام جذر و مد ضعیف در سواحل ما) شود که در سطوح مسطح انتهای مجراهای برون ریز یافت می شوند. با توجه به عرض و عمق مجراها، باید گفت سرعت جریان به طور حقیقی زیاد بوده شاید حتی صد مرتبه بیشتر از ۱۰۵ تن بر ثانیه که توسط رودخانه ی بزرگ آمازون منتقل می شود. سیلاب ها در حدود ۳ بیلیون سال پیش مجاری برون ریز را شکل دادند تقریبا زمانی که زمین های مسطح آتشفشانی شمال تشکیل شدند.

برخی از محققان گمان می کنند که مریخ از دوره ی اولیه ی طولانی مدتی برخوردار بوده که در این مدت رودخانه ها، دریاچه ها و شاید حتی اقیانوس ها سطح آن را زینت داده بودند. عکس های گرفته شده در نقشه برداری سراسری از مریخ در سال ۲۰۰۳، آن چه محققان ناسا باور دارند که ممکن است یک دلتا باشد را نشان می دهند- شبکه ی پنکه ای مانند از مجاری و رسوبات ته نشین شده جایی که زمانی یک رودخانه به مقدار آب بیشتری جریان می یافت در این مورد می توان به دریاچه ای که دهانه ی آتشفشانی کوهستان های جنوبی را پر کرده است اشاره کرد. دیگر محققان

بیشتر پیشروی کرده اند و اشاره می کنند که اطلاعات فراهم آمده شاهدی بر وسعت گسترده ی آب ها بر سطح مریخ در اوایل هستند. نظریه ی مبتنی بر داده های کامپیوتری جمع شده از نواحی قطب شمال مریخ، وسعت آنچه را نشان می دهد که ممکن است اقیانوس قدیمی باشد که بیشتر زمین های پست شمالی را پوشانیده است. حوزه ی آبگیر یونان گزینه ی دیگری برای دریای قدیمی مریخ محسوب می شود که سرتاسر آن حدود ۳۰۰۰ کیلومتر اندازه گرفته شده و بستری دارد که نزدیک به ۹ کیلومتر زیر لبه های حوزه واقع شده است.

این تصورات همچنان بحث برانگیز باقی مانده اند. طرفداران به ویژگی هایی همچون سواحل هم ردیف نشان داده شده در یک تصویر اشاره می کنند که بطور ممکن به عنوان دریاچه یا اقیانوس تبخیر شده و خطوط ساحلی پس رفته باقی گذارده شده اند. اما مخالفان عنوان می کنند این سواحل ممکن است بر اثر فعالیت های زمین شناسی ایجاد شده و مربوط به نیروهای زمین شناسی وارد شده بر نیمکره ی شمالی باشند که خیلی بیشتر از سطح جنوبی فرونشسته اند، پس در این صورت مرتبط به آب های مریخ نیستند. داده های فراهم آمده از نقشه برداری های سراسری از مریخ در سال ۲۰۰۳ ظاهرا نشان می دهد که مقدار بسیار کمی لایه های کربناتی در صخره ها ی سطح مریخ وجود دارد- لایه هایی که ترکیبی از اکسیژن و کربن هستند- که باید به وفور در اقیانوس های قدیمی تشکیل می شدند. نبود این لایه ها به تایید تصویری از مریخ می پردازد که سرد و خشک است و هیچگاه برای دراز مدت، دوره ای معتدل که ملزم ایجاد دریاچه ها و رودخانه ها است را تجربه نکرده. اما داده های جدیدتر به این مطلب اشاره می کنند که حداقل برخی از قسمت های سیاره ی مریخ چنین دوره هایی را در گذشته تجربه کرده اند که آب مایع بر سطح سیاره یافت می شده. گذشته از برخی راه آب های کوچک (مجراها) که تا سال ۲۰۰۰ یافت شدند و بی نتیجه مانده اند، امروزه ستاره شناسان هیچ سند بلاواسطه ای برای وجود آب مایع در سطح مریخ در دست ندارند و مقدار بخار آب موجود در جو مریخ بسیار اندک است.

