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Master's Thesis of Economics

Protein Product Consumption from the Perspective of Healthy Diet

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Abstract

The growth of interest in health makes protein foods trendy. This study analyzed the factors influencing the purchase of protein foods from the perspective of a healthy diet. In the first study, the relationship between consumers' consciousness of healthy eating and purchasing meat products was investigated through regression analysis using data from consumer panels' agri-food purchase receipts. The frequency of purchasing meat products in four categories was used for the study. The results of the study show the impact of consumers' consciousness of healthy eating on the frequency of purchasing bacon, sausage, and chicken breast. As the level of consumers' consciousness of healthy eating increased, the frequency of purchasing bacon and sausage was lower, whereas that of chicken breast was higher. The purpose of the second study was to identify the factors influencing the intention to purchase protein supplements using stepwise regression analysis. Four hundred respondents participated in the online survey, and the experiments were designed as between-subjects method. The results show that the formulation of protein supplements, lifestyle, physical activity, and health consciousness have a significant influence on purchase intention. In particular, the interaction effects of message framing with formulation and health consciousness show a significant effect on purchase intention. The implications of this study and suggestions for future research are included in the last chapter of each study.

Keywords: Protein foods, meat products, protein supplement, multiple regression, between subject design, step wise regression

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I. Essay 1: The effect of consumers' consciousness on healthy eating on purchasing meat products

Chapter 1. Introduction

The food consumption behavior of Korean consumers has rapidly changed due to the development of science and technology and, socioeconomic and demographic changes (Choi & Kim, 2013; Kim et al., 2021; Lee et al., 2016). After Korean consumers' eating habits became westernized, consumers' meat consumption more than doubled, from 29.8kg in 1994 to 68.1kg in 2019, and has steadily increased every year (Hong & Yun, 2020). As Koreans' diet has shifted from being carbohydrate –centered to protein –centered, the portion of meat in their daily diet has increased significantly compared to the past, and the food service industry has also undergone changes because of the switch in Korean consumers' eating patterns (Han, 2009; Park, 2016).

Consumers' interest has increased in their general well-being, and they now value quality of life more than they did in the past. This trend can be seen in their food choices and has accelerated due to Corona virus disease in 2019 (COVID-19) (Baek & Lee, 2019; Jaeger et al., 2021). The pandemic has aroused concerns about their health, and consumers are trying to improve their health status by making changes in their food intake (Jaeger et al., 2021). Because our bodies need to be supplied with food nutrients that can strengthen the function of our immune systems, consumers try to

intake nutritious food to take care of their health (Vishwakarma et al., 2022). Among the nutrients obtained through food intake, proteins have begun to draw attention from consumers due to the benefits they provide to remain healthy.

In October 2015, the International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), announced that the consumption of red meat was classified as “probably carcinogenic to humans” based on limited evidence and that the consumption of processed meat was classified as “carcinogenic to humans” based on sufficient evidence in humans (Bouvard et al., 2015). This release caused much debate among scholars and gave an “unhealthy image” to red and processed meat. Since this report was announced, the red meat market has been criticized for causing critical diseases. Evidence from studies about the association between meat and human disease and opinions on reducing meat consumption have grown more prominent ever since. However, other views insist on the necessity of consuming meat due to its nutritional benefits and claim no association between consuming meat and the disease (Ahmad et al., 2018; Botez et al., 2017; Li et al., 2014; Siri–Tarino et al., 2010; Verbeke et al., 1999; Williamson et al., 2005). On the contrary, white meat has been recognized as “healthy meat” by consumers due to its nutritional advantages, and processed meat has been criticized for causing chronic diseases (Baek, 2006; Chan et al., 2011; Kaluza et al., 2014; Kim et al., 2015). Therefore, because of the creation these perceptions of meat products and their influence over consumers through different study results, it is necessary to investigate consumers’ perspectives on meat products belonging to different species and product types.

This study aims to examine the effect of consumers' consciousness on healthy eating (CCHE) on consumers' trends of meat purchases and food intake. For detailed research purposes, the effects of CCHE on expenditure for (1) meat product type and, (2) meat species are analyzed. For this research, data from the Rural Development Administration's consumer panel survey were used for analysis. These data comprise details of receipts on agri-food purchases recorded for over 10 years. This study is an empirical analysis that has used actual receipt data from panels, much more than studying consumers' purchase intentions or willingness to pay for the meat products. Although there several studies have focused on this topic, they have mostly treated purchase intention as a criterion that reflects consumers' health consciousness (Buaprommee & Polyorat, 2016; Ling et al., 2021; O' Donovan & McCarthy, 2002; Sepúlveda et al., 2010). Therefore, these studies have limitations in that it is difficult to confirm whether the research results depict real human behaviors. However, this study is unique in illustrating the effect of CCHE by utilizing the consumers' real receipts. The findings from this study have more reliability and implications for the people engaged in the meat industry who try to apply the results to the field. This research is intended to provide empirical conclusions for stakeholders in the meat industry to cope with consumers' needs for healthy food by implementing marketing strategies in the field (Kim et al., 2005).

Chapter 2. Literature Review

2.1. The effect of health consciousness on eating

The effects of psychological factors on eating have been extensively studied. Restricting eating under stress is a “natural” response; however, women who are under stress overeat during stressful situations and fail to exert over self-imposed rules, not dietary restraint (Weinstein et al., 1997). According to the study by Zellner et al. (2006), stress causes people to shift their food choices from lower-fat to higher-fat foods. Alfoukha et al. (2019) claimed that people who show symptoms of low self-esteem or psychological distress are more at risk of eating disorders. Ishikawa et al. (2018) investigated people with good subjective well-being and found that they had wider food diversity and higher satisfaction with meal quality than people with poor subjective well-being. In addition, a disruption in life can lead to changes in eating behavior. According to Jaeger et al. (2021), people have increased their consumption of healthy foods recommended by dietary guidelines after the appearance of COVID-19 to reduce their susceptibility to the long-term complications of COVID-19 and future pandemics.

Health is one of the most important factors that people consider when choosing food (Roininen et al., 1999; Schifferstein & Ophuis, 1998). Health consciousness is an indicator of one’s intrinsic motivation to maintain good health and reflects consumers’ enduring involvement in health-related issues (Dutta-Bergman, 2005). Moorman and Matulich (1993) found that health-conscious

consumers are constantly involved in searching for information that can help them improve their health. Therefore, given the above researches, people with higher health consciousness will search for information on food nutrition and pursue healthier diets.

2.2. Meat Consumption in Korea and its association with health

Economic and population growths have progressed rapidly in Korea, and meat consumption has followed. If we look at the per capita annual consumption of major foods, rice consumption has decreased from 112.6 kg in 1994 to 70 kg in 2019, while meat consumption has more than doubled from 29.8 kg in 1994 to 68.1 kg in 2019 (Table 1). Specifically, the increase in pork consumption was remarkable while the overall consumption of all meat species increased (Table 2).

Table 1. Annual food items consumption per capita in Korea

Year	Rice	Meat	Vegetables	Fruits	Fish	Fat and oils
1994	112.6	29.8	140.7	35.1	32.5	13.9
1998	102.9	34.8	148.3	34.6	27.2	12.9
2002	91.1	39.2	144.6	42.0	36.3	17.5
2006	84.1	38.4	153.8	44.6	43.5	18.1
2010	81.5	43.5	132.2	44.2	36.5	20.1
2014	74.8	49.8	153.7	49.8	41.6	20.4
2018	72.3	63.4	151.2	40.0	41.8	24.4

2019	70.0	68.1	144.9	39.9	42.3	27.5
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Scale: kg

Source: Korea Rural Economic Institute (2020), Food balance sheet

Table 2. Annual meat production and consumption per capita in Korea

Year	Beef		Pork		Chicken	
	Production	Consumption per capita	Production	Consumption per capita	Production	Consumption per capita
1970	37	1.2	83	2.6	45	1.4
1980	93	2.6	239	6.3	92	2.4
1990	95	4.1	508	11.8	172	4
2000	214	8.5	714	16.5	261	6.9
2010	186	8.8	764	19.3	436	10.7
2015	255	10.5	849	22.4	585	10.7
2016	231	11.2	891	23.7	600	11.1
2017	239	11	939	24.7	777	13.8
2018	237	12.2	979	25.1	862	15
2019(E)	245	12.6	1,070	27.4	923	16.2

Scale: Production (1,000 ton), Consumption per capita (kg)

Source: Korea Rural Economic Institute (2020), Food balance sheet

Meat can be classified as red meat (beef, pork, and lamb products) and white meat (poultry products), and each category has been studied in relation to human health. A number of studies on red meat have focused on cardiovascular and chronic diseases. Abete et al. (2014) showed that the risk of mortality due to cardiovascular disease caused by consuming red meat was higher than that by consuming white meat. Alexander et al. (2011) pointed out that consuming red meat appeared to play a role in the

development of colorectal cancer. Furthermore, numerous studies have revealed red meat is connected to squamous cell lung cancer and non-Hodgkin's lymphoma (Deneo-Pellegrini et al., 2015; Fallahzadeh et al., 2015). Beyond this, many studies have also shown evidence of red meat's effect on human disease (Larsson & Orsini, 2014; Micha et al., 2012). They have contributed to consumer's perceptions of red meat being a risk factor for causing the disease. However, some scholars have attempted to modify these conceptions about consuming red meat. They argued that excessive consumption of red meat is the main reason for serious human disease, and this was admitted in previous studies claiming that red meat was the cause of disease (Chan et al., 2011; Da Young Lee et al., 2021; Kaluza et al., 2014; Larsson & Orsini, 2014; Li et al., 2014; Siri-Tarino et al., 2010).

