Self-efficacy for dietary behaviour concerning heart disease among Alexandria school pupils

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الكفاءة الذاتية في السلوك الغذائي فيما يتعلق بأمراض القلب بين تلاميذ المدارس في الإسكندرية.

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خلاصة: أجريت هذه الدراسة على 1134 من تلاميذ المدارس الابتدائية لقياس مستوى الكفاءة الذاتية للأطفال في اختيار الغذاء الصحي بالنسبة للقلب، ولبحث العلاقة بين الكفاءة الذاتية وبين الاستهلاك المعتاد من الأغذية حسب قول الأطفال أنفسهم، ولتعيين مدى موثوقية الاختبار وإعادة الاختبار. وكشفت النتائج عن تقدير مقبول للاتساق الداخلي للكفاءة الذاتية الغذائية (كرنباش ألفا = 0.76). ولقد أبدى أكثر من نصف التلاميذ مستوى متوسطاً من الكفاءة الذاتية، وأبدى 42% منهم مستوى مرتفعاً. ووجد أن موثوقية مقياس الاختبار وإعادة الاختبار كانت جيدة (r = 0.65) وكرنباش ألفا = 0.79). وتبين أن اختيار الطعام المعتاد كان أفضل عوامل التكهن بالكفاءة الذاتية الغذائية (r = 0.44)، وجاء بعده نوع الطفل (حيث كانت الكفاءة الذاتية للأولاد أعلى منها بين البنات)، ثم جاءت المعرفة (r=0.37). وأسهمت هذه العوامل الثلاثة في تفسير 25% من التباين.

ABSTRACT A study of 1134 preparatory-school pupils was conducted to measure children's self-efficacy for selecting healthy food for the heart, to examine the relationship between self-efficacy and self-reported usual food consumption and to estimate test–retest reliability. Results revealed an acceptable estimate of internal consistency of dietary self-efficacy (Cronbach alpha = 0.76). Over half the students exhibited a moderate level of self-efficacy and 42% a high level. Test–retest reliability of the scale was good ($r = 0.65$, Cronbach alpha = 0.79). Usual food choice was the first best predictor of dietary self-efficacy ($r = 0.44$), followed by sex (boys had higher self-efficacy than girls) and then knowledge ($r = 0.37$).The three factors contributed to explain 25% of the variance.

L'efficacité personnelle à l'égard du comportement alimentaire concernant la cardiopathie chez des élèves à Alexandrie

RESUME Une étude a été réalisée auprès de 1134 élèves des écoles préparatoires en vue de mesurer l'auto-efficacité perçue des enfants dans le choix d'aliments sains pour le cœur, d'examiner la relation entre l'auto-efficacité perçue et la consommation alimentaire habituelle rapportée par les intéressés et d'estimer la fiabilité «test–retest» de l'échelle de mesure. Les résultats ont indiqué une estimation acceptable de la cohérence interne de l'efficacité personnelle en matière d'alimentation (alpha de Cronbach = 0,76). Plus de la moitié des élèves montraient une auto-efficacité modérée et 42% une auto-efficacité élevée. La fiabilité «test–retest» de l'échelle de mesure était bonne ($r = 0,65$, alpha de Cronbach = 0,79). Le choix habituel des aliments était le premier facteur qui permettait le mieux de prédire l'auto-efficacité en matière d'alimentation ($r = 0,44$), suivi par le sexe (les garçons avaient une auto-efficacité supérieure aux filles) puis les connaissances ($r = 0,37$). Ces trois facteurs permettaient d'expliquer 25% de la variance.

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Introduction

Coronary heart disease is a major cause of morbidity and mortality. It is the commonest cause of death in both sexes worldwide [1]. Evidence that heart disease develops in response to a diet high in saturated fat, cholesterol and salt should encourage healthier behaviour early in life [2].

Diet patterns appear to be learned at an early age, suggesting the need for health promotion within schools [3]. Interventions during childhood are intended primarily to promote behaviours which, if continued into adulthood, will reduce the risk of cardiovascular diseases (CVD) by delaying or preventing physiological degeneration, such as fatty deposition in coronary arteries and elevated blood pressure [4].

Social psychology models that identify environmental, individual and behavioural characteristics associated with CVD have helped to guide the development of chronic disease prevention programmes among children and youth [5,6].

Social cognitive theory implicates self-efficacy, which refers to one's belief in one's ability to adopt a specific behaviour [7]. People with strong self-efficacy expectations in a particular domain approach tasks as challenges rather than threats, persist when their efforts fail, feel in control of potential stressors and maintain commitment to goals [8].

The child and adolescent trial for cardiovascular health (CATCH) includes an intervention component to improve child nutrition by lowering total fat and sodium in the diet. CATCH intervention efforts, based on the principle of social cognitive theory and organizational changes, emphasize modelling, self-efficacy, skill-building and behavioural competency while targeting social influences and environmental opportunities to promote cardiovascular health among students [9]. Process evaluation (based on health education methods and materials) and impact evaluation (based on the effect of health education on knowledge, attitude and behaviour) of such interventions can improve school-based health education programmes, planning, evaluation and ultimately will decrease behavioural risk factors for CVD among children [8].

The aims of the present work were to measure the self-efficacy of pupils for usual food (foods usually eaten by the pupils) consumption as it relates to fat and sodium intakes, to examine the relationship between self-efficacy and self-reported usual food consumption among pupils, and also to estimate test–retest reliability for the self-efficacy scale.

Subjects and methods

Sample selection
A representative multistage stratified random sample of pupils in the second grade of preparatory schools in Alexandria was selected. The stratification was based on educational regions, type of school and sex. Alexandria governorate is divided into six districts. The schools in each district were divided into two strata, governmental and private schools. Using an equal allocation technique, two schools from each stratum were selected randomly; one for boys and another for girls. The total number of schools selected was 24. One class from the second grade was selected randomly from each school and all the pupils were included in the study. The total sample amounted to 1134 pupils.

