

A Study on the Importance and Satisfaction of Protein Supplement of College Students Majoring in Physical Education

Joeun Lee*

Department of Food and Nutrition, Seowon University, Korea; joody88@hanmail.net

Abstract

This study investigated the importance of and satisfaction level with protein supplements among university students majoring in physical education. The importance and satisfaction perceived by the subjects were analyzed to be used as a basic set of data for improving the quality of protein supplements. Of a total of 536 students, those who took protein supplements were 228(42.5%). There were a total of 307 males (57.8%) and 224 females (42.2%). A significantly higher number of male students took protein supplements than female students ($p < 0.001$) and those who did muscle exercise or had joined a health club had significantly higher numbers of protein supplement takers ($p < 0.001$). In all categories excluding the three categories of 'product advertisement and brand awareness', 'packaging design', 'form of product, e.g. pills, capsules or powder', the mean score for importance was significantly higher than that of satisfaction level ($p < 0.01$, $p < 0.001$). The analysis of importance-satisfaction showed that while importance was ranked high for 'after-sales service', 'price and quantity' and 'portability', satisfaction for these categories was low, indicating a need for improvement. The study findings show that when developing protein supplements, the focus should be on internal factors such as the efficacy and ingredients of the product and that after-sales service needs to be improved. Moreover, products and packaging that make it more convenient to carry the product and take them when necessary is also recommended to improve satisfaction level. Reasonable prices for products and ways to increase satisfaction with the efficacy of the product will also have to be considered.

Keywords: After-sales Service, Efficacy, Importance, Protein Supplement, Satisfaction

1. Introduction

Protein supplements refer to commercially manufactured and processed products taken to improve the power and size of muscles as well as exercise capabilities. They are one category of ergogenic aids that provide protein or amino acids to the body when taken^{1,2}. Because protein supplements are extracted and refined from natural protein, they are not all that different in their function to control the synthesis of muscle protein compared to high protein food¹, but make it easier to carry and thus take before or after exercise, reduces the

concern for storage and does not contain fat as with natural protein in food. As a result, there has been a gradual increase in the intake of protein supplements³. In particular, when doing resistance exercise such as muscle strength exercise, supplying an adequate amount and quality of protein at the optimal timing can help improve exercise capabilities and promote quick recovery of the muscle^{4,5} and therefore it is expected that the intake of protein supplements will gradually increase³. As today's society and culture value of appearances, increasing number of laymen who are not professional athletes are taking protein supplements in order to increase the

*Author for correspondence

externally visible muscle mass⁶⁻⁹. But the lack of guidelines on how to take them, what their nutritional efficacy is, and what their side effects may be have led to misinformation among takers of protein supplements. As such, more education and promotion on these aspects is needed^{1,10}. It is also necessary to understand the importance takers attach to protein supplements and their level of satisfaction after intake to receive feedback on the product. Therefore, this study used college students majoring in physical education, who are likely to take protein supplements, as subjects to analyze the importance of and satisfaction level with these supplements perceived by the subjects. The results will provide a basic set of data for improving the quality of protein supplements.

2. Methods

2.1 Research Subjects and Duration

A survey was conducted from December 2, 2013 to December 13, 2013 among university students majoring in physical education at 10 universities located in 4 regions. A total of 800 copies of the survey were distributed, of which 680 were collected. Excluding those whose answers were incomplete or non-existent, 536 copies were used for analysis.

2.2 Survey Content and Method

The study was conducted through a survey on university students. The questionnaire used for the study was composed to gauge the importance of and satisfaction with protein supplements as well as general items. In the category of general items, the subjects' age, gender, grade, sports they engaged in, their club activities, alcohol consumption and whether they smoked were investigated using a nominal scale. The importance of and satisfaction with protein supplements were measured using a five point Likert scale (1=very low, 5=very high).

2.3 Data Analysis

Statistical analysis was conducted using SPSS ver. 18.0 for window (Statistical Package for Social Science, SPSS Inc, Chicago, IL, USA). First, a frequency analysis was conducted for the demographic characteristics of subjects and to verify the validity, a factor analysis was conducted. In order to verify the internal consistency of each factor that was identified through the factor analysis, a reliability

analysis was conducted. After calculating the mean value for the importance and satisfaction using technical statistical analysis, a t-test was conducted to analyze the difference between importance and satisfaction values. A grid sensitivity analysis was done to set the x axis and y axis at the mean value of each, divides the areas into four and analyzed the importance and satisfaction level perceived for each segment.