In contrast, studies on white meat have focused on its function as healthy meat. Some studies have shown that white meat is low in fat and cholesterol and rich in protein; thus, eating large quantities of white meat is not related to cardiovascular disease (Abete et al., 2014; Kim et al., 2015). Klurfeld (2015) showed that the mortality rate caused by consuming white meat was lower than that caused by consuming red meat in all areas (e.g., cancer and cardiovascular diseases). The nutritional benefits of white meat have drawn attention, leading to its reorganization as a substitute for red meat (Lupoli et al., 2021). Contradicting many studies, one study found that white meat was associated with total cancer mortality (Sinha et al., 2009). The well-being trend spread in the meat market. Consumers' interest in white meat as "healthy meat" is expected to increase continuously, and consumer preferences are also expected to follow this trend of consumer food purchasing trend

(Baek, 2006; Kim et al., 2015). Studies on the association between eating meat and human health have stimulated debate among scholars due to conflicting results and have affected consumers' perceptions of meat. Thus, a need to investigate consumers' purchasing patterns of meat products, as they are affected by CCHE, and explore consumers' views of meat products, specifically, remains.

Chapter 3. Methodology

There are four categories of meat products: fresh pork products, processed pork products, fresh chicken products, and processed chicken products. Detailed items are shown in Table 3. Beef products are excluded due to insufficient classification of processed products. In this study, the analysis focuses on pork and chicken, which are representatives of red meat and white meat, respectively and some of items were excluded due to low reliabilities of regression models.

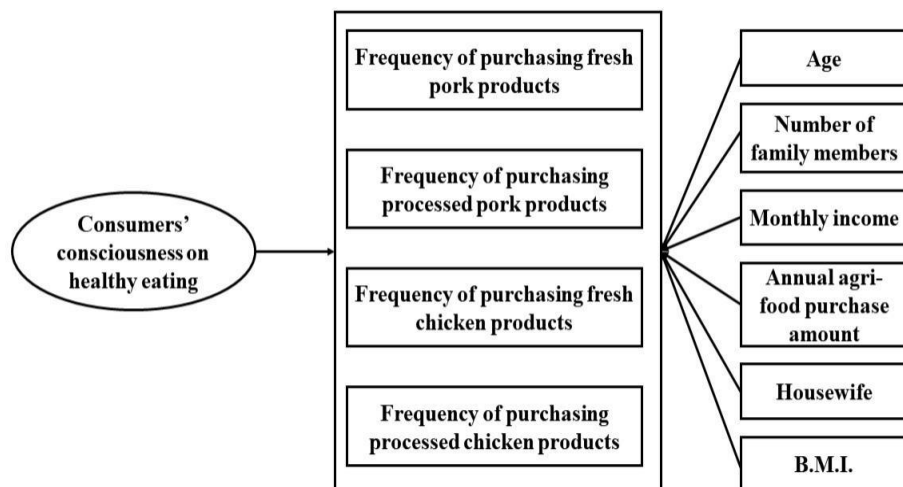
Table 3. Categorization of analyzed items

Category	Specific Items
Fresh-pork products	Belly, Shoulder neck, Tenderloin, Loin, Picnic shoulder, Ham, Rib
Processed-pork products	Pork cutlet, Marinated pork, Bacon, Sausage, Sliced Ham, Fried Pork, Canned Ham
Fresh-chicken products	Chicken breast, Wing, Leg, Tenderloin, Whole Chicken
Processed-chicken products	Nugget, Processed-Chicken Breast, Chicken Gangjeong, Marinated Chicken, Partial Processed Chicken, Fried Chicken

This study used consumer household panel data collected by the Rural Development Administration from January 2018 to December 2020. The data collected from the agri-food purchase receipts of 1,250 household panels (selected for submitting food purchase receipts continually 4 years) living across the country,

and this dataset is considered one of the representative datasets that indicate the current status of agri–food consumption in Korean households. Consumer panel data were collected through general retailers, excluding eating out, and through them, it is possible to grasp consumer food purchase patterns, such as purchase date, purchase channel, purchase volume, purchase amount, brand name, and product name. In this study, data from 647 households (which belonged to the 1,250 household panels that responded to an additional survey on CCHE) were used. Multiple regression analysis was conducted using R program 4.1.1 to verify the relationship between CCHE and the purchase frequency of meat products. In the analysis, the purchase frequency of meat products was set as a dependent variable, and the participants’ CCHE value was set as an independent variable. Demographic and purchase frequency variables, such as number of family members, age, annual agri–food purchase amount, and BMI index, were used as control variables (Figure 1).

Figure 1. Research model for analysis



Dutta–Bergman (2005) developed 10 survey items to measure

CCHE. Of these items, four were used in the present study for the concept' s reliability and internal consistency. These four items were as follows: (1) I try to avoid foods with a high salt content, (2) I try to avoid foods that are high in fat, (3) I try to avoid foods that are high in cholesterol, and (4) I try to avoid foods that have additives in them. The statements were rated on a 7–point Likert scale (1 = definitely disagree, 7 = definitely agree; Table 5).

Chapter 4. Result

4.1. Demographic characteristics and descriptive statistics

Table 4 shows the panel' s demographic characteristics for each category. Most panel members were female, and the average age of panel members was 54, since middle-aged people (especially in their 40s and 50s) participated in the survey. On average, the participants had three family members, and their average monthly income was about five million KRW. More specific information is described in Table 4. Descriptive statistics of the meat products purchased by the survey participants are given in Table 5.

Table 4. Demographic characteristics of panel members

	Items	N	%
Age	20 – 29 years old	6	1
	30 – 39 years old	37	6
	40 – 49 years old	162	25
	50 – 59 years old	230	36
	60 – 69 years old	175	27
	70 – 79 years old	37	6
Family Number	1	90	14
	2	161	25
	3	174	27
	4	176	27
	Over than 5	46	7
Monthly	Less than 2,000,000 KRW	63	10

Income	2,000,000 ~ 2,990,000 KRW	84	13
	3,000,000 ~ 3,990,000 KRW	101	15
	4,000,000 ~ 4,990,000 KRW	109	17
	5,000,000 ~ 5,990,000 KRW	90	14
	6,000,000 ~ 6,990,000 KRW	58	9
	7,000,000 ~ 7,990,000 KRW	50	8
	8,000,000 ~ 8,990,000 KRW	45	7
	9,000,000 ~ 9,990,000 KRW	14	2
	More than 10,000,000 KRW	33	5
Annual Agri-food Purchase Amount	Less than 2,500,000 KRW	104	16
	2,500,000 ~ under 5,000,000 KRW	335	52
	5,000,000 ~ under 7,500,000 KRW	165	26
	More than 7,500,000 KRW	43	7
Housewife	Yes	249	38
	No	398	62
B.M.I.	Less than 18.5	19	3
	18.5 ~ under 23	345	53
	23 ~ under 25	153	24
	More than 25	130	20

Table 5. Descriptive statistics of consumers' frequency of purchasing meat products

Category	Specific Items	Min.	Max.	Mean	Standard Error
Fresh pork products	Belly	0	255	35.69	31.26
	Shoulder neck	0	167	13.68	13.38
	Tenderloin	0	70	2.79	6.48
	Loin	0	35	4.70	5.86
	Picnic shoulder	0	64	4.27	8.32
	Ham	0	350	21.2	26.16

	Rib	0	39	2.00	4.62
Processed pork products	Pork cutlet	0	61	3.97	6.11
	Marinated pork	0	56	4.03	6.35
	Bacon	0	115	4.52	9.68
	Sausage	0	269	15.33	20.76
	Sliced Ham	0	39	2.25	4.70
	Fried Pork	0	9	0.34	1.01
	Canned Ham	0	100	4.45	8.18
Fresh chicken products	Chicken Breast	0	48	2.40	5.51
	Wing	0	35	1.10	3.48
	Leg	0	57	1.76	4.62
	Tenderloin	0	23	0.61	2.12
	Whole Chicken	0	84	15.62	14.45
Processed chicken products	Nugget	0	48	2.86	5.10
	Processed Chicken Breast	0	62	1.64	3.97
	Chicken Gangjeong	0	41	3.03	5.05
	Marinated Chicken	0	69	1.87	4.79
	Partial Processed Chicken	0	22	1.15	2.39
	Fried Chicken	0	56	5.22	7.39

4.2. Reliability test and convergent validity test

The significance level was set at 0.05 (5%) to investigate the effect of CCHE on the purchase of meat products. To assess the measurement of the CCHE, a reliability test and a convergent validity test were used. The composite reliability (CR) test and Cronbach's alpha were chosen to determine the internal consistency of the CCHE. According to Fornell and Larcker (1981), an alpha value higher than 0.7 indicates that a construct has internal validity (Bohrnstedt & Knoke, 1982), and reliability is ensured if the CR is greater than 0.7 (Bagozzi & Yi, 1988) and the average variance extracted (AVE) is greater than 0.5 (Fornell & Larcker,

1981). Here, the alpha index is higher than 0.7, the CR is higher than 0.7, and the AVE of CCHE is greater than 0.5 (Table 6).