Instrumentation and procedures

Data were collected through the administration of a predesigned questionnaire to the pupils as a class activity, so all pupils were encouraged and expected to participate. Pupils were instructed to use a cover sheet for their responses and not to answer out loud. The importance of honest answers was emphasized. During administration, the researcher walked around the classroom to ensure that the instructions were understood.

The questionnaire was designed to elicit information on the pupils' personal and socioeconomic situation and their health behaviour. For the latter, a questionnaire related to health behaviour was developed and pilot tested to measure several psychosocial constructs such as knowledge, self-efficacy and usual behaviour related to diet among preparatory-school pupils. A child dietary self-efficacy scale was developed after literature review [8,10]. Thus, the questionnaire consisted of the following parts.

- Personal and socioeconomic data which included age, sex, birth order, level of education and occupation of the parents, family size, estimated economic level and the presence of audiovisual equipment (television, radio) in the house. All the previous items were scored and modified after the model developed by Fahmy and El-Sherbini [11]. The total socioeconomic score was 29 and scores ≥ 25 indicated high socioeconomic level; scores of 20–24 middle level and scores < 20 indicated low socioeconomic level.
- The knowledge scale which consisted of 12 items concerning the pupils' knowledge about which food was more healthy, i.e. had high or low salt or fat. Each item consisted of two choices and was scored as 2 for the right answer and

0 for the wrong or don't know, except for the question which asked about which food was the most healthy: without salt (2), with a little salt (1) and with a lot of salt or don't know (0). Thus the total score ranged from 0 to 24, and was classified as follows: satisfactory (19 or more), fair (12–18) and poor (< 12).

- The child dietary self-efficacy scale which measured the latent construct of the children's self-confidence in their ability to choose lower fat, lower sodium foods rather than high fat or high sodium food products. The scale included 17 items which were chosen to represent common food choices which, if acted upon, could potentially lower fat and sodium intake among this age group. Responses were classified according to a three point Likert-type format with the options of: not sure, a little sure or very sure, with scores of 1–3. The total score ranged from 17 to 51 and was classified as follows: high level (40 or more), moderate (28–39) and low level (17–27).
- The behaviour questionnaire (usual food choices scale) which was based on the self-reported dietary behaviour as it pertained to fat and sodium consumption. This scale included 17 items; each item was scored 0 for higher intake of fat or sodium and 2 for lower fat/lower sodium intake, except for the question on which foods were eaten more often: without salt (2), with little salt (1) and with a lot of salt (0). Thus the total score ranged from 0 to 34 and was classified as: poor dietary behaviour (< 11), average (11–22) and good (23–34).

A total of 1068 pupils completed the self-efficacy questionnaire and 1032 completed the behaviour questionnaire. The total questionnaire required approximately 20–30 minutes to complete. The child di-

etary self-efficacy scale was administrated twice, two weeks apart, to examine test–retest reliability; 736 of the participants completed the whole retest questionnaire.

Statistical analysis

Data were analysed using *SPSS* (version 6.0). Percentile coefficients of skewness and kurtosis were used to test the distribution of the data. The data proved to be normally distributed so parametric statistics were preferred.

The chi-squared test of independence was used to assess sex differences in psychosocial factors (knowledge, behaviour and self-efficacy) with the subsequent Cramer's V for testing the strength of the association.

A principal components factor analysis with varimax rotation was carried out to estimate factorial validity, which is a type of construct validity of the self-efficacy scale in which squared multiple correlation is used as the prior communality estimates and Kaiser's criterion applied (eigenvalue > 1 extraction) where the eigenvalue is the total variance explained by each factor. The rationale for Kaiser's criterion is that a factor should account for more variance than any single variable.

The Levene test of equality of variances and Student t-test were performed to test the difference in the overall mean scores by sex. ANOVA with subsequent multiple comparison (Tukey B test) was used to assess the differences in the mean scores by social class.

Reliability of the scale was assessed in terms of internal consistency. Cronbach alpha was computed; a coefficient alpha of 0.70 was considered as adequate.

Test–retest reliability was also assessed using Cronbach alpha, Pearson correlation coefficient, percent agreement and Hotelling T-squared.

To obtain an estimate of convergent validity, a correlation analysis was used to make inferences about the relationship between the two constructs, dietary self-efficacy and usual food choices. In addition, the concurrent form of criterion-related validity was investigated through stepwise multiple regression analysis.

Stepwise multiple regression analysis was adopted for three models. In the first model, the knowledge score was the dependent variable and the independent variables were: sex (x_1), birth order (x_2), family size (x_3), education of the mother (x_4) and the presence of audiovisual equipment (x_5). In the second and third models, the self-efficacy and behaviour scores respectively were the dependent variables and the same independent variables in the first model were included, in addition to knowledge score (x_6), behaviour score in the second model (x_7) and self-efficacy score in the last model (x_8).

Results

Demographic characteristics of the sample

A total of 1134 pupils participated in the study. Their mean age was 13.14 years (SD = 0.76). The sample comprised 581 boys (51.2%) and 553 girls (48.8%). With regard to birth order, about 40% of the pupils were the first child in the family, 31.4% were the second child, 18.1% and 10.1% were the third and fourth children or more. As regards social class, 23.3% were in the low socioeconomic class, 17.7% were middle class and 59.0% were in the high socioeconomic group.