3. Results

3.1 General Aspects of Research Subjects

The general information on subjects is as shown in Table 1. Of the total of 536 subjects, users of protein supplements accounted for 228(42.5%), and those who had never taken it were 308 people (57.5%). In terms of age, those between ages 20~22 took up the majority at 49.5%, with third year students (40.0%) and second year students (32.0%) accounting for the most. Male students counted three hundred seven (57.8%) and female counted two hundred twenty four (42.2%). There was a significantly difference in distribution between male and female students taking protein supplements ($p<0.001$). Sports they participated in were muscle exercises (35.0%), followed by ball exercises such as soccer or baseball (35.0%) and among types of what they did exerciser had joined club, there were significantly differences in distribution of protein supplement users ($p<0.001$).

3.2 Validity and Reliability Analysis of Protein Supplements' Attributes

The results of the validity and reliability test for categories on the characteristics of protein supplements are shown in Table 2. To verify the validity of the measurement tools a factor analysis was conducted and in order to extract the number of potential factors, analysis was done for an Eigen value of 1 or higher. For the rotation method of factors, a Vary max rotation was used. The analysis results showed 4 significant factors with the factor loading of each category being 0.4 or higher, indicating that they contribute to the interpretation of factors. As such, the validity of the four factors consist the category of characteristics of protein supplements was proven.

To check the internal consistency of the four factors derived, Cronbach's α coefficient was used in the reliability analysis. Cronbach's α coefficient for the 16 categories

Table 1. General characteristics of university students

Variables		User	Nonuser	Total	<N=536> χ^2 -value
Age	<20	3(18.8)	13(81.3)	16(3.0)	14.45**
	20~22	96(36.2)	169(63.8)	265(49.5)	
	23~25	111(50.5)	109(49.5)	220(41.1)	
	26≤	17(50.0)	17(50.0)	34(6.4)	
Gender	Male	155(50.5)	152(49.5)	307(57.8)	19.63***
	Female	70(31.3)	154(68.8)	224(42.2)	
Grade	1st	19(25.0)	57(75.0)	76(14.3)	11.76**
	2nd	78(45.9)	92(54.1)	170(32.0)	
	3rd	92(43.2)	121(56.8)	213(40.0)	
	4th	36(49.3)	37(50.7)	73(13.7)	
Type of exercise	Muscle exercises	120(64.2)	67(35.8)	187(35.0)	59.75***
	Martial arts	10(27.8)	26(72.2)	36(6.7)	
	Ball exercises	68(36.4)	119(63.6)	187(35.0)	
	Endurance exercises	16(25.4)	47(74.6)	63(11.8)	
	Flexibility exercises	5(17.2)	24(82.8)	29(5.4)	
	Others	9(28.1)	23(71.9)	32(6.0)	
Type of club	Heath-related club	36(61.0)	23(39.0)	59(11.0)	15.48***
	Other club	97(35.3)	178(64.7)	275(51.5)	
	Nonparticipating	93(46.5)	107(53.5)	200(37.5)	
Alcohol consumption	Never	35(43.2)	46(56.8)	81(15.1)	3.89
	2~3 times/mth	117(39.1)	182(60.9)	299(55.8)	
	2~3 times/wk	66(48.9)	69(51.1)	135(25.2)	
	4~5 times/wk	10(47.6)	11(52.4)	21(3.9)	
Smoking (cigarettes /day)	Never	144(38.6)	229(61.4)	373(69.6)	9.52*
	<10	40(53.3)	35(46.7)	75(14.0)	
	11≤~<20	36(47.4)	40(52.6)	76(14.2)	
	≥20	8(66.7)	4(33.3)	12(2.2)	
Total		228(42.5)	308(57.5)	536(100.0)	

1) N (%).

2) Due to missing data, the sum of number of cases may not equal to the total.

*P<0.05, **P<0.01, ***P<0.001.