Table 6. CCHE measurement items

Concept	Items	CR	AVE	Cronbach's Alpha
CCHE	I try to avoid foods with a high salt content	0.817	0.531	0.815
	I try to avoid foods that are high in fat			
	I try to avoid foods that are high in cholesterol			
	I try to avoid foods that have additives in them			

4.3. Multiple linear regression analysis

Table 7 shows the correlation analysis of the relationship between the major variables. The correlation between number of family member and purchase frequency shows 0.589 and one between number of annual agri–food purchase amount and purchase frequency shows 0.619, showing strong correlation. This is because people who have more family member spend more money to fulfill their family members' hunger and the degree of purchasing meat products contributes to the degree of purchasing agri–food purchase amount. Considering that the cutoff to diagnose multicollinearity is 0.7 to 0.9 (Yoo et al., 2014) and the results of vif test (Table 8.), all variables were included in the regression model.

Table 7. Correlation analysis results

	Age	N.O.F.	Income	A.P.A.	Housewife	B.M.I.	CCHE	P.F.
Age	1.000							
N.O.F.	- 0.180	1.000						
Income	0.081	- 0.096	1.000					
A.P.A.	0.146	0.515	0.026	1.000				
Housewife	0.171	0.195	0.068	0.222	1.000			
B.M.I.	0.000	0.037	-0.002	0.066	0.047	1.000		
CCHE	0.238	- 0.096	0.071	0.081	0.081	0.048	1.000	
P.F.	- 0.187	0.589	0.021	0.619	0.160	0.015	- 0.039	1.000

* N.O.F. : Number of family member

* A.P.A. : Annual agri-food purchase amount

* H.C. : Health Consciousness

* P.F. : Purchase frequency

Table 8. Vif test

Age	Number of family member	Income	Annual agri-food purchase amount	Housewife	B.M.I.	CCHE
1.10	1.55	1.01	1.51	1.10	1.01	1.07

Table 9 shows the results of the analysis, with the frequency of purchasing fresh pork products as the dependent variable. No significant results were found regarding the effect of CCHE on fresh pork products.

Table 10 is the result of the coefficient analysis, with the frequency of purchasing processed pork products as the dependent variable. Among the items, bacon and sausage show significant results. The frequency of bacon purchases is found to be linearly related to age, annual agri-food purchase amount, and CCHE.

According to the statistical analysis, the beta coefficient between CCHE and the frequency of purchasing bacon is -0.905 and R^2 is 0.188 . The frequency of purchasing sausage is found to be linearly related to age, number of family members, annual agri-food purchase amount, and CCHE. According to the statistical analysis, the beta coefficient between CCHE and the frequency of purchasing sausage is -1.819 and $R^2 = 0.236$. This result implies that consumers are affected by the study about the relationship between health and consuming processed pork products.

Table 11 shows the results of the coefficient analysis, with the frequency of purchasing fresh chicken products as the dependent variable. Among the items, chicken breast, and whole chicken show significant results. The frequency of purchasing chicken breast is found to be linearly related to age, annual agri-food purchase amount, housewife, and CCHE. According to the statistical analysis, the beta coefficient between CCHE and the frequency of purchasing chicken breast is 0.528 and R^2 is 0.095 . The frequency of purchasing whole chicken is found to be linearly related to the number of family members, annual agri-food purchase amount, and the CCHE. According to the statistical analysis, the beta coefficient between CCHE and the frequency of purchasing whole chicken is 0.012 and R^2 is 0.150 .

Table 12 shows the results of the analysis, with the frequency of purchasing processed chicken products as the dependent variable. No significant results were found regarding the effect of CCHE on processed chicken products.

Table 9. Result of multiple linear regression in fresh-pork products

Analysis Model		Belly		Shoulder neck		Tenderloin		Loin		Picnic shoulder		Ham		Rib	
Variable		β	p-value	β	p-value	β	p-value	β	p-value	β	p-value	β	p-value	β	p-value
Control Variable	Age	-0.123	0.305	-0.084	0.213	-0.053	0.058	-0.067	0.006**	0.030	0.783	-0.037	0.306	-0.117	0.558
	Number of Family	5.114	0.000***	1.891	1.891	0.224	0.383	0.479	0.033*	3.787	0.000***	0.732	0.030*	0.246	0.172
	Income	0.000	0.523	0.000	0.117	0.000	0.520	-0.000	0.412	-0.000	0.730	0.000	0.263	0.000	0.351
	Annual Agri-food Purchase Amount	5.999	0.000***	2.265	0.000***	0.735	0.000***	0.850	0.000***	2.700	0.000***	0.347	0.078	0.420	0.000***
	Housewife	-3.710	0.107	-1.98	0.128	1.177	0.027*	0.920	0.047**	-2.033	0.336	0.894	0.199	0.598	0.109
	B.M.I.	-0.000	0.975	-0.002	0.696	-0.002	0.362	-0.002	0.445	-0.009	0.360	-0.003	0.392	0.008	0.000***
Independent Variable	HCE	-2.129	0.083	-0.063	0.9274	-0.025	0.931	0.015	0.952	0.767	0.497	0.695	0.062	-0.117	0.558
Multiple R-square		0.259		0.134		0.146		0.082		0.106		0.042		0.110	

Adjusted R-square	0.251	0.1247	0.137	0.072	0.096	0.032	0.100
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Table 10. Result of multiple linear regression in processed-pork products

Analysis Model		Pork Cutlet		Marinated pork		Bacon		Sausage		Sliced Ham		Fried Pork		Canned Ham	
Variable		β	p-value	β	p-value	β	p-value	β	p-value	β	p-value	β	p-value	β	p-value
Control Variable	Age	-0.115	0.000***	-0.096	0.000***	0.241	0.000***	0.584	0.000***	0.127	0.000***	0.276	0.000***	-0.124	0.000***
	Number of Family	1.279	0.000***	0.579	0.020*	0.291	0.416	4.171	0.000***	0.294	0.0926.	2.174	0.000***	1.083	0.000***
	Income	-0.000	0.427	0.000	0.400	0.000	0.951	0.000	0.660	0.000	0.597	0.000	0.688	0.000	0.674
	Annual Agri-food Purchase Amount	0.580	0.000***	0.748	0.000***	1.712	0.000***	2.167	0.000***	0.685	0.000***	0.140	0.000***	0.683	0.000***
	Housewife	0.121	0.796	0.003	0.947	1.048	0.157	1.281	0.402	1.327	0.000***	0.634	0.523	0.334	0.614
	B.M.I.	-0.003	0.139	0.002	0.323	0.002	0.617	0.006	0.385	0.002	0.203	0.005	0.2683	0.000	0.899
Independent Variable	HCE	0.392	0.118	0.132	0.628	0.905	0.022*	1.819	0.0261*	0.262	0.173	0.040	0.365	-0.213	0.547
Multiple R-square		0.188		0.112		0.197		0.244		0.195		0.065		0.108	

Adjusted R-square	0.179	0.103	0.188	0.236	0.186	0.55	0.0981
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Table 11. Result of multiple linear regression in fresh-chicken products

