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Energy Consumption and Exercise Effect of University Students During Automatic Stepper Exercise*

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Abstract

Purpose-Meat plays an important role in the Chinese daily diet, however, due to the spread of COVID-19, food supply and safety have become a major concern. The safety and health features of chilled fresh meat have attracted the attention of consumers. To study consumers' purchasing behavior and willingness to pay for chilled meat under the influence of the epidemic. Research methodology- The data were obtained by questionnaire survey, major issues include consumers' meat consumption habits in the wake of the COVID-19 and their awareness of meat product quality labels. In addition, the gender, age, family income, and other basic personal information of the interviewees were also counted. Based on the binary Logit regression method, we study consumers' purchasing behavior and willingness to pay for chilled meat under different demographic characteristics. Results-The results showed that brand and quality certification are important factors influencing purchases. In addition, the presence of children under the age of 12 in the household and the level of income and education also influence consumers' purchase intention of the chilled fresh meat. However, mart promotions and city ratings can significantly lower consumers' propensity to buy the chilled fresh meat. Apart from this, such factors as gender, age, and living conditions have no significant influence on consumers' purchase of chilled fresh meat.

Keywords: Chilled fresh meat, The binary Logit regression method, Consumer purchasing behavior

Major classifications: Food Nutrition, Healthy Food

1. Introduction

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With the improvement of living standards and the pursuit of higher needs, people begin to put more effort into food safety. Meat plays an important role in the Chinese daily diet. Usually, meat consumption falls into three main categories in China (Liu et al., 2017). The first category is hot fresh meat without any refrigeration, which means the raw meat is manufactured in the early morning and sold in the traditional Chinese terminal market. The second category is the chilled fresh meat, which refers to the raw meat that is refrigerated at the same temperature in the subsequent processing, circulation, and distribution process after the raw meat is cooled rapidly to 0~4 degrees Celsius in strict accordance with the quarantine system (Koutsoumanis & Taoukis, 2005). The third category is frozen meat, which refers to the meat that is stored below -18°C. More than 60% of Chinese traditional meat consumption falls into the first category (Liu et al., 2017).

With the spread of new media and the improvement of urbanization level, chilled fresh meat has gradually entered the consumer's vision (Zhou et al., 2012). Chilled fresh meat is characterized by safety, nutrition, good taste, and long shelf life (Huang & Min, 2012). Because chilled fresh meat keeps the meat under the chilling chain's control in the subsequent processing, storage, transportation, and sales process, the activity of enzyme and most of the growth of microorganisms are restrained which ensures the safety of chilled fresh meat (Wang et al., 2011). In this process, the chilled fresh meat experienced a relatively sufficient process of decompensating and ripening, the meat quality becomes tender and the taste keeps delicious. A film of dry oil is formed on the surface of the chilled meat in the process of chilling, which reduces the evaporation of water inside the meat and makes the meat soft and juicy. At the same time, the formation of dry oil film can prevent the invasion and reproduction of microorganisms, and extend the shelf life of meat (Huang & Min, 2012).

Despite the advantages of chilled fresh meat, the Chinese have followed the tradition of eating hot fresh meat and have a belief that the shorter the meat is left after slaughter, the fresher it will be. This has led traditional consumers to question the quality and safety of chilled meat. With the promotion of marketing activities, chilled fresh meat has gradually opened the traditional market. Chilled fresh meat began to enter traditional offline consumption places such as traditional supermarkets, farmers' markets, and direct-sale stores, as well as online fresh meat stores such as T-mall and JD-mall.

Due to the spread of COVID-19, the Chinese government has closed down relevant cities, and most of them have implemented resident control. People are not allowed to go to the market to buy meat the traditional way. Food supply and food safety have become a major concern at this time. To ensure the supply and safety of meat food, the government has issued a series of policies to ensure the supply of meat. Therefore, chilled fresh meat products based on cold chain logistics stand out in the process of relevant procurement organized by the government due to their safety and health characteristics. More and more consumers have realized the safety and health features of chilled fresh meat during the COVID-19 epidemic. Unlike other countries, some of the Chinese citizens still prefer hot fresh meats from the less hygienic local wet markets to ensure freshness (Zhang, 2020). As the epidemic becomes more concerned, the Chinese government imposed further restrictions on the live poultry market. A large number of meat products will be faced with the problem of getting rid of the sales habit in the traditional market, and it is necessary to separate the consumption area from the production area. As a result, the market for frozen meat and chilled fresh meat will grow further. Among them, chilled fresh meat is more in line with the taste and safety requirements of Chinese people than frozen meat, so it is particularly necessary to study the consumption of chilled meat after the COVID-19 epidemic.