Table 2. Validity and reliability analysis of protein supplement's attributes

Factor	Attributes	Factor loading	Eigen value	Variance percentage	Cronbach's α
1	Portability	0.805	4.670	29.749	0.811
	Convenience of taking	0.747			
	Convenience in purchase	0.657			
	After-sales service	0.644			
	Convenience of obtaining information	0.587			
2	Advertising & brand awareness	0.756	1.630	10.186	0.840
	Brand & manufacturer	0.752			
	Package design	0.464			
3	Raw material & ingredients	0.659	1.232	7.703	0.730
	Relevance of one's physical constitution	0.576			
	Dose & number of taking	0.540			
	Date of manufacturing & expiration	0.514			
4	Efficacy of product intake'	0.448	1.207	7.543	0.858
	Taste & aroma	0.750			
	Price & quantity	0.675			
Total	Form of product(e.g. pills, capsules or powder)	0.498	1.207	7.543	0.858
Total					0.745

representing the characteristics of protein supplements was 0.745, and Cronbach's α coefficient for all categories being 0.7 or higher indicate that there is a consistent characteristic explained by these categories. As such, the reliability of the categories for the characteristics of protein supplements was verified.

3.3 Comparison of Importance of and Satisfaction with Protein Supplements

The scores given for the importance of and satisfaction with protein supplements as perceived by the subjects were investigated, and the mean score is shown in Table 3. The items with the highest mean score for each category are as follows: In the category of 'convenience of product usage', 'after-sales service' was highest at 3.76 points; in the category of 'marketing', 'brand and manufacturer' was highest at 3.60 points; in the 'internal factor of products' category, 'efficacy of product intake' was highest at 4.46 points; in the 'external factor of products' category, 'price and quantity' was highest at 4.04 points. In terms of satisfaction, in the category of 'convenience of product usage', 'convenience in purchase' was highest at 3.47 points and the satisfaction with 'after-sales service' was lowest at 3.18. In the category of 'marketing', 'brand and manufacturer' showed the highest satisfaction at 3.55 points, while in the category of 'product's internal factors', 'date of manufacturing and expiration' was highest at 3.66 points. For the category of 'product's external factors', 'taste and aroma' showed the highest satisfaction at 3.67 points. The category with the greatest difference in importance and satisfaction scores was 'efficacy of intake' with the difference being 0.98 points, followed by 'relevance to one's physical condition' at 0.88 points. In all categories excluding the three categories of 'Advertising and brand awareness', 'package design' and 'product form, e.g. pills, capsules or powder', the mean score for importance was significantly higher than that for satisfaction ($p < 0.01$, $p < 0.001$).

3.3 Analysis of the Importance of and Satisfaction with Protein Supplements' Characteristics

Figure 1 shows the results of a grid analysis using the mean scores for importance of and satisfaction with the characteristics of protein supplements. The first quadrant, titled 'Doing great, keep it up', mean scores for both importance and satisfaction are high and therefore the

present trend should be maintained. In this segment are 'efficacy of intake', 'relevance to one's physical condition', 'manufactured date and expiration date', 'ingredients and components', 'flavor and aroma' and 'convenience of intake'. The second quadrant represents high importance but low satisfaction, calling for improvement in product quality and management, and therefore is titled 'Focus here'. In this segment are 'after-sales service', 'price and quantity' and 'portability'. The third quadrant is where both importance and satisfaction are low and is therefore nicknamed 'Low priority'. In this segment are 'packaging design', 'convenience in acquiring information on the product', 'advertisement and brand awareness', and 'dosage'. The fourth quadrant represents high importance and high satisfaction and is titled 'Over-done'. In this category are 'product form', 'brand and manufacturer' and 'convenience of purchase'.

4. Discussion

In this study, male subjects had more experience in taking protein supplements than their female counterparts and if they had joined a health-related club and engaged in muscle workouts, there were more protein supplement takers. Even in studies conducted on university athletes, more male athletes reported to take protein supplements than female athletes, indicating that in general male subjects took more protein supplements than their female counterparts¹¹. Professional athletes specializing particularly in body building or weight-lifting that fall under the category of muscle strength training, showed a high rate of protein supplement intake¹², indicating that the characteristics of the sport engaged affected the intake frequency of supplements¹³.