حتی با کنار گذاشتن مدارک به اثبات نرسیده از اقیانوس های قدیمی، باز هم وسعت مجاری برون ریز به وجود حجم عظیمی از آب در زمان های گذشته دلالت دارد. اینهمه آب به کجا رفته است؟ پاسخ سوال می تواند این باشد که همه ی آب موجود در مریخ هم اکنون در لایه ی منجمده که زیر سطح قرار گرفته محبوس شده است که بیشتر آن را دو سر قطب های سیاره دربر دارند.

C: Turkish Reading Passage Test

دایناسورلارین انقراضینا

قدیم زمانلاردان دیرین شناسلار دایناسورلارین آرادان گئتمه سینین علّتینه گوره بحث ائیلر و بونا معتقددیرلر کی بو مسئله نین علّتی هوانین دییشیلمسینه وابسته دی کی قاره لرین و دریالارین حرکت الماغینا گوره دیر. کی او اوزوده یئرین دوزلدن صفحه لرین نن ناشی اولور، وجودا گلیبدی، هردن بیر دوره کرتاسه نین دوره سینده (کی آخرین دوره از ایکینجی دوره ی زمین شناسی که داینا سورلار بودوره ده وجودا گلیبلر) بویو و عمقی آزاولان دریالار، قاره لرین عمده قسمتین اورتور دولر. فرقلی اطلاعات که اونلاردان بیری شواهد شیمی خاک دی که دریانین ترکنیده رسوب ائیلر،گورسدیلرکی دوره ی کرتاسه نین آخرینده، هوا ایندیه گوره ملایم تریمیش. نه گونوزلر و یایلار چوخ ایستی اولورموش و نه گئنجلرو قیشلار چوخ سویوخ اولورموشلار. احتمالی واراکی عمقی آزاولان اقیانوسلار اطراف لارینداکی هوایا بیر مانع اولورموشلار و اونو ثابت ساخلیر مشیلار.

زمین شناسی شواهدی دوره ی کرتاسه نین آخریندا گورسدیلرکی بو دریایی یوللار قوراخلیخدان گدیبلراقیانوسون محدوده سینه. هئچ کس بونون دلیلین بولمور. یوزمین ایل بوندان قاباخ، اوزامان کی دریالار اوزامان کی دریالار کی دریالار عقب نشینی ائله دیلر، دنیانین آب و هواسی بیردن و شدید صورت ده تغییر تاپدی، گونوزلرایسّی لشدی، گئنجلر سویوخ لاشدی، قیشلار داسویوخلاشدی و یایلار داغ اولدولار. احتمالی وار داینا سورلاربو تغییری آب و هوادا نحمل ائینمدیلر و منقرض اولبلار.

اگر بوجور اولسا، پس نجور اولوب کی قانی سویوخ حیوانات مثلا ایلان، مارمولک، توسباغا، کروکدیل بو سویوخ قیشلاردان و ایسّی یایلاردان سالم قالیبلار و آرادان گئتمپیلر؟ بوحیوانات آب و هوادان امان دا قالیبلار تا بدنلرین دماسین یاشیایشا حفظ ائینلر. چوخ چئتیندی کی بیز اله بولاخ بومسئله نین علّتین تاپاخ کی نیه بوموجودات بوهوادا دوام گئتیلر امّا داینا سورلار آرادان گئیدیپلر مخصوصا اگر واقعا اوجورکی دانشمندلردیلر، داینا سورلار قان ایسّی اولالار. منتقدلر همچنین دئیب لر زمین شناسینین ایکینجی دوره سینده (مزوزوییک) دریایی یولادار چوختر قوراخلیخدان اوزاخلاشیلار و اونا طرف قاباغا گئدیپلر، پس نیه داینا سورلار آب و هوا نین دییشلمه سینده قاباخکی نوسالارین اثرئندیمیش نجات تاپیبلار امّا ایندی کی دئیشیم لردن یوخ؟ ساده آب و هوایی تغییرلر کی قاباخکی نوسالارین نتیجه سینده. ایجاد اولیبلار، دوزدی کی اولده جالب نظره گلیللر امّا تمام اطلاعاتین توضیحینه کافی دیللر.