Analysis Model		Chicken Breast		Wing		Leg		Tenderloin		Whole Chicken	
Variable		β	p-value	β	p-value	β	p-value	β	p-value	β	p-value
Control Variable	Age	-0.086	0.000***	-0.043	0.005**	-0.055	0.005**	-0.011	0.215	-0.111	0.836
	Number of Family	-0.076	0.723	0.049	0.727	-0.100	0.581	0.032	0.714	0.317	0.000***
	Income	-0.000	0.852	0.000	0.992	-0.000	0.588	0.000	0.927	0.000	0.606
	Annual Agri-food Purchase Amount	0.000	0.000***	0.000	0.000***	0.000	0.000***	0.000	0.013*	1.714	0.000***
	Housewife	0.956	0.032*	0.523	0.070.	0.336	0.372	-0.183	0.310	0.051	0.000 ***
	B.M.I.	-0.002	0.314	-0.000	0.510	-0.002	0.317	-0.000	0.608	0.051	0.400
Independent Variable	HCE	0.528	0.0268*	-0.061	0.691	0.272	0.175	0.022	0.820	0.064	0.172
Multiple R-square		0.104		0.057		0.096		0.018		0.179	
Adjusted R-square		0.095		0.046		0.086		0.008		0.170	

Table 12. Result of multiple linear regression in processed-chicken products

Analysis Model		Nugget		Processed- Chicken Breast		Chicken Gangjeong		Marinated Chicken		Partial Processed Chicken		Fried Chicken	
		β	p-value	β	p-value	β	p-value	β	p-value	β	p-value	β	p-value
Control Variable	Age	-0.109	0.000***	-0.077	0.000***	-0.115	0.000***	-0.081	0.000***	-0.51	0.000***	-0.163	0.000***
	Number of Family	1.015	0.000***	-0.008	0.957	0.487	0.009**	0.292	0.126	-0.051	0.000***	0.475	0.096.
	Income	-0.000	0.737	-0.000	0.641	-0.000	0.7497	-0.000	0.681	-0.000	0.654	0.000	0.393
	Annual Agri- food Purchase Amount	0.599	0.000***	0.434	0.000***	0.807	0.000***	0.422	0.000***	0.332	0.000***	0.981	0.000***
	Housewife	0.004	0.918	0.400	0.221	0.010	0.797	0.220	0.577	-0.082	0.674	0.187	0.751
	B.M.I.	-0.001	0.343	-0.001	0.351	-0.003	0.150	0.000	0.794	-0.000	0.323	-0.000	0.960
Independent Variable	HCE	0.125	0.544	0.132	0.451	0.178	0.000***	0.006	0.778	0.076	0.467	0.107	0.733
Multiple R-square		0.214		0.075		0.192		0.074		0.098		0.135	
Adjusted R-square		0.206		0.065		0.182		0.064		0.088		0.125	

Chapter 5. Conclusion

The present study addresses consumers' meat purchase patterns, specifically red meat and white meat, as they are affected by CCHE. First, although the CCHE index increased, consumers' preference or disfavor for fresh red meat does not show up in the analysis. However, it is found that people with a high CCHE index prefer not to purchase bacon or sausage. These findings imply that people who are highly conscious of healthy eating habits try to seek more information about achieving health through diet and consider bacon and sausage to be products that possess a health risk. Second, consumers' preference or disfavor for processed white meat does not show up in the analysis either. However, it is found that people with a high CCHE index prefer to purchase chicken breast or whole chicken. From these results, consumers form their own perceptions of livestock products related to the health perspective, and marketing information seems to have greatly affected the formation of awareness rather than scientific information. If scientific information can influence the formation of perception, the results regarding the consumption of processed meat would have shown negative relationships with CCHE. On the other hand, fresh meat consumption would have showed overall positive relationships with CCHE; however, the results are different. Therefore, the results of the analysis mean that consumers have different perceptions of specific products depending on CCHE, regardless of whether the products fall into the category of fresh products or processed products, and they have different perceptions of the health benefits of each livestock species. Many studies have been conducted on the association between the consumption of red or white meat and

health (Babio et al., 2012; Cabrera & Saadoun, 2014; Choi & Yang, 2017; Godfray et al., 2018; McAfee et al., 2010; Sinha et al., 2009). However, despite these results, the information spread the media would have more impact on consumers' perception of consumption and knowledge about the health benefits.

This study has academic implications because it reveals the effects of CCHE on consumers' purchase behaviors for meat products. The research reported in this paper contributes to the knowledge by investigating CCHE as a predictor of consumers' meat purchase patterns. Many studies have investigated the association between psychological factors, health, and food (Buaprommee & Polyorat, 2016; Ling et al., 2021; O' Donovan & McCarthy, 2002; Sepúlveda et al., 2010), but none of those based in Korea identified the relationships between CCHE and consumers' meat purchase patterns deducted from their agri-food receipts. Therefore, for analyzing consumers' real receipts, the present study is notable in revealing the effect of CCHE on consumers' actual purchase behavior, not purchase intention or willingness to buy. This analysis is meaningful because it exposes, through data analysis, how consumers' perceptions show up in their purchases. As the CCHE is identified as a significant predictor of consumers' decisions about purchasing meat products, the meat species and product types (fresh or processed) would be the factors affecting perceived CCHE. Therefore, these results support the stream of studies on behaviors affected by psychological factors. Moreover, these conclusions can have important implications for the Korean meat industry, as it demonstrates the way to efficiently communicate by using of healthy images on meat products. As consumers' interest in health has grown, it has become more

important to distinguish segmentation in detail according to consumers' health involvement. Therefore, for practitioners in the food service industry who target consumers who are conscious about healthy eating, this study can provide practical evidence for composition of the products to sell them to their potential customers. As the restaurant menu functions as a communicative device between the restaurant and the consumer (McCall & Lynn, 2008), the owners can select the menu items on the basis of these findings, which would appeal to customers with consciousness on healthy eating. For the food distribution industry, for example, supermarkets, and retail stores, these findings would prove to be efficient advice for arranging meat products for their customers' segments. From these strategies, customers with satisfactory health would revisit or repurchase the items, providing stable profits to field players. Many stakeholders related to the meat industry can respond to consumer well-being trends by segmenting consumers' based on the results of the present study and implementing different strategies or promotions to emphasize the healthy images of meat products.

Despite these findings, this study has some limitations that can provide guidance for further research. First, the panels in the present study tend to be biased. They are more or less of an older age, and the proportion of females is overwhelmingly higher than that of males. Thus, there is a limitation in generalizing the findings for the overall population. Second, these results don't reflect the consumers' preferences. This study considered receipts, the result of purchase behavior, focusing on the connection between CCHE and meat purchase patterns. Hence, it is difficult to determine from these findings the best cut of meat for consumers

who are conscious of healthy eating. Third, there is a lack of variety in the scope of the analysis. The present study focuses mainly on the effect of CCHE on purchasing pig and chicken products; however, the opportunity to investigate the effect of CCHE on other meat products (such as beef, lamb, duck, etc.) remains. This effect could also be analyzed in other food categories besides meat products, such as vegetables and fruits, and the results of those studies would provide valuable information for the food service industry. Fourth, it is impossible to confirm whether the panel used the agri-food products they purchased as ingredients for a healthy diet despite their high level of CCHE. Recently, various health diets (e.g., the Mediterranean diet, ketogenic diet, and intermittent fasting) have emerged to reflect the well-being trend, and there is room for further research on whether CCHE has effects on diet. Lastly, the surveys in this research were conducted in Korea, and the results cannot be applied to foreign consumers. Therefore, opportunities to research foreign customers' perceptions of meat products related to healthy images remain.

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II. Essay 2: Identifying the Factors Affecting the Intention to Purchase Protein Supplements

Chapter 1. Introduction

“Dumbbell economy” is a newly coined phrase in Korea that refers to the fact that the market is experiencing massive investments in health care due to consumers’ –increasing interest in their health status (Kim and Kim, 2021, Song, 2020a). The spread of the corona virus in 2019 (COVID–19) has further accelerated this phenomenon, and the protein market has increased from only 80 billion won in 2018 to 400 billion won in 2022 (expected) with a 30% increase subsequent to the outbreak of the COVID–19 pandemic (aTFIS, 2022). The pandemic has raised concerns about individual health, and consumers are trying to improve their health by controlling their food intake (Jaeger et al., 2021). As weight management is one of the most important health issues for adult men and women, interest in protein–rich foods in addition to exercise, diet control, and diet management, has increased (aTFIS, 2022).

Historically, protein supplements have been consumed primarily by athletes for functional or medical benefits (Guefai et al., 2022). However, nowadays, well–being and lookism have spread, and consumers are more interested in their health than before and seek appropriate food to satisfy their needs. Consumers have started recognizing protein as the most satiating macronutrient and food,

with a significantly higher satiety score (Barkeling et al., 1990, Benelam, 2009). Protein-rich foods can help consumers control their food intake when they are seeking to lose or gain weight (MacKenzie-Shalders et al., 2015), so consumers have increased their consumption of protein supplements.