When university students majoring in physical education used protein supplements, 'products' internal factors' such as the product's efficacy, relevance with their own physical condition and ingredients were deemed important. This was the same result in studies on health supplement foods^{14,15}. Therefore, better care of quality should be taken when developing products with specific functions to enhance health such as protein supplements. The category with the highest mean score in importance following 'product's internal factor' was 'product's convenience of usage' but in terms of satisfaction, this was the category that was ranked lowest. 'After-sales service' which is also part of this category had the lowest satisfaction

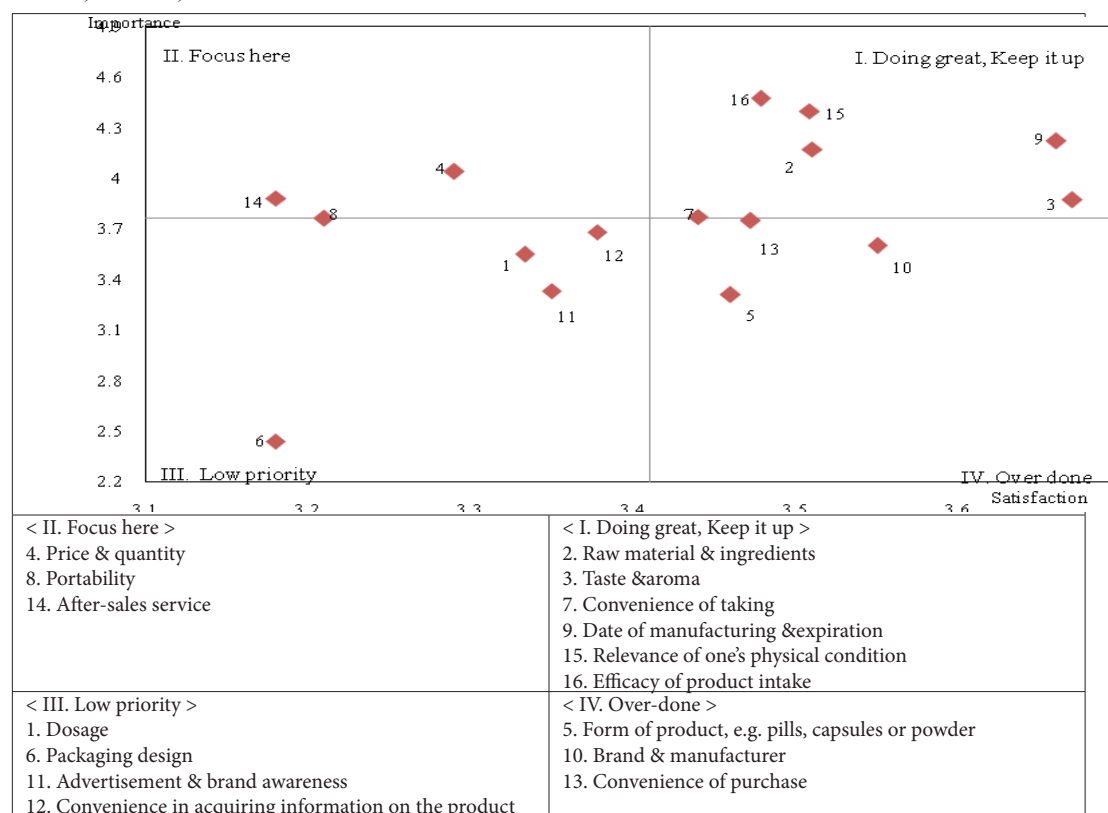
Table 3. Mean comparison between importance and satisfaction of protein supplement

Factor	Attributes	Importance	Satisfaction	Gap	t-value
1. Convenience of product usage	Portability	3.76±0.94 ¹⁾	3.21±0.91 ²⁾	0.55	7.43***
	Convenience of taking	3.77±0.88	3.44±0.79	0.33	5.01***
	Convenience in purchase	3.74±0.90	3.47±0.91	0.27	3.77***
	After-sales service	3.87±0.97	3.18±0.89	0.69	9.65***
	Convenience of obtaining information	3.68±0.89	3.38±0.89	0.30	4.26***
Subtotal		3.76±0.92	3.34±0.88	0.42	
2. Marketing	Advertising & brand awareness	3.32±0.99	3.35±0.85	-0.03	-0.40
	Brand & manufacturer	3.60±0.96	3.55±0.80	0.05	0.66
	Package design	2.44±1.04	3.18±0.79	-0.74	-10.77***
	Subtotal	3.12±1.10	3.36±0.82	-0.24	
3. Internal factor of products	Raw material & ingredients	4.17±0.87	3.52±0.76	0.65	9.89***
	Relevance of one's physical constitution	4.39±0.81	3.51±0.86	0.88	13.65***
	Dose & number of taking	3.55±0.96	3.33±0.71	0.22	3.40**
	Date of manufacturing & expiration	4.22±0.90	3.66±0.89	0.56	7.97***
	Efficacy of product intake	4.46±0.80	3.48±0.85	0.98	15.40***
Subtotal		4.16±0.87	3.50±0.81	0.66	
4. External factor of products	Taste & aroma	3.87±0.94	3.67±0.87	0.20	2.66**
	Price & quantity	4.04±0.84	3.29±0.81	0.75	11.36***
	Form of product (e.g. pills, capsules or powder)	3.13±0.97	3.46±0.73	-0.33	-2.36
	Subtotal	3.68±0.92	3.47±0.80	0.21	
Total		3.76±0.91	3.42±0.83	0.34	