Because chilled fresh meat is more expensive than hot fresh and frozen meat, we can assume that consumers tend to consume chilled meat, not for the price but mainly probably for food safety (Wang

et al., 2011). Another small number of consumers choose for taste. There are three major food safety standards for chilled fresh meat from well-known Chinese brands. They are ISO international quality certification management issued by China state administration of technical supervision (CSBTS) for Chinese enterprises, HACCP (Hazard Analysis and Critical Control Point system certification), and China's national safety standard for food quality. However, not all chilled fresh meats are certified, so consumers may be swayed in their choice of chilled fresh meats. It is necessary to explore the role of quality certification marks in consumers' purchasing behavior.

In addition, traditional studies of emerging foods have shown that younger consumers tend to be more receptive to new things (Aschemann-Witzel & Aagaard, 2014). Research on healthy food, for example, has shown that families with children and the elderly tend to value food safety more (Liu & Niyongira, 2017). For traditional consumer goods, research shows that households with higher incomes tend to be more receptive to consumer price premiums (Sethuraman & Cole, 1999). In the study of organic food, it is shown that consumers' educational background can influence their purchasing behavior of organic food (Rana & Paul, 2017). However, research on the purchase of chilled meat is not common. Therefore, it is particularly necessary to study consumers' purchasing behavior and willingness to pay for chilled meat under different demographic characteristics.

2. Method

Relevant data were obtained thorough a questionnaire. The questionnaire consists of 23 questions. Major issues include consumers' meat consumption habits in the wake of the COVID-19 and their awareness of meat product quality labels. In addition, the gender, age, family income, and other basic personal information of the interviewees were also counted. The questionnaire was posted on China's professional questionnaire website on May 15, 2020. After that, 209 questionnaires were collected. According to the tracking of IP location, the respondents covered all provinces in China except Inner Mongolia and Taiwan.

2.1. Demographic Analysis Results

The last section of the questionnaire was about the demographic data of participants. The characteristics of the sample are shown in <Table 1>.

Table 1: Demographic analysis results

	Variable	Frequency	Percentage(%)
Gender	Male	80	38.3
	Female	129	61.7
Age	under the age of 20	0	0
	21-30	44	21.1
	31-40	62	29.7
	41-50	79	37.8
	51-60	24	11.5
	Over the age of 60	0	0

Household income	under 3000CNY	8	3.8
	3000-6000CNY	6	2.9
	6000-9000CNY	27	12.9
	9000-12000CNY	51	24.4
	12000-15000CNY	51	24.4
	15000-18000CNY	43	20.6
	Over18000CNY	23	11
Degree of the one who purchases meat products	Primary school	18	8.6
	Middle school	23	11.0
	High school	68	32.5
	Undergraduate degree	72	34.4
	Graduate degree	28	13.4
Family residence	First-tier city	36	17.2
	Second-tier city	26	12.4
	Ordinary prefectural cities	60	28.7
	County-level city	67	32.1
	Country	20	9.6
Family with children under 12 years old	Yes	156	74.6
	No	53	25.4
Family with people over 60 years old	Yes	122	58.3
	No	87	41.7
Total Response		209	100

2.1. Result of purchasing chilled fresh meat

The first is the result of consumers' purchase of raw meat. The results showed that consumers most often purchased raw meat in supermarkets (N=86, 41.4%); It is followed by direct-sale stores in farmers' markets (N=63, 30.1%), and it is worth noting that online purchase accounts for 10% (N=21), showing a certain development momentum. The results for branded packaged meat and meat in bulk were in line with expectations, with 70.8% of respondents saying they preferred to buy meat in bulk (N=148), much higher than those who chose branded packaged meat (N=65).

As for the results of chilled fresh meat, 68.9% of respondents said they would like to buy chilled fresh meat (N=144), while 31.1% said they would not, the same as those who buy fresh chilled fresh meat less than twice a week. While 39.7% of respondents said that they buy chilled fresh meat 3-4 times per week, which was slightly higher than the proportion of respondents who bought chilled fresh meat 5-6 times per week (20.6%, N=43), but much higher than the proportion of respondents who bought chilled fresh meat more than 8 times per week (8.6%, N=18). The results showed that the respondents basically purchased chilled fresh meat once every 1-2 days.

And the following are the results of the impact of the brands of chilled fresh meat. The results showed that 73.3% of the respondents believed that brand was one of the main factors influencing the purchase of chilled fresh meat. Among them, the traditional fresh meat brand Shuanghui (25.8%,

N=54), Jinluo (19.1%, N=40), Yirun (22.5%, N=47) are still the brands most frequently purchased by respondents, which are better than emerging chilled fresh meat brands Zhongping (12.9%, N= 27), Lidus (6.2%, N= 13) and Songlin (7.2%, N= 15).