راضی اولماماخ تمام توضیحاتی که داینا سورلارین انقراضینا مربوط دولار باعث اولوپ کی عجیب نظریه لر وجودا گلیسر که هر بیری اوزنویسنده تزه فرضیه لر ایجاد الیللر. اوزامان کی لایه های سنگی دوره ی کرتاسه نین آخرینده وجودا گلیپلرو دوره ی سنوزوییک (مزوزوییک دن سوراکی دوره) نظرده آلیدیخ متوجه اولوروخ کی چوخلی گیاهلار و حیوانلار بیردن بیره صفحات فسیلی دن ناپدید اولوپلار. دوره ی کرتاسه نین آخیرده کی داش لایه لرین و سنوزوییکین اولده گی داش لایه سینین آراسیندا، نازیک بیر رس تور پاغینین لایه سی واردی که دانشمندلر معتقد دیلر کی بوللّر اوزامان کی لازم دی تا بیر سانتی متر رس توراغی وجودا گلسین و زمان انقراض و اوزامان کی توراپاخ تشکیل تاپیپ تاپیپ دی نی، عنصر ایریدیوم کی توریاخدا وجودی واردی، اونان اله گئتیسنیلر.

ایریدیوم سیاره نین اول تاریخچه سین ایندیجات معمولا یرین اوزونده تاپیلماز. بوعنصر اوزامان کی یر آرام و محکم دی، یرین هسته سین قاتیشار و بوعلّته خاطیر معمولا فلزی صورت ده وجودی واردی. بعضی شهاب سنگ لرده کی اصلی ترکیب شیمیایی حفظ اولوپ دی، ایریدیوم قوی غلظتده وجودی واردی. ایندی لر، میکروسکوپی شهاب سنگ لر مداوم صورت ده یری بمباران ائیللر و دریا و خشکی یه توکوللر. دانشمندلر اللیه بوللّر تعداد شهاب سنگ لری که بیر مدت زمان دایره توکوللر، اولاری اندازه توتماغینان اوزامان کی لازم دی که ایریدیوم کی رس توراغینین مزینده گورسنیری، اندازه توتالار. بو محاسبه لر گورسدیلرکی بو مدت زمان حدودا بیر میلیون ایلدی. هرچند کی آیری شواهد گورسدیلرکی خاک رسین مرزین تشکیل تاپاسین الّه بولمز بیر میلیون ایل وقت آپارا. پس نظره گلیرکی ایریدیومین تشکیل تاپاسین به صورت یوخاری غلظت و نامتعارف صورت ده خاص بیر توضیحه نیازی واردی.

بوسوزلرکی اولارا اشاره اولوندی، بولارین نتیجه سینده، دانشمندلر بوفرضیه یه ال تاپیبلارکی بیر سیارک کی اندازه سی 10تا 15 کیلومتریمیش یرین تصادف الیپه و اونون ریزش نتیجه سینده، رس توراغین مرزی وجودا گلیدی. محاسبه لر گورسدیلرکی بو ریزش گرد و غباری ایجاد الیدی کی نچه آیا جان گونون نوری اونان رد اولمورموش، فتوسنترین قاباغین آلیرمیش و باعث اولوپ کی قاره نین سطحی دماسین نقطه ی زیر انجمادایئتیسین و افراطی اسیدی یاغیشلار وجودا گلسین و اونان مهمتر کره ی زمینین دماسی، اثر گلخانه ای نین نتیجه سینره چوخ یوخاری حدّده چاتسین.