1) Scale score: 1(not very important) ~ 5(very important, very satisfied)

2) Mean±SD

*P<0.05, **P<0.01, ***P<0.001.

**Figure 1.** Importance-satisfaction analysis of protein supplement.

score. In the grid analysis, this category again showed a need for focused improvement. In the study by Cha¹⁶, satisfaction with after-sales service was ranked low and therefore it appears that an improvement in after-sales service to enhance the convenience of health supplements is an urgent issue to be addressed.

The area that needs focused improvement (“focus here”) in the grid analysis of importance-satisfaction was ‘after-sales service’, ‘price and quantity’ and ‘portability’. Unlike food, protein supplements have the advantage of making it easy to intake before or after exercise. The product itself and its packaging should be improved to increase satisfaction in the category of portability. The difference in importance and satisfaction scores for ‘price and quantity’ was the third greatest after ‘efficacy’ and ‘relevance to my physical condition’ and was a category with a relatively high satisfaction score compared to the importance score. In numerous studies on health supplements, satisfaction with ‘price’ appeared to be low and their price in general was perceived to be expensive, while the satisfaction with products’ efficacy was lower than average^{15–19}. Therefore, along with suggesting reasonable prices, a measure to improve the satisfaction with after-sales service and product efficacy will have to be considered.

5. Summary and Conclusion

This study investigated the importance of and satisfaction level with protein supplements among college students majoring in physical education. The importance and satisfaction perceived by the subjects were analyzed to be used as a basic set of data for improving the quality of protein supplements. College students majoring in physical education at 10 universities were the subjects of a survey, whose findings are as follows.

1. Of a total of 536 students, those who took protein supplements were 228 (42.5%) and those who didn’t were 308 (57.5%). There were a total of 307 males (57.8%) and 224 females (42.2%). A significantly higher number of male students took protein supplements than female students ($P < 0.001$) and those who did muscle exercise or had joined a health club had significantly higher numbers of protein supplement takers ($P < 0.001$).
2. The category with the highest mean score for importance was ‘efficacy of intake’ at 4.46 points and the lowest was ‘packaging design’ at 2.44 points. The category with the highest satisfaction score was ‘flavor and aroma’

at 3.67 points and the lowest was ‘after-sales service’ and ‘packaging design’ at 3.18 points. The category with the biggest difference in score between importance and satisfaction was ‘efficacy of intake’ with the difference being 0.98 points. In all categories excluding the three categories of ‘product advertisement and brand awareness’, ‘packaging design’, ‘form of product, e.g. pills, capsules or powder’, the mean score for importance was significantly higher than that of satisfaction level ($P < 0.05$, $P < 0.01$, $P < 0.001$).

3. The quadrant titled ‘Doing great, keep it up’, has high mean scores for both importance and satisfaction and therefore the present trend should be maintained. In this segment are ‘efficacy of intake’, ‘relevance to one’s physical condition’, ‘manufactured date and expiration date’, ‘ingredients and components’, ‘flavor and aroma’ and ‘convenience of intake’. The second quadrant represents high importance but low satisfaction, calling for improvement in product quality and management and therefore is titled ‘Focus here’. In this segment are ‘after-sales service’, ‘price and quantity’ and ‘portability’. The third quadrant is where both importance and satisfaction are low and is therefore nicknamed ‘Low priority’. In this segment are ‘packaging design’, ‘convenience in acquiring information on the product’, ‘advertisement and brand awareness’ and ‘dosage’. The fourth quadrant represents high importance and high satisfaction and is titled ‘Over-done’. In this category are ‘product form’, ‘brand and manufacturer’ and ‘convenience of purchase’.