Studies on the chilled fresh meat quality certification mark show that an overwhelming majority of people (89%, N=186) say they are concerned about the chilled fresh meat quality mark. But the determination of the three quality standards for chilled fresh meat was unexpected. Less than 40% of the respondents knew the ISO quality certification mark (37.3%), HACCP quality certification mark (19.6%), and GB (29.2%) respectively. This result needs to be taken seriously. Both the government, manufacturers, and distributors need to further publicize the quality certification standards. 90% of the respondents agreed that chilled fresh meat with a certified quality standard is safer than regular chilled meat, and 87.6% of the respondents agreed that chilled fresh meat with a certified quality standard is more nutritious than regular chilled fresh meat. 90.4% of the respondents said they would prefer chilled fresh meat with a quality certification mark.

3. Empirical analysis of the factors influencing consumers' purchase of chilled fresh meat

3.1. Model selection and variable setting

The research adopts the binary Logit regression method to analyze the factors influencing consumers' purchasing behavior toward chilled fresh meat. The basic form of binary Logit regression equation is :

$$\text{Logit } P = Y_i = \lambda_0 + \lambda_1 X_1 + \lambda_2 X_2 + \lambda_3 X_3 + \dots + \lambda_{10} X_{10} + m$$

Where, “ $Y_i=1$ ” means that the consumer is more willing to buy chilled fresh meat with the quality certification mark, and “ $Y_i = 0$ ” means that the consumer is not willing to buy chilled fresh meat with the quality certification mark. X_1 through X_{10} represents the 10 explanatory variables from "brand" to "place of residence" in Table 2. λ_0 is a constant, and the coefficients of the 10 explanatory variables are calculated from λ_1 to λ_{10} , with m being the random perturbation term.

Table 2: The variables and their definitions

Variable name	Scale	
Brand (X_1)	0-1	1= “yes”; 0= “no”
Quality certification attention (X_2)	0-1	1= “yes”; 0= “no”
Mart promotion (X_3)	0-1	1= “yes”; 0= “no”
Gender (X_4)	1-0	1= “male”; 0= “female”
Age (X_5)	1-6	1= “under the age of 20” 2= “21-30” 3= “31-40” 4= “41-50” 5= “51-60” 6= “Over the age of 60”
Live condition (X_6)	1-5	1= “live alone” 2= “live with parents” 3= “live with roommates” 4= “live with lover”

		5= "others"
Live with children (X₇)	0-1	1= "yes"; 0= "no"
Income (X₈)	1-7	1= "under 3000CNY" 2= "3000-6000CNY" 3= "6000-9000CNY" 4= "9000-12000CNY" 5= "12000-15000CNY" 6= "15000-18000CNY" 7= "Over18000CNY"
Education background (X₉)	1-5	1= "Primary school " 2= "Middle school" 3= "High school" 4= "Undergraduate degree" 5= "Graduate degree and others"
Residence (X₁₀)	1-5	1= "First-tier city" 2= "Second-tier city" 3= "Ordinary prefectural cities" 4= "County-level city" 5= "Others"

Table3: Results of regression model

Variables	Odds Ratio	Std. Err.	Z value	p value	[95% Conf. Interval]	
Brands	4.001	1.66	3.340	0.001	[1.774	9.024]
Quality certification attention	22.506	19.617	3.570	0.000	[4.077	124.23]
Mart promotion	0.314	0.202	-1.800	0.071	[0.089	1.106]
Gender	0.866	0.317	-0.390	0.695	[0.423	1.776]
Age	1.117	0.214	0.580	0.562	[0.768	1.625]
Living condition	1.102	0.157	0.680	0.496	[0.833	1.457]
Children	5.489	2.327	4.020	0.000	[2.391	12.60]
Income	1.241	0.16	1.670	0.095	[0.963	1.598]
Qualifications	1.605	0.264	2.870	0.004	[1.162	2.217]
Address	0.668	0.109	-2.470	0.013	[0.484	0.920]
Constant	0.003	0.006	-3.270	0.001	[0.000	0.100]

3.2. Variables research

3.2.1. Brand

Brand is a major factor influencing purchasing chilled fresh meat. From the regression analysis results, the factor of brand influencing purchasing chilled fresh meat is within the significant level of 1%, indicating that brand has become an important factor in influencing consumers' purchase and consumption of chilled meat. Compared with non-branded chilled meat, consumers' purchase rate of branded chilled meat was 4.001 times more.

3.2.2. Quality certification attention

From the regression results, the attention to quality certification was within the significance level of 1%, indicating that quality certification also had an important influence on consumers' purchase behavior of chilled fresh meat. In particular, in recent years. There have been frequent occurrences of food safety problems in China. Consumers' awareness of quality has been raised to a new height. Therefore, the purchase ratio of consumers to chilled meat with quality marks is 22.506 times higher than that of chilled fresh meat without quality marks.