Dietary knowledge for heart health

Almost 24.7% of the pupils displayed a satisfactory level of awareness of heart health,

56.2% had a fair level and 19.1% had a low level. Table 1 shows that the percentage of correct responses ranged from about 30% to 96%. The question for which the lowest percentage of pupils gave the correct answer (30%) was about the relative healthiness of cereals compared to nuts, with a similarity of response in both girls and boys. Less than one-third of the pupils knew that low fat milk was more healthy than high fat milk (buffalo milk), with greater awareness among girls than boys (37.6% and 23.6% respectively); the differ-

ence was statistically significant, but with a weak association ($\chi_1^2 = 26.36$, $P < 0.05$, $V = 0.15$). Over 60% of the pupils knew that boiled potatoes were more healthy than fried potatoes or crisps; boys were more likely than girls to answer this question correctly (68.3% and 59.0% respectively) ($\chi_1^2 = 10.79$, $P < 0.01$). The question for which the highest proportion of pupils gave the correct answer (about 96%) was about the relative healthiness of fresh fruit compared to candy bars.

Table 1 **Distribution of the pupils according to their correct answers to the knowledge item questionnaire by sex**

Knowledge item (which food is more healthy?)	Correct answer						Test of significance χ_1^2
	Males ($n = 581$)		Females ($n = 553$)		Total ($n = 1134$)		
	No.	%	No.	%	No.	%	
With a lot of salt or minimal or no salt	468	80.6	430	77.8	898	79.2	1.34
Fresh or canned vegetables	443	76.2	454	82.1	897	79.1	5.86* $V = 0.07$
Vegetables and salad or hamburger and fried potatoes	491	84.5	460	83.2	951	83.9	0.37
Low fat milk or high fat milk	137	23.6	208	37.6	345	30.4	26.36** $V = 0.15$
Cereals or nuts	175	30.1	164	29.7	339	29.9	0.03
Fresh fruit or candy bars	556	95.7	527	95.3	1083	95.5	0.10
Fruit juice or soft drinks	549	94.5	514	92.9	1063	93.7	1.15
Ice-cream or yoghurt	499	85.9	426	77.0	925	81.6	14.77** $V = 0.11$
Boiled potatoes or fried potatoes/ crisps	397	68.3	326	59.0	723	63.8	10.79*** $V = 0.10$
Margarine or butter	226	38.9	208	37.6	434	38.3	0.19
Fatty meat or lean meat	488	84.0	463	83.7	951	83.9	0.02
Eating four eggs or less per week or eating more than four eggs per week	292	50.3	306	55.3	598	52.7	2.93

*P < 0.05   **P < 0.001   ***P < 0.01

Usual food choices of the pupils

It was found that most of the participants (56.7%) consumed an average level of usual food according to sex and usual food choices. It is surprising to note that although more than 60% of the pupils knew that boiled potatoes were more healthy than fried potatoes or crisps, 71.5% of them consumed fried potatoes very often. Also, although about 82% of the participants knew that yoghurt was more healthy than ice-cream (Table 1), more than a half of them indicated that they consumed ice-cream very often (Table 2).

Girls were more likely to report eating ice-cream, fried potatoes and salty fish (63.7%, 76.3% and 39.8% respectively) than boys (43.4%, 67.0% and 26.8% respectively) and the differences were statistically significant. On the other hand, about 32% of the pupils consumed more than four eggs per week, with a significantly higher percentage for boys than girls (35.4% and 29.0% respectively) ($\chi_1^2 = 5.20$, $P < 0.05$). A high consumption of the fat of chicken and meat was found to be more characteristic of boys than girls; 23.5% of boys ate chicken without removing the fat as compared with 15.8% of girls ($\chi_1^2 = 10.57$, $P < 0.01$). Also, 15.5% of boys ate the fat of meat as compared with 11.7% of girls (Table 2).

Dietary self-efficacy scale

Table 3 illustrates the principal components factor analysis with varimax rotation for the dietary self-efficacy part of the questionnaire. The results revealed that four factors with eigenvalues greater than one were extracted. Factor 1 represents low fat or low sodium foods (go foods) and included six items with eigenvalue of 3.15 and accounted for 18.5 % of the total variance; the item loading ranged from 0.38 to 0.65. Factor 2 represents low calories or low sodium intake (four items); the item loading

ranged from 0.45 to 0.64. Factor 3 represents low cholesterol in the diet (four items). Factor 4 denotes an additional low fat preference (three items). The overall internal consistency of all the items (standardized Cronbach alpha 0.76) indicates sufficiently reliable questionnaires.

Table 4 demonstrates the distribution of the pupils according to sex and the dietary self-efficacy scale. It was found that for almost all the items boys were more likely to eat healthy food than girls. The percentage of pupils that reported being "very sure" ranged from a high of 70.1% regarding drinking fruit juice instead of soft drinks to a low of 16.5% regarding eating food without adding salt.

For go food items, about 36% of the pupils were very sure of being able to eat boiled potatoes instead of fried potatoes or crisps, with a significantly higher percentage among boys than girls (40.1% and 31.5% respectively). For the item regarding eating yoghurt instead of ice-cream, about 49% of boys were very sure as compared to 42% of girls; the difference was statistically significant ($\chi_2^2 = 13.90$, $P < 0.01$, with a weak association, $V = 0.11$).

More than 80% of the pupils reported not being sure or only a little sure that they would be able to eat food without adding salt. On the other hand, more than a half of the pupils were very sure of eating grilled fish instead of salted fish (59.3% among boys versus 50.0% for girls, $\chi_2^2 = 11.94$, $P < 0.01$).

As regards the intake of low calories or sodium, more than 65% of the pupils reported being able to eat fresh fruit instead of a candy bar and to drink fruit juice instead of soft drinks.