The study results suggest that focus should be given to improving the internal factors of products when service is urgently called for. Moreover, developing products with packaging that make it easier for product intake before or after exercise can help increase satisfaction. A reasonable price and ways to improve satisfaction with the products’ efficacy will also have to be taken into account.

6. References

1. Duellman MC, Lukaszuk JM, Prawitz AD, Brandenburg JP. Protein supplement users among high school athletes have misconceptions about effectiveness. *J Strength Condit Res.* 2008; 22(4):1124–29.
2. Dan N, Alon E. Protein and amino acid supplementation in sport. *J International Sport Med.* 2007; 8(1):11–23.
3. Kleiner S. The scoop on protein supplements. *Athletic Therapy Today.* 2001; 6(1):52–3.

4. Cribb PJ, Hayes A. Effect of supplement timing and resistance exercise on skeletal muscle hypertrophy. *Med Sci Sports Exerc.* 2006; 38(1):1918–25.
5. Burnley ECD, Olson AN, Sharp RL, Baier SM, Alekel DL. Impact of protein supplements on muscle recovery after exercise-induced muscle soreness. *J Exercise Science & Fitness.* 2010; 8(2):89–96.
6. Shin KS, Lee SJ, Lyu SP, Choi SJ, Heo MD, Kim UJ, Jang YC, Min KS. Effect of intake time of protein supplement after training on physique and muscular strength of adolescent. 39th workshop presentation file of J Korean Physical Education-Humanities and social sciences. 2001; 39(1):695–701.
7. Goston JL, Correia MITD. Intake of nutritional supplements among people exercising in gyms and influencing factors. *Nutrition.* 2010; 26(6):604–11.
8. Bianco A, Mammina C, Paoli A, Bellafiore M, Battaglia G, Caramazza G, Palma A, Jemni M. Protein supplementation in strength and conditioning adepts: knowledge, dietary behavior and practice in Palermo, Italy. *J International Society of Sports Nutrition.* 2011; 8(1):25–30.
9. Oliver AS, Leon MTM, Guerra-Hernandez E. Prevalence of protein supplement use at gyms. *Nutr Hosp.* 2011; 26(5):1168–74.
10. Lee JE. A survey on intake of protein supplement of university students majoring in physical education. *J Korean Soc Food Sci Nutr.* 2014; 43(10):1607–13.
11. Kim SH, Kang CK, Sung SC, Lee MG. Comparative analysis of sports functional supplement patterns between male and female collegiate athletes. *Korean J Physical Education.* 2012; 51(4):467–75.
12. Cho SS, Lee OH. Practices of nutritional ergogenic aids usage by elite bodybuilders and weight lifters. *Korean J Commu Nutr.* 2008; 13(1):134–42.
13. Kim JK, Lee, NJ, Lee, MS. The current statues and cause of dietary supplement use in elite athletes. *Korean J Physical Educ.* 2012; 51(3):427–35.
14. Choi SI, Kwak JH. A study on effect of silver consumer's lifestyle on purchase satisfaction and repurchase intention of the health functional foods. *Korean J Food & Nutr.* 2007; 13(1):334–40.
15. Choi YR. A study on health recognition and intake and satisfaction of functional foods of adults over 40 years old in Incheon [MS Thesis]. Seoul, Korea: Chungang University; 2012. p. 49–53.
16. Cha EK. A study on the customer perception and satisfaction of health functional food [MS Thesis]. Seoul, Korea: Chungang University; 2006. p. 37–46.
17. Kim GJ. A study for the consumer's perception and satisfaction of health food and functional health food [MS Thesis]. Seoul, Korea: Hanyang University; 2009. p. 33–42.
18. Hwang KH. An investigation of functional health food intakes and satisfaction of housewives [MS Thesis]. Kyungsan, Korea: Yeungnam University; 2010. p. 23–35.
19. Kang YJ, Jung SJ, Yang JA, Cha YS. School dietitians' perceptions and intake of healthy functional foods in jeonbuk province. *J Korean Soc Food Sci Nutr.* 2007; 36(9):1172–81.