Evolution dynamics of men’s preference for women’s age

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**Abstraction**

Many researches show that men’s preferences for women are to maximize their genetic benefits or fitness. Also, men try to win Intrasexual competitions by various strategies. Combining these facts, it is reasonable for men to prefer women whose age is minimal to mate. Because if one is late, then he loses his chance to mate. However, this does not happen in the real world. Instead, they select only women in some range of ages which can maximize fertility. It results in competition which burdens costs for men, so it is reasonable to have preference for various ages to decide flexibly by surrounding environments. But previous evolutionary psychology can’t explain why other preferences can’t be evolved. To solve this problem, I made a dynamic model of men’s preference for women’s age using evolutionary game theory. In this model, men’s fitness depends on not only women’s age but also other men’s decision to mate. I proved that our current preference is Evolutionary Stable Strategy(ESS). Its threshold for stability depends on the fitness of each strategy and accessibility to some ages.

Keywords: men’s preference for women’s age, fertility, Intrasexual competitions, game theory.

**Introduction**

Many researches show that men’s preferences for women are to maximize their genetic benefits or fitness. One of the famous researches is that men like women in their early 20s because it can maximize fertility to bear healthy babies(David, 1989). Another research is about the relationship between accessibility to resources and preference for women’s body size(Viren, 2012). It says that when men are in some extreme situations, they prefer healthier women because they can’t ensure their ability to provide food for them. And body size is an index of it. Like this, men’s preference for women is heritable but dependent on the surrounding environment.

Also, men try to win Intrasexual competitions for mating by their sperm. For example, men tend to be aggressive or devalue other’s reputations for mating(Davis, 2023). And men tend to cooperate with women than other men(Sally et.al, 1994). These kinds of competitions are for increasing their fitness.

Combining these observations and game theory, it is reasonable for men to prefer women whose age is minimal to mate rather than appropriate age. Because if one man waits until she matures, then the other can intercept it. Then the former loses his chance to increase his genetic benefits. Therefore, all men should prefer the youngest women who can mate to win intrasexual competitions. Because that age is Nash-equilibrium by game theory. This equilibrium is not to maximize fertility. Instead, this is an inevitable decision because of other men’s desire to increase their fitness with a first come first serve strategy.

Although that solution to mate is not the maximum, this kind of interception is useful because it can help to avoid conflicts which sometimes are critical. Therefore, a wide preference for women’s age may make men flexible to deal with the surrounding environment and other men’s strategies. But this does not happen in the real world. Instead, they prefer age to maximize fertility and compete for it.

However, as far as I know, there are no papers to explain why other preferences can’t evolve. Rather, they focus on men’s strategies or traits that contribute to winning intrasexual competitions. For example, monogamy is evolved to prohibit cuckload caused by extra mating(Schacht et.al, 2016). But this assumes that men’s lifespan is long enough to protect women from other’s access and bear babies, which we can’t ensure in prehistory. Therefore, we should explain why the preference for a younger age than optimal one can’t be evolved because existing evolutionary psychology cannot explain it well.

So, I suggest a dynamic model of men’s preference for women’s age when they compete with each other. I use evolutionary game theory which strategies are women’s age men choose. Analyzing the stability of equilibrium, I checked whether our current preference could survive. The rest of the paper is as follows: Method is about a mathematical model for fertility and dynamics of men’s preference rate. Interpretation is about the interpretation of results in Method. Simulation is the computation result of the model. The conclusion deals with limitations and future research directions.

**Method**

1)Model for fertility.

The woman’s expected fertility when she mate from age is defined as below.

is the born rate, and is the survival rate Since they are non-negative, the integral is increased as . It means that when a woman gets married earlier, the more babies they bear. This is based on research that woman who suffers early marriage tends to bear more babies than ones who don’t (Choe MK, et.al. 2005; Yaya, S et al. 2019,). But there is a risk of pregnancy which is dependent on a woman’s age. So, I define as a risk of mating from age and use it for a woman’s fertility like It means the expected number of babies a woman bears from age . And as we know, there is an appropriate age to be pregnant(Kimberly, 2011).

2)Men’s fitness function

Fitness is genetic benefit which is related to the number of offspring and the probability of their survival by certain strategies. Let be a collection of woman’s age which men can decide to mate. is called strategy set and each element is a strategy. In this section, I only consider two men and to define ’s fitness function , which ’s strategy is and is ’s.

is a probability for men to mate with woman in age . This includes how much can access to woman in age 𝑖. means that can easily mate with 𝑖 years old woman. is probability for men to win competition with and mate. means that loses his chance if he is late to mate(Schacht, R et.al, 2016). We can generalize this fitness function when there are many other men.