With respect to low cholesterol intake, more than half of the pupils reported being uncertain (not sure or a little sure) of eating only four eggs per week. Also, more than

Table 2 **Distribution of the pupils according to usual food choice scale and sex**

Which food do you eat very often?	Males No.	Males %	Females No.	Females %	Total No.	Total %	Test of significance
Salty food	48	8.3	43	7.8	91	8.0	
Food with a little salt	506	87.1	496	89.7	1002	88.4	$\chi^2_2 = 3.81$
Food without salt	27	4.6	14	2.5	41	3.6	
Canned vegetables	85	14.6	63	11.4	148	131	
Fresh or frozen vegetables	496	85.4	490	88.6	986	86.9	$\chi^2_1 = 2.61$
Highly salted cheese	68	12.0	64	11.7	132	11.9	
Stored cheese (moderately salted)	53	9.4	38	6.9	91	8.2	$\chi^2_2 = 2.30$
White cheese	444	78.6	445	81.4	889	79.9	
Grilled fish	417	73.2	328	60.2	745	66.8	$\chi^2_1 = 21.15^*$
Salted fish	153	26.8	217	39.8	370	33.2	$V = 0.14$
Low fat milk	428	74.8	300	57.0	728	66.3	$\chi^2_2 = 38.82^*$
High fat milk	144	25.2	226	43.0	370	33.7	$V = 0.19$
Fresh fruit	516	89.7	506	92.2	1022	90.9	
Candy bar	59	10.3	43	7.8	102	9.1	$\chi^2_1 = 2.01$
Fruit juice	455	78.7	427	77.2	882	78.0	
Soft drinks	123	21.3	126	22.8	249	22.0	$\chi^2_1 = 0.37$
Yoghurt	328	56.6	201	36.3	529	46.7	$\chi^2_1 = 46.83^*$
Ice-cream	251	43.4	352	63.7	603	53.3	$V = 0.20$
Jam or honey alone	289	50.6	291	54.5	580	52.5	
Jam or honey after adding butter or cream	282	49.4	243	45.5	525	47.5	$\chi^2_1 = 1.67$
Boiled potatoes	191	33.0	131	23.7	322	28.5	$\chi^2_1 = 11.09^{**}$
Fried potatoes/crisps	388	67.0	421	76.3	809	71.5	$V = 0.10$
Beans with oil	402	70.0	406	74.1	808	72.0	
Beans with butter	172	30.0	142	25.9	314	28.0	$\chi^2_1 = 2.28$
Chicken with its skin	136	23.5	87	15.8	223	19.7	$\chi^2_1 = 10.57^{**}$
Chicken after removing the skin	443	76.5	464	84.2	907	80.3	$V = 0.10$
Food cooked with margarine or oil	379	65.2	355	64.2	734	64.7	
Food cooked with butter	202	34.8	198	35.8	400	35.3	$\chi^2_1 = 0.13$
Boiled or grilled meat	382	66.3	368	66.7	750	66.5	
Fried meat	194	33.7	183	33.2	377	33.5	$\chi^2_1 = 0.03$
Boiled or grilled chicken	251	43.8	214	39.0	465	41.5	
Boiled and fried chicken	322	56.2	334	60.9	656	58.5	$\chi^2_1 = 2.61$
Meat with fat	89	15.5	64	11.7	153	13.6	
Meat without fat	487	84.5	484	88.3	971	86.4	$\chi^2_1 = 3.40$
Four eggs or less per week	369	64.6	387	71.0	756	67.7	$\chi^2_1 = 5.20^{***}$
More than four eggs per week	202	35.4	158	29.0	360	32.2	$V = 0.07$

*$P < 0.001$ **$P < 0.01$ ***$P < 0.05$

The sample size varied from the original n = 1134 for certain items as a result of incomplete responses on the questionnaires of some pupils (the percentage is calculated out of the total number who answered).

Table 3 **Factor analysis of items in the dietary self-efficacy questionnaire**

How sure are you that you can:	Communality	Eigenvalue	Factor loading
Factor 1: low fat or low sodium (go foods)			
Eat boiled potatoes instead of fried potatoes/crisps?	0.46		0.65
Eat boiled chicken without frying?	0.48		0.64
Eat yoghurt instead of ice-cream?	0.45	3.15	0.53
Eat boiled or grilled meat instead of fried meat?	0.37		0.51
Eat food without adding salt?	0.23		0.40
Eat grilled fish instead of salted fish?	0.35		0.38
Factor 2: low calories or low sodium			
Eat fresh fruit instead of a candy bar?	0.46		0.64
Drink fruit juice instead of soft drinks?	0.49	1.32	0.64
Eat fresh or frozen vegetables instead of canned vegetables?	0.32		0.48
Eat white cheese instead of salted cheese?	0.31		0.45
Factor 3: low cholesterol intake			
Drink low fat milk instead of high fat milk?	0.46		0.64
Eat vegetables cooked with oil or margarine instead of butter?	0.45	1.14	0.62
Eat beans with oil instead of butter?	0.38		0.49
Eat only four eggs per week?	0.31		0.47
Factor 4: additional low fat preference			
Remove and discard the skin of chicken?	0.50		0.69
Remove and discard the fat of meat?	0.48	1.06	0.68
Eat jam or honey without adding butter or cream?	0.30		0.34

67% were uncertain of being able to eat vegetables cooked with oil or margarine instead of butter or to drink low fat milk instead of high fat buffalo milk.

Concerning low fat preference, girls were more sure than boys of their ability to remove the skin of chicken or fat of meat (68.1% and 67.5% respectively) as compared to boys (60.2% and 64.7% respectively) but the difference was only significant for the first item ($\chi^2_2 = 12.35$, $P < 0.01$).