The desire for protein-rich foods has become an important consumer trend and many food producers are developing such foods to meet consumers' needs (Bäuerle and Kühn, 2022, Arenas-Jal et al., 2020). Furthermore, many products with added nutritional value are being released in the market to meet consumers' requirements for convenience and nutrition because consumers want to use their eating time more efficiently to manage their busy daily lives (Barska, 2018, Arenas-Jal et al., 2020, Stranieri et al., 2017). Thus, due to their comprehensive benefits, consumers are using protein supplements as dietary substitutes to meet their needs (Scholliers, 2015, Samal and Samal, 2018).

Protein supplements belong to the category of dietary supplements, which has been the subject of many studies. According to the Dietary Supplement Health and Education Act (DSHEA), a dietary supplement is defined as a product containing additional ingredients (e.g. a vitamin, a mineral, an amino acid, and a whey protein) to supplement the diet (Act, 1994, Dickinson and MacKay, 2014). The use of dietary supplements is considered to have a positive effect on an individual's health status, particularly by ensuring a recommended daily nutrient intake (Kim et al., 2001, Kim et al., 2018, Dickinson and MacKay, 2014). Studies on dietary supplements have focused on understanding the status of consumption. Dietary supplements are more popular among women than men, and the usage rate increases with age (Dickinson and

MacKay, 2014). Dietary supplement users believe that these supplements contribute to a healthy life and perceive them as a lifestyle habit (Dickinson and MacKay, 2014). According to Kang et al. (2017), consumers believe that using dietary supplements is as healthy as eating fruits and vegetables, and that there is a positive correlation between consuming fruits, vegetables, and supplements.

Although the market for protein food has grown rapidly in recent years, few studies have focused on protein supplements from a consumer perspective. Existing studies on protein supplements have focused on athletes' performance enhancement or muscle physiology (Samal and Samal, 2018, Pasiakos et al., 2015, Graf et al., 2011, Slater and Phillips, 2013). Accordingly, this study aimed to identify the factors related to the purchase of protein supplements and discuss the results and implications of the experiments using data from a survey of 400 consumers.

Chapter 2. Literature Review

2.1. Marketing communication method:

Message framing and formulation

The focus of the message, emphasized by the product type or consumption goal, is also an important issue in marketing (Micu and Chowdhury, 2010, Kong and Zhang, 2014, Klein and Melnyk, 2016). Consumer evaluation would be different depending on products' characteristics, consumption goal and message framing. Utilitarian and hedonic values are the two product features that consumers select. Hedonic values are related to fun evoking, excitement, joy, and fantasy, whereas utilitarian values are related to instrumentality, functionality, goal-orientation and self-control (Dhar and Wertenbroch, 2000, Alba and Williams, 2013, Holbrook and Hirschman, 1982).

2.2. Message framing and the promotion healthy behavior

Message framing is an effective tool for delivering health-related messages to consumers and promoting healthy behaviors (Gallagher and Updegraff, 2012, Smith and Petty, 1996, Trudel-Guy et al., 2019). Types of health-promoting message include health and appearance based messages (Putterman and Linden, 2004, O' Hara et al., 2014). Health-based messages focus on health results from practicing healthy behaviors, while appearance-based messages focus on physical appearance as a result of healthy

behaviors (Gaston and Gammage, 2010). Many studies have examined the effectiveness of these two message types, but it is difficult to conclude that one is more effective than the other. Studies emphasizing health (Hadfield et al., 2022) and appearance (O' Hara et al., 2014) report conflicting findings in terms of promoting exercise. In studies on sun lotions, appearance based messages have resulted in increased consumer intention to engage in skin protection (Thomas et al., 2011). However Cornelis et al. (2014) argued that the effect of messages focusing on health or appearance would depend on people' s orientation on health or appearance. In food related studies, Putterman and Linden (2004) showed that individuals with health-based motives had more positive eating patterns than those with appearance based-motives. Sang-Hee and Young-Kyu (2010) found that appearance consciousness fostered healthy menu choices in restaurants. The results vary for each research topic, and no studies have focused on protein supplements with this message framing.

2.3. Studies on formulation

Research on energy intake and satiety has compared liquid and solid forms of food, and the findings have varied depending on the form (Mourao et al., 2007, Leidy et al., 2010). Studies have shown that solids are effective in reducing satiety and hunger (Cassady et al., 2012, Flood-Obbagy and Rolls, 2009). However, the results have also shown that liquids have a greater effect on weight gain than solids (Leidy et al., 2010, Pan and Hu, 2011). Consumers form their preferences for the type of food formulation based on the studies' results. However, there is a lack of studies on the

preferences of formulations from a consumer' s point of view.

Bar and drink types were selected for this study. According to the aTFIS (2022), Korean consumers prefer protein supplements mostly in the drinks, and bars. Additionally, bar and drink forms are familiar types for carrying out the meal replacement function (Jovanov et al., 2021, Song, 2020b). According to Szocs and Lefebvre (2016), people' s evaluation of the perceived healthiness of food products would be different depending on the degree of processing. The blend effect explains that people have low perceived healthiness from processed food products. Significantly, drink types are recognized as healthier than bar types (Szocs and Lefebvre, 2016). In terms of product characteristics, the bar shape retains the raw material form of the ingredients, and the ingredients lose their shape in a drink form.

Consumption mismatch is a condition in which there is a mismatch between the the benefits that product provides and communicated benefits (Klein and Melnyk, 2016). Consumers raise their information processing level and evaluate mismatch products more positively (Klein and Melnyk, 2016). As the protein supplements have a utilitarian value, the products with hedonic message framing would increase the consumers' intention to purchase. Since consumers perceive the drink form of protein supplements as less healthy (Szocs and Lefebvre, 2016), the products with a utilitarian message framing would impact the consumers' intention more efficiently. Therefore, this study sought to determine the effectiveness of different formulations and messaging on consumers' evaluations. The following hypothesis is presented:

H1: Consumers' purchase intention will vary depending on the protein supplement's formulation and message framing

2.4. Means–end chain (MEC) theory and food–related lifestyle (FRL)

The means–end chain (MEC) theory holds that consumers depend on personal values (Gutman, 1982). According to the MEC theory, people purchase products for the benefits that they provide, not for the sake of products (Buckley et al., 2007). De Boer et al. (2005) supported the MEC theory and emphasized its value for investigating motivational cognitive processes related to the purchase and consumption of foods. MEC theory helps to understand consumers' choices of products and is well established in food–related literature (Grunert and Grunert, 1995, Chema et al., 2006, Barrena and Sánchez, 2009). Furthermore, this theory helps explain why consumers choose a product or service and which particular areas influence (Buckley et al., 2007, Olson and Reynolds, 2001).

Grunert et al. (2001) investigated the concept of food–related lifestyles (FRL) based on the MEC and suggested five dimensions of FRL. The FRL concept is particularly important, as it helps to provide an understanding of the role of food and convenience orientation (Buckley et al., 2007). Individuals reflect their values in the product attributes, and thus FRL indicates the attributes of selected food items (Brunsø et al., 1996). According to previous studies, convenience includes three components: time, physical energy, and mental energy (Kaufman, 1996, Berry, 1979, Candel, 2001). Specifically, “convenience is associated with reducing the

input required from consumers in either food shopping, preparation, cooking or cleaning after the meal” (Publications, 2002). Buckley et al. (2007) developed a number of measures to investigate convenience FRL and suggested several dimensions.

Foods that can replace the need for cooking are recognized as convenience foods (Nakano and Washizu, 2020, Casini et al., 2019). Bars and drinks are viewed as meal replacements (Jovanov et al., 2021, Song, 2020b), and thus it would seem that the convenience food lifestyle dimensions could be applied to protein supplements in the form of bars or drinks (Buckley et al., 2007). Previous studies have shown that food choices vary depending on lifestyle (Sjöberg et al., 2003, Zanchini et al., 2022, Pellegrini and Farinello, 2009, van der Horst et al., 2011), In this study, it is assumed that the intention to purchase protein supplements will vary depending on the consumers’ FRL.

Additionally, the current study investigates consumers’ preferences regarding food formulation. The consumers’ preferred form will vary depending on the consumption purpose (Chernev, 2004). This means that consumers have different preferences depending on the formulation of products. This understanding leads to the following research hypotheses.