3.2.3. Mart promotion

Although mart promotion is significant within the statistical level of 10%, the purchase rate of supermarket promotion is 0.314 times higher than that of non-promotion. This is contrary to normal research. However, as food, the safety of chilled fresh meat is considered more by customers. When the price is lower than normal, people's psychological state is worth further investigation. We questioned some of the respondents. When being asked the reason for their resistance to supermarket promotion, they said that they hold the opinion that supermarket salesmen might be promoting last-minute or poor-quality products rather than good and cheap ones.

3.2.4. gender

From the regression results of the model, it can be seen that men purchase chilled fresh meat 0.866 times as much as women, but it is statistically significant on the top, which means that men are more inclined to buy chilled fresh meat. The reason may be that chilled fresh meat costs more than regular meat, and men are less sensitive to price than women.

3.2.5. Age

The probability ratio of age is 1.117, indicating that with the increase of age, consumers are more and more likely to buy chilled fresh meat. However, this factor is not statistically significant, indicating that age has no significant influence on the behavior of consumers to buy chilled meat.

3.2.6. Living conditions

According to the regression results, the situation of non-solitary living would promote the possibility of consumers buying chilled meat, with an occurrence ratio of 1.102. However, this result was not statistically significant, which meant that living conditions had no substantial influence on consumers' purchase behavior of chilled fresh meat.

3.2.7. Living with children under the age of 12 or not

If there are children under the age of 12 in the case of other conditions unchanged, families with children under 12 years of age purchase chilled fresh meat 5.489 times as much as the purchase of the family without children under 12 years of age, which means that living with the children under the age of 12 is a significant indicator of purchasing chilled fresh meat. And the reason may be that people think that chilled fresh meat is more safer and nutritious.

3.2.8. Household income

With the increasing of family income, the probability ratio of consumers to buy chilled fresh meat increases. To be specific, other things being equal, the occurrence of consumers' willingness to buy chilled fresh meat increases by 0.241 times on average with each increase of income level, which is

significant at 10%. This indicates that with the increase of household income, the purchasing power of consumers and so does the purchase amount of chilled fresh meat.

3.2.9. Education background

The higher the degree of education, the higher the occurrence rate of buying chilled fresh meat. In general, as consumers become more educated and more concerned about the quality of life and nutrition, they are more likely to buy higher-priced, more nutritious chilled fresh meat.

3.2.10. Residence

From the regression results of residence, the occurrence ratio of purchasing chilled fresh meat gradually decreases with the decrease of city grade. The occurrence ratio decreases by an average of 0.332 times with each grade reduction and is within the significant level of 5%. This is also consistent with the actual situation in China. Large cities have stronger income levels and consumption power, so they have stronger purchasing power for chilled fresh meat.

4. Conclusion

According to our analysis results, brand and quality certification are two more important factors influencing consumers' purchase of chilled fresh meat. In today's society with an increasingly high material standard of living, these two factors have become important influencing factors in the field of food consumption, which are reflected in the purchase of chilled fresh meat in present research. In addition, the presence of children under the age of 12 in the household and the level of income and education also encouraged consumers to buy chilled fresh meat. However, mart promotions and city ratings can significantly lower consumers' propensity to buy chilled meat. However, such factors as gender, age, and living conditions have no significant influence on consumers' purchase of chilled fresh meat, which means that these factors have no significant influence on consumers' purchase of chilled fresh meat.

Limitation: (1) This paper does not have general applicability because the sample survey has been done in China. Because of China's special national conditions and food environment, the results of this paper are not applicable to other countries and regions. (2) Due to the limitation of the analysis method and the limitation of variable selection, a robustness test cannot be carried out in this paper, so the results may be inaccurate. (3) The survey data for this article were produced around May 2020. Since July, there have been reports of positive test results for COVID-19 on the packaging of imported chilled fresh meat products. Therefore, it is necessary to further explore whether there are changes in influencing factors of meat product consumption after relevant reports enter the public eye.

Policy recommendations: (1) The government should strengthen the supervision of chilled fresh meat manufacturers, in accordance with the relevant laws and quality regulations to carry out the work of granting quality marks, to ensure that the chilled meat produced by various manufacturers meet the quality certification standards, so as to enhance consumers' confidence in buying. (2) While improving the quality, each chilled meat factory should pay attention to their own brand construction, not blindly pursue profits, but should spend more time and energy to manage their own brand, from a long-term perspective, to create high-quality goods, famous products, so as to improve the brand influence and visibility.

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