To clarify the most relevant concerns of the pupils, items were ordered by mean response. The ordered list of items is shown in Table 5 with the greater means indicating higher self-efficacy and perceived ability to adopt preventive behaviour, while the lower means indicate perceived inability to adopt protective behaviours against heart disease. The areas of greatest perceived competence were the first three items, which had means ranging from 2.51 to 2.60, indicating that pupils were very sure of their ability to drink fruit juice instead of soft drinks, eat fresh fruit instead of a candy bar and to remove or not eat the fat of meat. On the other hand, the areas of highest vulnerability (lowest means 1.88 and 1.74) indicated that the pupils were still highly

Table 4 Distribution of pupils according to dietary self-efficacy scale and sex

How sure are you that you can:	Males No.	%	Females No.	%	Total No.	%	Test of significance χ_2^2
Factor 1: low fat or sodium (go foods)							
Eat boiled potatoes instead of fried potatoes/crisps?							
Not sure	176	30.3	218	39.6	394	34.8	
A little sure	172	29.6	159	28.9	331	29.2	12.75*
Very sure	233	40.1	174	31.5	407	36.0	$V = 0.11$
Eat boiled chicken without frying?							
Not sure	235	40.7	243	43.9	478	42.2	
A little sure	163	28.2	147	26.6	310	27.3	1.44
Very sure	180	31.1	160	28.9	340	30.0	
Eat yoghurt instead of ice-cream?							
Not sure	156	27.0	205	37.3	361	32.0	
A little sure	142	24.5	113	20.5	255	22.6	13.90*
Very sure	281	48.5	232	42.2	513	45.4	$V = 0.11$
Eat boiled or grilled meat instead of fried meat?							
Not sure	99	17.2	109	19.8	208	18.5	
A little sure	167	28.9	187	34.0	354	31.4	6.72**
Very sure	311	53.9	254	46.2	565	50.1	$V = 0.08$
Eat food without adding salt?							
Not sure	204	35.1	281	50.8	485	42.8	
A little sure	276	47.5	186	33.6	462	40.7	30.29***
Very sure	101	17.4	86	15.6	187	16.5	$V = 0.16$
Eat grilled fish instead of salted fish?							
Not sure	133	23.0	172	31.4	305	27.1	
A little sure	102	17.7	102	18.6	204	18.1	11.94*
Very sure	342	59.3	273	50.0	615	54.7	$V = 0.10$
Factor 2: low calories or low sodium							
Eat fresh fruit instead of a candy bar?							
Not sure	76	13.1	68	12.3	144	12.7	
A little sure	114	19.6	119	21.5	233	20.5	0.69
Very sure	391	67.3	366	66.2	757	66.8	
Drink fruit juice instead of soft drinks?							
Not sure	50	8.6	59	10.7	109	9.6	
A little sure	111	19.1	119	21.5	230	20.3	2.87
Very sure	420	72.3	375	67.8	795	70.1	
Eat fresh or frozen vegetables instead of canned vegetables?							
Not sure	102	17.6	110	19.9	212	18.7	
A little sure	124	21.3	127	23.0	251	22.1	1.91
Very sure	355	61.1	316	57.1	671	59.2	

Table 4 *(Continued)*

How sure are you that you can:	Males No.	%	Females No.	%	Total No.	%	Test of significance χ_2^2
Eat white cheese instead of salted cheese?							
Not sure	114	19.8	95	17.3	209	18.6	
A little sure	120	20.9	105	19.2	225	20.0	2.15
Very sure	341	59.3	348	63.5	689	61.4	
Factor 3: low cholesterol intake							
Drink low fat milk instead of high fat milk?							
Not sure	242	42.2	211	9.1	453	40.7	
A little sure	160	27.9	139	25.7	299	26.8	3.46
Very sure	172	29.9	190	35.2	362	32.5	
Eat vegetables cooked with oil or margarine instead of butter?							
Not sure	180	31.0	175	31.8	355	31.4	
A little sure	211	36.4	195	35.4	406	35.9	0.13
Very sure	189	32.6	181	32.8	370	32.7	
Eat beans with oil instead of butter?							
Not sure	85	14.7	103	18.8	188	16.7	
A little sure	127	22.0	126	23.0	253	22.5	4.16
Very sure	366	63.3	319	58.2	685	60.8	
Eat only four eggs per week?							
Not sure	141	24.5	154	28.1	295	26.3	
A little sure	157	27.3	124	22.6	281	25.0	3.86
Very sure	277	48.2	269	49.2	546	48.7	
Factor 4: additional low fat preference							
Remove and discard the skin of chicken?							
Not sure	127	22.0	116	21.1	243	21.6	
A little sure	102	17.7	59	10.7	161	14.3	12.35*
Very sure	347	60.2	374	68.1	721	64.1	$V = 0.11$
Remove and discard the fat of meat?							
Not sure	85	14.7	86	15.6	171	15.2	
A little sure	119	20.6	93	16.9	212	18.8	2.51
Very sure	374	64.7	371	67.5	745	66.0	
Eat jam or honey without adding butter or cream?							
Not sure	141	24.4	154	28.1	295	26.2	
A little sure	122	21.1	115	21.0	237	21.0	2.16
Very sure	315	54.5	279	50.9	594	52.8	

*$P < 0.01$ **$P < 0.05$ ***$P < 0.001$

The sample size varied from the original n = 1134 for certain items as a result of incomplete responses on the questionnaires of some pupils (percentage is calculated from the total number who answered).

Table 5 Self-efficacy items ordered by mean scale score

How sure are you that you can:	Mean (n = 1068)[a]
Drink fruit juice instead of soft drinks?	2.60
Eat fresh fruit instead of a candy bar?	2.54
Remove and discard the fat of meat?	2.51
Eat beans with oil instead of butter?	2.44
Eat white cheese instead of salted cheese?	2.43
Remove and discard the skin of chicken?	2.43
Eat fresh or frozen vegetables instead of canned vegetables?	2.40
Eat boiled or grilled meat instead of fried meat?	2.32
Eat grilled fish instead of salted fish?	2.28
Eat jam or honey without adding butter or cream?	2.27
Eat only four eggs per week?	2.22
Eat yoghurt instead of ice-cream?	2.13
Eat vegetables cooked with oil or margarine instead of butter?	2.01
Eat boiled potatoes instead of fried potatoes/crisps?	2.01
Drink low fat milk instead of high fat milk?	1.92
Eat boiled chicken without frying?	1.88
Eat food without adding salt?	1.74

[a]*Total number of pupils who completed the self-efficacy questionnaire*

uncertain of their ability to eat boiled chicken without frying and to eat food without adding salt.