H2: FRL factors impact consumers’ purchase intention regarding protein supplements

H3: The factors affecting purchase intention would differ depending on the formulation

2.5. Physical activity

The lifestyle patterns linking physical activity and diet are diverse and have been the subject of research. According to Lowry et al. (2000), students who exercise regularly are more likely to eat fruits and vegetables and are unlikely to eat high-fat foods. Meanwhile, people who engage in physical activity eat less healthy foods (McAloney et al., 2012). Pearson and Biddle (2011) found that inactive people are linked to unhealthy diets. Accordingly, the following hypothesis is presented:

H4: Physical activity affects consumers' purchase intentions regarding protein supplements

2.6. Health consciousness and its moderating effect

Health consciousness is an indicator of a person's level of involvement in remaining healthy and interested in health-related issues (Dutta-Bergman, 2005). Moorman and Matulich (1993) found that more health-conscious consumers constantly search for health-related information, and are willing to change their behavior to improve their health (Espinosa and Kadić-Maglajlić, 2018). Moreover, messages focusing on health are effective in inducing healthy behavior, and healthy products with health-related messages affect consumers' evaluations of products (Rothman et al., 2006, Castonguay et al., 2013, Gallagher and Updegraff, 2012). Mai and Hoffmann (2012) argued that messaging is an important strategy for targeting health-conscious consumers. This leads to the following hypotheses:

H5: The purchase intention of consumers with high levels of health consciousness is greater than that of consumers with low levels of health consciousness

H6: Health-focused messages increase the purchase intention of consumers with high levels of health consciousness

Chapter 3. Method

3.1. Sample

The data for this study were collected through a web survey. Embrain, a market research company in Korea, gathered participants for this survey. People aged 20 or older were included in the target population, and information about the survey was introduced to them in advance. They were informed that the data extracted from the study would remain confidential and would only be used for research purposes. Only those who agreed to participate in the study were included in the experiment. Four hundred surveys were completed. Participants were randomly assigned one of four conditions in a 2 (formulation: drink, bar) x 2 (message: health, appearance) between-subjects design. For this study, the authors selected the drink and bar types as protein supplement' formulations. However, Korean consumers mostly prefer drinks, bars, and powders for protein supplements (aTFIS, 2022). Furthermore, consumers with an exposure to only powder form of supplements can have a biased perception. Instead, the other types are familiar to the public and could provide more insights to practitioners. Two types were selected. The stimuli used in the experiment are presented in Appendix A. The characteristics of the sample are presented in Table 14. The research protocol was reviewed and approved by the Institutional Review Board (IRB) of Seoul National University (IRB No. 2211/004-003) prior to the beginning of data collection.

Table 13. Number of final responses

Formulation Message Framing	Bar		Drink	
	Health	Appearance	Health	Appearance
N	100	100	100	100

3.2. Survey

The survey form consisted of four sections. The first section included the agreement to participate in the study. The second section was dedicated to eliciting the participants’ purchase intention related to protein supplements. Respondents were shown one of the four stimuli according to the group they were placed in and asked to rate their level of purchase intention using a Likert scale. In the third section, participants were asked to reply to questions about their FRL, physical activity, and health consciousness. The fourth section included a questionnaire on demographic characteristics.

The questionnaires were developed using items from the relevant literature. Items on physical activity were derived from Lowry et al. (2000), and convenience FRL measures included eight items from Buckley et al. (2007). Protein supplements in the form of bars and drinks are convenience foods, so the convenience FRL concept was applied in this study. The FRL factors, relevant to the protein supplements were selected for analysis in this study.

“Time pressure” measures the extent to which an individual is aware of the burden on available time resources. “Stress level” measures the extent to which an individual perceives stress.

“Eating alone” measures the extent to which an individual prefers

convenient food choices when eating alone. “Snacking” measures the extent to which the individual consumers snacks between fixed meals. Three items from Shin and Mattila (2019) were utilized to measure health consciousness. Purchase intention was measured using three items from (Chen and Lee, 2015). Respondents indicated their level of agreement with the statements on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The measures used in this study are presented in Appendix B.

Table 14. Socio-demographic characteristics of the sample

	Characteristics	N	%
Age	20 ~ 29	100	25
	30 ~ 39	100	25
	40 ~ 39	100	25
	50 or above	100	25
Gender	Male	200	50
	Female	200	50
Marital status	Single	210	53
	Married	190	47
Monthly Income	~ 199	75	19
	200 ~ 399	176	44
	400 ~ 599	83	21
	600 ~ 799	40	10
	800 or above	26	7
Experience of gym supplements	Experience	216	54
	Nonexperience	184	46

Chapter 4. Results

4.1. Analysis of validity and reliability

The collected data were analyzed using R 4.1.3 software. Confirmatory factor analysis (CFA) was conducted to estimate the proposed measures. The CFA generated factor loadings for each measurement, which could be used as a single index. Churchill Jr (1979) suggests that a Cronbach's α value of 0.6 is acceptable and Hair (2009) suggests that a factor loading of 0.5 is acceptable. The Cronbach's α and composite reliability values of all measurements were above the lower limit of 0.6, indicating good internal consistency. Fornell and Larcker (1981) suggests that average variance extracted (AVE) value of 0.5 is acceptable. The AVE of all factors exceeded the minimum level of 0.5, and the measurements had more than 50% variation with the latent variable. The effects of the CFA assessments are shown in Table 15.

Table 15. Confirmatory factor analyses

Factors (Cronbach's α)	Measure	Factor Loading	C.R.	A.V.E.
Time pressure (0.825)	I am often rushing to get everything done	0.803	0.838	0.742
	I am always in a rush	0.858		
Stress levels (0.851)	In the last month difficulties were piling up so high that I could not overcome them	0.727	0.851	0.741
	Recently I have been unable to control the important things in my life	0.984		
Snacking	I eat whenever I feel the slightest bit hungry	0.818	0.695	0.533

(0.693)	I snack a lot when I am at home on my own	0.648		
Eating alone (0.833)	I don't usually prepare a proper meal when there's just me	0.992	0.797	0.577
	I don't enjoy cooking just for myself	0.707		
CFI = 0.987, TLI = 0.975, RMSEA = 0.049, SRMR = 0.025				
Health consciousness (0.784)	I choose food carefully to ensure good health	0.763		
	I think of myself as a health-conscious consumer	0.914	0.797	0.577
	I think often about health issues	0.561		
CFI = 1.000, TLI = 1.000, RMESA = 0.000, SRMR = 0.000				
Purchase intention (0.902)	After seeing the above information, I would consider buying protein supplement	0.928		
	After seeing the above information, the probability that I would consider choosing protein supplement is high	0.903	0.905	0.762
	After seeing the above information, I would recommend Protein supplement to others	0.782		
CFI = 1.000, TLI = 1.000, RMESA = 0.000, SRMR = 0.000				

4.2. Hypothesis testing

To analyze the effect of formulation, message framing, lifestyle, physical activity, and health consciousness, a regression analysis was performed as follows:

$$\begin{aligned}
 Y = & a + b1 * X_{Age} + b2 * X_{Gender} + b3 * X_{Marriage} + b4 * X_{Income} \\
 & + b5 * X_{B.M.I.} + b6 * X_{E.O.G.} + b7 * X_{Time\ pressure} + b8 * X_{Stress\ level} \\
 & + b9 * X_{Eating\ alone} + b10 * X_{Snacking} + b11 * X_{Vigorous\ physical\ activity} \\
 & + b12 * X_{Muscle\ physical\ activity} + b13 * X_{Health\ consciousness} + b14 * \\
 & X_{Formulation} + b15 * X_{Message} + b16 * X_{Formulation*Message} + b17 * \\
 & X_{Health\ consciousness*Message}
 \end{aligned}$$

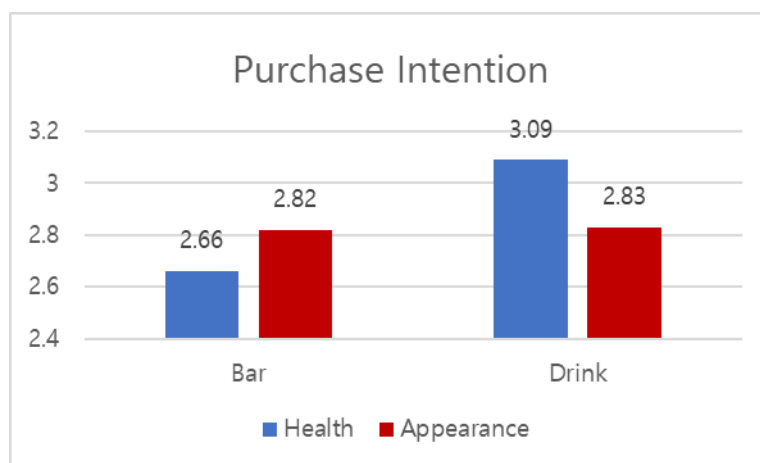
The variables utilized in the model are shown in Table 16.