3)Evolutionary game theory

Evolutionary game theory is a dynamic model for describing a population of species having certain strategies. is a collection of men who try to mate with age woman and is the ratio of . so . In this case, I make a model for to see how current men’s preferences can survive. The differential equation of is defined as below, using above(Weibull, 1992).

is fitness of group having strategy . It is derived from same logic of in above, considering ratio of strategies. That is, is related to competition between men having and comes from stealing chance of strategies , which is same no matter what other strategies are. So, I replace it with to make calculation simple. is a cumulative distribution function of strategy and is the average fitness. measures how much strategy is more suitable than the average and it is birth-death rate of strategy . In , is average probability of group having strategy to mate.

can be expressed as for some continuous function because the ratio of other strategies depends on . This results in three equilibrium points: 0, 1 and . We can easily find that 0 and 1 are locally stable but is unstable. If , then as and if , then . This means that current men’s preference for women’s age is Evolutionary Stable strategy(ESS), in which survival depends on the ratio of strategy .

**Interpretation**

According to the model, men’s preference for women in age can either survive or be extinct, which depends on a portion of other strategies and their fitness function. Small is beneficial to the survival of strategy because it makes the prevalence of easy. One possible scenario for this is that fertility is highly peaked at . It means that other women’s ages are not appropriate to mate. If we consider age as one of the indexes for weight, then men in extreme environments mostly prefer women in age (Viren, 2012). Because weight is proportional to age in some sense.

Combining this interpretation and the harsh environment in prehistory, it is natural for women in stone age to mate at 23 years old(Richard J, 2023). The kurtosis of data is 0.15 which is very low. It means that other preferences except are extinct. So, men’s current preference for women is a heritage of ones that overcome ancient environments.

Also, should be big enough to ensure the survival of strategy . This parameter is about men’s ability to access women at age , which includes women’s willingness to mate with men. If she does not want to mate or society does not allow it, then will be low. It results in reduced fitness and increased threshold for . Some variables affect . The requirement of resources is one of the well-known examples(David, 2023). If a group of women in age demands so much, men try to seek another group due to the heavy cost.

Accessibility to other ages can also effect on . If is so low that the ratio of strategy for age is satisfied, then will be extinct. Because stable equilibriums are either 0 or 1. This is supported by the research that paying cash for a girl at age is one of the factors for early marriage(Chort et. at, 2022). Because it can increase ) by providing men method for access to girls at age .

**Simulation**

I use simulation to verify whether dynamic model and its analysis are appropriate. I define as ), which is a scale to define range of as interval . is a parameter which is related to abrupt changes at . Also, I define . is number of baby woman bear from age and is a coefficient for . In both figure tables, I set , , , but in table1 and in table2. It means that difference between tables is how fast changes from around . I use Euler method to simulate ODE.

In both tables, (a) is a graph of fertility and (b) is a fitness of strategies . The latter assumed that there are 100 strategies between and . Also, all ratios of strategies are equal. (c) is a scatter plot of fitness for each strategy while changing each ratio. We can see whether the strategy will survive or not by comparing it with average fitness. (d) is a dynamic of strategy , which its initial ratio is 0.7. I only consider two strategies because the survival of is only dependent on the sum of a portion of other strategies.

In 1-(b), because the value of is big only at the small neighbor of , the fitness of strategy is maximized although the sum of other strategies ratio is high. Therefore, no matter what the initial ratio of the other strategy is, ratio will converge to 1 in 1-(d). In 2-(b), we can see that is relatively smooth than one in 1-(b). In this case, the strategy will survive if a portion of other strategies is small enough.

|  |  |
| --- | --- |
| (1-a) | (1-b) |
| (1-c) | (1-d) |

Table1: Fitness and evolutionary dynamics of when

|  |  |
| --- | --- |
| (2-a) | (2-b) |
| (2-c) | (2-d) |

Table2: Fitness and evolutionary dynamics of when

**Conclusion**

I made a dynamic model to explain how men’s preference for women’s age is naturally selected. Although fertility is maximized at age , they can be extinct if their portion is not big enough or access to age is hard. This means that the preference to maximize fertility does not always survive but depends on the environment and other’s decision to mate. This interpretation is different from existing evolutionary psychology which claims that men’s preference is a trivial solution to maximize fertility. It does not consider other strategies as a preference.

However, this paper has two limitations. First, I do not define a concrete form of , and . This is important because it enables us to analyze bifurcation of a model, which is related to the environment. It may talk about what environment determines our preferences. Also, although I showed that the survival of certain strategies is decided by the ratio of others, the model itself can’t explain why people choose some strategies. That is, we can’t see the process of decisions men made using this model. This is important because it can show a concrete process of evolution of men’s preferences. Also, it may reveal why women’s mating age is different between the Stone Age and Iron Age. The women in prehistory mate at 23 which is higher than ancient Roman mating in the early 10s(Richard J,2023; Hopkins, 1965). But this is against our intuition because we can guess that lifespan is similar between them.

But this paper is meaningful because it was the first research trying to relate men’s preference for women with not only environments but also other’s decisions to mate. The result is consistent with previous studies. If we develop this model, then we can understand mating strategies more clearly.

**Data and Code availability**

The data I use is simulation data. You can download both data and code generating it in the “data” folder at <https://github.com/kimjeongwoon98/Code-men-preference-to-woman-s-age>. The code also includes displaying the figure in the paper.

Data for average women’s mating average in prehistory can be found in supplementary material in DOI:10.1126/sciadv.abm7047

**Competing Interests Statement**

There are no competing interests in this paper.

**Author Contributions**

From setting the model to simulate data, I write this paper on my own.

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