Overall, most of the responses of the pupils were near the middle of the scale, about 54% of the pupils had a moderate score on the self-efficacy scale. This pattern suggests a greater tendency for subjects to use the middle part (a little sure) of the scale items than the higher end (very sure) or the lower end (not sure). About 42% of the pupils had a high score on the self-efficacy scale and only 4% had a low score.

Factors affecting the psychosocial score

Table 6 shows that both boys and girls had a similar overall mean score for both the knowledge and behaviour scale. On the other hand, boys had a significantly higher mean score on the self-efficacy scale (38.59 ± 5.45) than girls (37.70 ± 6.06) ($t = 2.51$, $P < 0.05$). Likewise, ANOVA followed by Tukey test illustrated that pupils of high socioeconomic class exhibited a significantly higher mean score for all the psychosocial factors as compared with those of low socioeconomic class. For the knowledge scale, the score was 15.93 ± 3.70 for the high socioeconomic class compared to 14.70 ± 3.91 for the low socioeconomic class ($F = 10.19$, $P < 0.01$), for the self-efficacy scale the score was 38.54 ± 5.78 for the high socioeconomic class as compared to 37.59 ± 5.87 for the low socioeconomic class ($F = 3.49$, $P < 0.05$) and for the behaviour scale the scores were 22.09 ± 3.99 and 21.34 ± 4.14 for the high and low socioeconomic classes respectively ($F = 2.98$, $P < 0.05$).

Table 7 shows that the education of the mother was the only significant predictor of high total knowledge scores, but this only explained 1% of the variation. The relationship between self-efficacy and usual food choices was clarified by the result of stepwise multiple regression in Table 7. It reveals that the first best predictor of a high self-efficacy score was a high score on usual food choices ($r = 0.44$), followed by sex, where boys tended to have better scores than girls. The third factor to enter the model was the knowledge score as a high

Table 6 **Mean and standard deviation of psychosocial total scores by sex and social class**

Variable	Psychosocial factor		
	Knowledge Mean ± s	Self-efficacy Mean ± s	Behaviour Mean ± s
Sex			
Males	15.55 ± 3.68 (n = 581)	38.59 ± 5.45 (n = 549)	21.98 ± 4.09 (n = 534)
Females	15.52 ± 4.00 (n = 553)	37.70 ± 6.06 (n = 519)	21.72 ± 4.07 (n – 498)
t-value	0.14	2.51*	1.01
Social class			
Low	14.70 ± 3.91 (n = 264)	37.59 ± 5.87 (n = 248)	21.34 ± 4.14 (n = 235)
Middle	15.34 ± 3.99 (n = 201)	37.60 ± 5.51 (n = 189)	21.74 ± 4.24 (n = 185)
High	15.93 ± 3.70 (n = 669)	38.54 ± 5.78 (n = 631)	22.09 ± 3.99 (n = 612)
F-ratio	10.19**	3.49*	2.98*

*P < 0.05   **P < 0.01   s = standard deviation

knowledge score was associated with an increase in self-efficacy score ($r = 0.37$). These three predicted variables could explain 25% of variation in the self-efficacy scale score.

As regards the independent variables affecting the behaviour score, it was found that the presence of audiovisual equipment was the first predictor followed by the score of knowledge and self-efficacy. Having a high score on both the knowledge test and self-efficacy scale was associated with a high frequency of eating healthy foods. When the partial correlation was performed between self-efficacy and behaviour scores, it was 0.37, ($P < 0.01$) after controlling for knowledge and audiovisual equipment, whereas it was 0.20 ($P < 0.01$) after controlling for self-efficacy score. Overall,

the regression analysis model produced R^2 = 0.23.

Test–retest reliability for dietary self-efficacy scale (Table 8)

Approximately 65% of the items showed significant change in the mean score of test and retest scale. This indicated instability about the mean for the dietary self-efficacy scale. The significant change in the mean score tended to be from low to high for all the items except for eating grilled fish instead of salted fish. The overall score for the second completion (retest) was statistically higher (39.98 ± 5.90) than that of the first one (38.11 ± 5.81) ($P < 0.001$). The percentage agreement between responses on first and second administration of the questionnaire ranged from 42% to 72%, the

Table 7 Summary of stepwise multiple regression analysis of pupils' dietary knowledge, self-efficacy and behaviour scores on the different independent factors

Dependent variable	Independent variable	B	$s_{\bar{x}}(B)$	β	t	Multiple R	R^2	F
Knowledge	Education of the mother (x_4)	0.9829	0.2602	0.1118	3.78*	0.11	0.01	14.28**
	Constant	14.8028	0.2244					
Self-efficacy	Behaviour score (x_7)	0.5053	0.0408	0.3605	12.39**			
	Sex (x_1)	−0.6212	0.3139	−0.0545	1.98*	0.50	0.25	109.41**
	Knowledge score (x_6)	0.3647	0.0441	0.2402	8.29**			
	Constant	22.5003	0.9455					
Behaviour	Audiovisual aids (x_5)	1.1448	0.4761	0.0670	2.41*			
	Knowledge score (x_6)	0.2103	0.0323	0.1942	6.51**	0.48	0.23	99.28**
	Self-efficacy score (x_8)	0.2657	0.0213	0.3724	12.49**			
	Constant	8.2621	0.8004					

*$P < 0.05$ **$P < 0.001$ $s_{\bar{x}}$ = standard error of the mean
B = partial regression coefficient $s_x(B)$ = standard error of B R^2 = coefficient of determination
Prediction equation:
Knowledge $Y = 14.8028 + 0.9829 x_4$
Self-efficacy $Y = 22.5003 + 0.5053 x_7 -0.6212 x_1 + 0.3647 x_6$
Behaviour $Y = 8.2621 + 1.1448 x_5 + 0.2103 x_6 + 0.2657 x_8$

lower percentage of agreement was for the question about removing and not eating the skin of chicken, while the higher percentage was for the question about drinking fruit juice instead of soft drinks.