Table 16. Summary Statistics of the Study Variables

Variables			n/ mean
Dependent variable	Purchase intention	5-point Likert scale (1 = no intention, 5 = strongly intent)	2.84
Independent variables	Time pressure	5-point Likert scale (1 = strongly disagree, 5 = strongly agree)	3.31
	Stress level	5-point Likert scale (1 = strongly disagree, 5 = strongly agree)	2.69
	Eating alone	5-point Likert scale (1 = strongly disagree, 5 = strongly agree)	3.13
	Snacking	5-point Likert scale (1 = strongly disagree, 5 = strongly agree)	2.69
	Vigorous physical activity (V.P.A.)	Open-ended	1.63
	Muscle physical activity (M.P.A.)	Open-ended	1.86
	Health consciousness (H.C.)	5-point Likert scale (1 = strongly disagree, 5 = strongly agree)	3.25
	Formulation	Drink = -1	200
		Bar = 1	200
	Message	Appearance = -1	200
Health = 1		200	
Formulation * Message	Drink * Appearance = 1	100	
	Drink * Health = -1	100	
	Bar * Appearance = -1	100	
	Bar * Health = 1	100	
Health consciousness (H.C.)* Message	H.C. * Appearance => (-)	200	
	H.C. * Health => (+)	200	
Control variables	Age	Open-ended	39.25
	Gender	Male = 1	200
		Female = -1	200
	Marriage	Married = 1	210
		Single = 2	190
	Income	Open-ended (10,000 KRW)	380.6
	B.M.I.	Open-ended	23.05
Experience of gym supplements (E.O.G.)	1 = have experienced	216	
	2 = have not experienced	184	

The average purchase intentions for protein supplements are illustrated in Figure 2. In the case of the bar shape, the intention for an appearance-focused message was higher than the intention for a health-focused message. However, the intention for a health-focused message was higher than the intention for an appearance-focused message for drink shape.

Figure 2. Mean purchase intention for protein supplements (unit: score)



This study analyzed the effect of the independent variables on the dependent variables while keeping the demographic variables constant. The hypotheses were tested using stepwise regression analysis, and the results are presented in Table 17. The changes in the model were analyzed by adding or subtracting independent variables to identify the variables' effect on intentions and different effects between variables.

As seen in Table 17, when only control variables were included, age and experience with gym supplements had a significant impact in Model 1. The coefficient of determination (R^2) was 0.053,

indicating that 5.3% of purchase intention was explained by these demographic variables. Model 2 considered the effects of lifestyle factors, physical activity, and health consciousness. The results showed that vigorous physical activity, stress level, eating alone, and health consciousness had a significant impact on purchase intentions. However, experience with gym supplements did not have a significant effect. When these variables were added, the R2 increased to 0.145 or 14.5%. This R2 change (0.092) was significant ($p < 0.001$). This implies that an additional 9.2% of the variation in consumers' intention to purchase protein supplements was explained by lifestyle factors, physical activities, and health consciousness. Model 3 considered formulation, message framing, and the interaction effect of message framing. R2 increased from 14.5% to 18.4%, indicating a change of 3.9 percent, which was significant ($p < 0.001$). The final model explained 18.4 percent of the variation in consumers' intention to purchase protein supplements. Almost all hypotheses were supported. Specifically, the results showed that protein supplements in the form of drinks had a positive effect on purchase intention, and the degree was amplified with health-focused message (message did not appear significant alone). However, the protein supplements in the form of bars had a negative effect on purchase intention, and the degree increased with the appearance-focused message (message did not appear significant alone).

Table 17. Stepwise regression analysis predicting intention to purchase protein supplements, for the total sample (n = 400)

Variables	Purchase intention for Protein supplements		
	Model1	Model2	Model3
(Intercept)	2.903 ***	0.968	0.988

Age	0.012 *	0.012 *	0.012 *
Gender	0.067	0.003	-0.016
Marriage	-0.103	-0.092	-0.079
Income	-0.000	-0.000 *	-0.000 **
B.M.I.	-0.000	0.004	0.003
E.O.G.	-0.261 **	-0.156	-0.136
Time pressure		-0.004	-0.014
Stress level		0.145 **	0.138 **
Eating alone		0.107 *	0.109 *
Snacking		-0.007	-0.014
V.P.A.		0.055 *	0.057 *
M.P.A.		0.001	-0.005
H.C.		0.296 ***	0.322 ***
Formulation			-0.123 **
Message			-0.373
Formulation * Message			-0.105 *
H.C. * Message			0.119 *
R2	0.053	0.145	0.184
ΔR^2		0.092 ***	0.039 ***
F	3.678 **	5.047 ***	5.081 ***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In addition, regression analysis was conducted for each formulation of protein supplements and the results were presented on Table 18 and Table 19. The results showed that the factors influencing purchase intention were different depending on product formulations. In the case of bars, more vigorous exercise, higher health consciousness, higher emphasis on appearance, and higher purchase intention were evident. Specifically, with a health-focused message, the positive effect of health consciousness on the intention to purchase increased. The coefficient of determination (R^2) was 0.180, indicating that 18% of purchase intention is explained by variables. On the other hand, variables showed different result in the form of drinks. Among the variables, stress level, eating alone, and health consciousness were significant. They appear to have a positive effect on purchase intention. The coefficient of determination (R^2) was 0.214, indicating that 21.4%

of purchase intention is explained by variables.

Table 18. Stepwise regression analysis results for protein supplements in the form of bars (y = purchase intention, n = 200)

Variables	Purchase intention for Protein supplements		
	Model1	Model2	Model3
(Intercept)	2.387 **	1.194	1.120
Age	0.014 *	0.013	0.012
Gender	0.081	0.041	0.015
Marriage	0.005	-0.042	-0.033
Income	-0.000	-0.000	-0.000
B.M.I.	0.000	-0.003	-0.000
E.O.G.	0.199	-0.134	-0.103
Time pressure		0.067	0.016
Stress level		0.110	0.115
Eating alone		-0.022	0.013
Snacking		0.008	-0.004
V.P.A.		0.113 **	0.110 **
M.P.A.		-0.040	-0.049
H.C.		0.237 *	0.299 **
Message			-0.82 **
H.C. * Message			0.223 *
R2	0.047	0.147	0.180
ΔR2		0.1 **	0.033 *
F	1.611	2.475 **	2.708 ***

* p < 0.05, ** p < 0.01, *** p < 0.001

Table 19. Stepwise regression analysis results for protein supplements in the form of drinks (y = purchase intention, n = 200)

Variables	Purchase intention for Protein supplements		
	Model1	Model2	Model3
(Intercept)	3.504	0.806	0.685
Age	0.009	0.013	0.012
Gender	0.045	-0.002	-0.008
Marriage	-0.207	-0.101	-0.079
Income	-0.000	-0.000	-0.000
B.M.I.	-0.003	0.009	0.011
E.O.G.	-0.348 **	-0.239	-0.210
Time pressure		-0.015	-0.021
Stress level		0.133 *	0.139 *
Eating alone		0.191 **	0.194 **
Snacking		-0.011	-0.015

V.P.A.		0.010	0.006
M.P.A.		0.030	0.035
H.C.		0.338 ***	0.342 ***
Message			0.067
H.C. * Message			0.015
<hr/>			
R2	0.072	0.198	0.214
$\Delta R2$		0.126 ***	0.016
F	2.503 **	3.546 ***	3.357 ***
<hr/>			
* p < 0.05, ** p < 0.01, *** p < 0.001			
<hr/>			

Chapter 5. Discussion

Our primary goal in this study was to identify the factors influencing the intention to purchase protein supplements. To achieve this goal, the current study investigated the effect of food formulation, message framing, lifestyle, physical activity, and health consciousness on the intention to purchase protein supplements. The authors conducted an online survey to verify the study's hypotheses using a between-subjects design. As part of this study 400 responses were collected. The data were analyzed using stepwise regression and multiple regressions. The findings from this study and their implications are discussed below.

5.1. Theoretical implications

Consumers show different purchase intentions for protein supplements depending on the formulation. In the case of bars, when appearance was emphasized, purchase intention was higher than when health was emphasized. This was caused by a phenomenon of consumption goal mismatch, which required a higher level of consumers to process information. On the other hand, purchase intention in the case of drinks was higher when the health message was emphasized. The following assumptions are possible for this result. First, the consumption goal mismatch did not appear in the form of drinks. If consumers recognized protein supplements as a utilitarian function, the purchase intention with the hedonic message should have appeared higher. Protein supplement drinks might be an exception case in which the estimation is higher in the consumption goal match and not the consumption goal mismatch.

Due to the blender effect, consumers perceived the products as less healthy and might raise their processing level when the health message was focused. Thus, H1 is sustained.

The study findings revealed that factors concerning lifestyle directly impacted the intention to purchase protein supplements. Previous studies have divided consumers into segments based on lifestyle (Verain et al., 2012, Buckley et al., 2007, Nie and Zepeda, 2011). However, the current study identifies how specific factors concerning lifestyle impact purchase intention. Stress level and eating alone have positive impacts on purchase intention. Interestingly, and in contrast to the existing studies that people usually enjoy hedonic eating under stress (Fennis et al., 2022, Torres and Nowson, 2007), consumers have greater intention when their stress levels are high. This positive effect might reflect that consumers perceive protein supplements as hedonic products. In addition, consumers prefer to eat protein supplements when they solve their meal conveniently, eating alone. Furthermore, it was noted that time pressure was found to be insignificant regarding purchase intention. People who are short of time want to use their eating time efficiently, so the bar and drink forms of protein supplements meet their requirements to manage time pressure. However, in this study, it appeared insignificant. The current study had differentiated points identifying the relative impacts of lifestyle factors on purchase intention. Thus, H2 is sustained.