Correlation between scale scores at the first and second completion varied from 0.27 to 0.48. For the majority of the items, the pupils showed a moderate reliability, as Cronbach alpha ranged from 0.42 to 0.65. The lowest correlation was for eating boiled or grilled meat instead of fried meat ($r = 0.27$, Cronbach alpha = 0.42), whereas the highest was for eating grilled fish instead of salted fish ($r = 0.48$, Cronbach alpha = 0.65).

When all the 17 impact items were combined into one scale, the correlation between scores in the first and second administration was 0.65 and Cronbach alpha reached 0.79, indicating good reliabili-

ty. However, the overall reliability results as shown in Table 9 indicate that boys were more consistent than girls (Cronbach alpha = 0.80 and 0.77 respectively). Although pupils of higher socioeconomic class exhibited a significant change of scores from 38.68 ± 5.74 at the first administration of the questionnaire to 39.81 ± 5.78 at the second one ($P < 0.001$), they had a higher reliability (Cronbach alpha = 0.80) than pupils of middle and low socioeconomic class (Cronbach alpha = 0.78 and 0.74 respectively).

Discussion

There are several physiological risk factors for cardiovascular diseases such as high blood pressure, hypercholesterolaemia and obesity. Behaviour contributing to these

Table 8 **Test–retest reliability for dietary self-efficacy scale among the study sample**

How sure are you that you can:	% of agreement	Test Mean ± s	Retest Mean ± s	r	Cronbach alpha	Hotelling T-squared
Factor 1: low fat or low sodium (Go foods)						
Eat boiled potatoes instead fried potatoes/crisps?	57	2.01 ± 0.84	1.98 ± 0.84	0.42	0.59	0.89
Eat boiled chicken without frying?	59	1.89 ± 0.84	1.88 ± 0.80	0.45	0.62	0.08
Eat yoghurt instead of ice-cream?	58	2.13 ± 0.88	2.10 ± 0.86	0.45	0.62	0.68
Eat boiled or grilled meat instead of fried meat?	56	2.31 ± 0.77	2.32 ± 0.75	0.27	0.42	0.01
Eat food without adding salt?	57	1.71 ± 0.71	1.66 ± 0.70	0.34	0.51	2.61
Eat grilled fish instead of salted fish?	63	2.80 ± 0.87	2.35 ± 0.81	0.48	0.65	5.03*
Factor 2: low calories or low sodium						
Eat fresh fruit instead of a candy bar?	64	2.54 ± 0.71	2.62 ± 0.66	0.32	0.49	7.49**
Drink fruit juice instead of soft drinks?	72	2.61 ± 0.64	2.64 ± 0.62	0.41	0.59	1.20
Eat fresh or frozen vegetables instead of canned vegetables?	57	2.40 ± 0.78	2.54 ± 0.71	0.27	0.43	18.92***
Eat white cheese instead of salted cheese?	64	2.43 ± 0.79	2.54 ± 0.70	0.36	0.53	15.80***
Factor 3: low cholesterol intake						
Drink low fat milk instead of high fat milk?	55	1.90 ± 0.85	1.96 ± 0.84	0.42	0.59	2.50
Eat vegetables cooked with oil or margarine instead of butter?	53	2.02 ± 0.80	2.14 ± 0.79	0.35	0.52	15.38***
Eat beans with oil instead of butter?	60	2.43 ± 0.76	2.49 ± 0.73	0.34	0.51	4.19*
Eat only four eggs per week?	56	2.18 ± 0.84	2.25 ± 0.80	0.36	0.47	3.08
Factor 4: additional low fat preference						
Remove and discard the skin of chicken?	42	2.43 ± 0.82	2.54 ± 0.74	0.45	0.62	17.43***
Remove and discard the fat of meat?	64	2.50 ± 0.75	2.58 ± 0.69	0.32	0.49	7.04**
Eat jam or honey without adding butter or cream?	61	2.26 ± 0.85	2.34 ± 0.82	0.43	0.60	7.45**
Total scale score		38.11 ± 5.81	39.98 ± 5.90	0.65	0.79	

*P < 0.05   **P < 0.01   ***P < 0.001
r = correlation coefficient
s = standard deviation

Table 9 Test–retest reliability for overall dietary self-efficacy scale score by sex and social class

Variable	n	Total score		r	Cronbach alpha	Hotelling T-squared
		Test Mean ± s	Retest Mean ± s			
Sex						
Males	379	38.61 ± 5.70	39.56 ± 5.65	0.67	0.80	15.70*
Females	357	37.58 ± 6.08	38.36 ± 6.11	0.63	0.77	7.60**
Social class						
Low	164	37.45 ± 6.02	37.76 ± 5.88	0.64	0.78	0.59
Middle	124	36.94 ± 5.52	37.59 ± 5.86	0.58	0.74	1.91
High	448	38.68 ± 5.74	39.81 ± 5.78	0.67	0.80	26.08**

*P < 0.001   **P < 0.01
r = correlation coefficient
s = standard deviation

risk factors include consumption of excessive calories, total fat, saturated fat and sodium [3]. A prerequisite for any health promotion campaign should be to obtain information about the current level of knowledge and understanding of the issues by the public. This will enable the most appropriate health messages to be put forward [1].