Physical activity and health consciousness have positive impacts on the purchase intention for protein supplements. An interesting finding is that vigorous physical activity was significant, but in contrast to the existing study (Lowry et al., 2000), muscle physical activity was insignificant for purchase intention. These

results might be caused by respondents' characteristics. As shown in Table 16, the average frequency of physical activity per week for respondents remained about 1. Since the participants were not involved much in exercise, muscle physical activity might not have a significant impact. Health consciousness has a positive impact on consumers' intentions to purchase. This outcome is supported by many studies (Chen, 2011, Huang et al., 2022, Kim and Moon, 2022). Additionally, this paper hypothesizes that health messages have a moderating effect on the relationship between health consciousness and purchase intention. The results support the significance of health-focused message framing (Gallagher and Updegraff, 2012, Shen and Dillard, 2007), and this effect amplifies for health-conscious consumers. Thus, H4, H5, and H6 are sustained.

The stepwise regression analysis revealed that the factors have different significant impacts depending on the formulation of the protein supplements. First, demographic factors did not appear to be significant. However, in Model 1, age impacted the purchase intention of the protein bar, and the experience of gym supplements impacted the purchase intention of the protein drinks. Next, other factors showed a different impact on purchase intention depending on the formulation. In the protein bar, variables related to lifestyle were not significant, and physical activity, health consciousness, message, and interaction effect between health consciousness and message were significant. On the other hand, lifestyle variables were significant but other factors were not. This result shows that consumers perceive the same product differently based on food formulation and contribution to the literature that can be used as a cue for the future studies. Thus, H3 is sustained.

The results demonstrated that respondents demographics (age, income, and experience of gym supplements) show effects on consumers' purchase intention. Older individuals are more concerned than young people about their eating habits for health-related reasons (Hayes and Ross, 1987). Some studies have shown that older people prefer healthier food more than young people (Roininen et al., 1999, Westenhoefer, 2005) and the results of this study are consistent with such research. Contrary to conventional wisdom, it was found that the higher the income, the lower the purchase intention related to protein supplements. In general, the demand for inferior goods decreases when consumers' income increases. However, it is hard to find evidence regarding inferior goods, and the results of this study are obviously different from those of other studies related to investments in healthy products (Zhang et al., 2006, Rivera and Currais, 2003). In addition, experience with gym supplements influences purchase intention, which supports previous findings about the effect of experience on purchase intention (Zi-Ying and Ling-Yun, 2011, Nasermodeli et al., 2013).

5.2. Practical implications

The results of the present study have several implications for practitioners preparing appropriate marketing strategies by deciphering consumers' buying behaviors and responding to the growing demand for protein supplement products (Figiel and Kufel, 2016). Specifically, the use of drink shape can increase purchase intention, and the effect increases more with the health focused message. Consumers have different perceptions of different

formulations, so marketers should consider marketing methods while segmenting them. These directions can be applied to other healthy foods, so this result would provide meaningful insights for practitioners who work in other food industries. This study also advises managers to focus on lifestyle factors, especially stress and convenience orientation when eating alone, to stimulate consumers' intention to purchase protein supplements. For example, managers can position protein drinks for stressful modern people in daily life and for those who eat alone to meet all the nutrients without cooking. In addition, the potential beneficiaries of this study include policy-makers, who are interested in promoting healthy eating. For policymakers, this study shows that campaigns encouraging health-friendly lifestyles promote healthy eating habits among the public.

Chapter 6. Conclusion, limitations, and future research

6.1. Conclusion

Protein supplements represent an emerging food market, and the consumption of protein supplements is expected to increase. This study represents the first attempt to investigate the factors influencing consumers' purchase intention related to protein supplements in terms of formulation, message framing, lifestyle, and health consciousness and discusses the implications of the results. Importantly, this is the first study to examine protein supplements from a consumer's perspective. The results confirm that the overall factors used to test the hypotheses have positive effects on consumers' purchase intention. Hence, the results could offer guidance to practitioners and scholars regarding the factors that influence consumers' purchase intentions for protein supplements.

6.2. Limitations and scope for future research

Although the current study offers novel insights, it has several limitations, that provide further research opportunities. First, the result on income cannot be explained. The protein supplement belongs to dietary supplements, so people would purchase products with affordable budgets. However, the results of this study show the opposite result, which may be an exception to this study, or a future study could investigate this result. Second, the results are limited to a Korean sample. Since this experiment and survey were

conducted on 400 people living in Korea, it is impossible to generalize the results in consideration of consumers in other countries. Other studies can be conducted on other countries' consumers. Third, the results do not predict actual purchase behaviors. Although it has been claimed that purchase intention can predict purchase behavior, it is not known whether intention leads to action. Further research could explore buying behavior to narrow the gap between intention and behavior. Although the present study attempted to identify factors affecting the intention to purchase protein supplements, future research could investigate purchasing behavior to narrow the gap between purchase intention and behavior.

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Appendix A. Stimulus



Appendix B. Measurement items used in study

Factor	Items	Reference
Time pressure	I am always looking to save time ¹⁾	Buckley et al. (2007)
	I am often rushing to get everything done	
	I am always in a rush	
Stress levels	In the last month difficulties were piling up so high that I could not overcome them	Buckley et al. (2007)
	Recently I have been unable to control the important things in my life	
	Lately things have been going my way ¹⁾	
Snacking	I eat before I get hungry which means I am never hungry at mealtimes ¹⁾	Buckley et al. (2007)
	I eat whenever I feel the slightest bit hungry	

	I snack a lot when I am at home on my own	
Eating alone	I don't usually prepare a proper meal when there's just me I don't enjoy cooking just for myself	
Vigorous physical activity	How many times do vigorous physical activity (exercised or took part in sports that made them sweat and breathe hard for at least 20 minutes) in a week?	Adapted from
Muscle physical activity	How many times do muscle physical activity (muscle strengthening or toning exercises, such as push-ups, sit-ups, or weightlifting) in a week?	Lowry et al. (2000)
Health Consciousness	I choose food carefully to ensure good health I think of myself as a health-conscious consumer I think often about health issues	Shin and Mattila (2019)
Purchase intention	After seeing the above information, I would consider buying protein supplement After seeing the above information, the probability that I would consider choosing protein supplement is high After seeing the above information, I would recommend Protein supplement to others	Chen and Lee (2015)

1) Deleted due to low score on validity

국 문 초 록

건강한 식단 관점에서 바라본 단백질 식품 소비

소비자들의 건강에 대한 관심이 커지면서 단백질 식품에 대한 관심도 급증하였다. 본 연구는 단백질 식품의 구매에 영향을 미치는 요인들에 대한 분석을 건강한 식단 관점에서 분석하였다. 첫번째 연구에서는 소비자 패널들의 농식품 구매 영수증 데이터를 활용하여 회귀분석을 통해 건강한 식단에 대한 소비자 인식도와 축산물 구매 간의 관계를 조사했다. 연구를 수행하기 위해 4개의 범주에 속한 축산물 제품들의 소비자 구매 횟수를 사용하였다. 연구 결과, 소비자들의 건강한 식단에 대한 의식도가 베이컨, 소시지, 그리고 닭가슴살의 구매 횟수에 영향을 미쳤다. 의식 수준이 높을수록 베이컨, 소시지 구매 횟수는 감소하였으며, 반대로 의식 수준이 높을수록 닭가슴살 구매 횟수는 증가하였다. 두번째 연구에서는 단계적 회귀분석을 사용하여 단백질 보충제 구매 의도에 영향을 미친 변수들을 조사했다. 본 연구를 위해 400명의 참가자들을 대상으로 온라인 설문조사를 수행하였으며, 피험자간 설계 방식을 통해 실험을 설계하였다. 그 결과 단백질 보충제의 제형, 라이프 스타일, 신체 활동, 건강 의식도가 구매 의도에 유의미한 영향을 미쳤다. 특히 메시지 프레이밍의 제형과 건강 인식도와의 상호 효과가 구매의도에 유의미한 영향을 미쳤다. 본 연구를 통해 도출한 시사점 및 향후 연구를 위한 제언들을 각 연구의 마지막 장에 수록하였다.

주요어: 단백질 식품, 축산물 제품, 단백질 보충제, 다중 회귀분석, 피험자간 설계, 단계적 회귀분석

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