In a study done by Tate and Cade to determine the level of knowledge in the general population concerning dietary fat and the risk of coronary heart disease, they found that the overall knowledge levels were high with no difference between men and women, although women were more able to select the best food items than men [1]. Also, the knowledge level was higher among the higher socioeconomic classes than the low socioeconomic classes. The results of the present study revealed that the overall knowledge levels were moderate. In agreement with the results of the aforementioned study, both boys and girls had a similar total knowledge score, although girls were more able to select the best food items than boys. This could be explained by the fact that girls are more likely to help their mothers during shopping and cooking than boys and so are more aware of food and its nutrient contents.

The results of the present study also concur with the results of Tate and Cade concerning the positive correlation between socioeconomic class and knowledge score. This could be explained by the fact that parents of high socioeconomic class are more educated and have a better knowledge of healthy food that can be transmitted to their children than parents of low socioeconomic class. This is confirmed by the finding that education of the mother was the only significant predictor of high total knowledge score, because the mother is generally concerned with the nutrition of her family. Another explanation is that other sources of knowledge such as television and radio are more available to those of the higher socioeconomic classes. This is also confirmed by the present results which showed that audiovisual equipment was the first best predictor for usual food choices (dietary behaviour) score followed by knowledge and self-efficacy. This reflects the importance of audiovisual equipment

(mass media) as a source of health education for improvement of knowledge, self-efficacy and behaviour.

Although health education interventions may succeed in increasing children's knowledge and producing changes in behavioural intentions, the behavioural changes may not be maintained unless the school environment and children's parents reinforce such intentions[12]. This could explain the result of our study which revealed that although a high percentage of pupils knew that boiled potatoes were more healthy than fried potatoes or crisps and yoghurt more healthy than ice-cream, more than half of them ate fried potatoes or crisps and ice-cream very often due to the lack of reinforcement of the behavioural intentions.

In a study by Burdine et al., males were found to be more likely than females to eat healthy foods frequently, both at home and at school [13]. Our findings are consistent with this; girls were more likely to report eating ice-cream, fried potatoes, crisps and salty fish than boys. Also, overall dietary self-efficacy mean scores for boys were higher than those of girls. It is possible that males may be more conscious of diet for athletic appearance [13].

On the other hand, our study showed that a high consumption of fat was found to be more characteristic of boys than girls. Also, girls were more sure than boys of their ability to remove the skin of chicken or the fat of meat. Posner et al. reported that a substantially larger proportion of women than men satisfy the guidelines for dietary cholesterol (80% versus 49%) and sodium (94% versus 55%) [14].

Our study confirms the result of Parcel et al. who found sex was a significant predictor of usual food choices with girls tending to have better scores than boys. This could be explained by the fact that females may be more interested in restricting their diets and losing weight because of social influences such as peer pressure and concern for a slim appearance. In addition, males may simply eat more and thus consume more of some types of food [8].

Our study showed that about 56.7% of the pupils scored on the moderate level for usual food choices. This is consistent with the results of a study in California and Texas which found " twin peaks" near the middle of the scale [8].

Self-efficacy influences a variety of human actions, particularly the self-control of behaviour. What people believe themselves capable of doing strongly influences their decisions and choices about what to do. Self-efficacy positively enhances a person's decision to act, the amount of effort made, the persistence of the effort and the emotional and cognitive arousal [15].

Factor analysis of the self-efficacy scale revealed that four factors with eigenvalues greater than 1 were extracted. The factor loading ranged from 0.38 to 0.69. These results provide evidence of construct validity. The overall internal consistency of the all items (standardized Cronbach alpha = 0.76) indicates sufficiently reliable questionnaires. The results of a study in the United States revealed only one factor with an eigenvalue of 5.137 which accounted for 97% of variance in the scale [8]. Values of the factor loading ranged between 0.51 and 0.65 with Cronbach alpha = 0.84.

The present study indicated a greater tendency of subjects to use the middle part (a little sure) of the scale. This differs from the finding of Parcel et al. who found the distribution of the child dietary self-efficacy scale was skewed to the right, indicating more subjects scored on the high end of the scale, suggesting a greater tendency for subjects to use the higher end (very sure) of the scale items [8].

As regards the test–retest reliability of the child dietary self-efficacy scale, it was found that $r = 0.65$ and Cronbach alpha reached 0.79, indicating good reliability. These results are consistent with Parcel et al. who found the reliability estimate for the child dietary self-eficacy scale was $r = 0.63$ [8]. Boys were more consistent on the self-efficacy scale than girls; this may be attributed to the high stability or strong personality of boys in our culture.

Self-efficacy is a connection between knowledge and action since the belief that one can adopt a behaviour occurs before one actually attempts the behaviour. Self-efficacy also affects the choice of behaviour [7]. This is confirmed by the results of our study which showed that knowledge was a predicator of self-efficacy ($r = 0.37$). Also self-efficacy and knowledge together were predictors of usual food choices. Parcel et al. reported that self-efficacy was the strongest predictor of usual food choices ($r = 0.34$) [8].

An individual's performance of a behaviour usually provides the best indicator of the ability to do it. The converse is also true [7]. This is confirmed by the results of the present study which revealed that usual food choices were the best predictor of self-efficacy ($r = 0.44$).

The pupils in our study had areas of great perceived competence concerning their ability to drink fruit juice instead of soft drinks, eat fresh fruit instead of candy bars and remove or not eat the fat of meat. Also the highest proportion gave the correct knowledge answer (about 96%) for the question about the relative healthiness of fresh fruit or candy bars. This confirms the strong relationship between knowledge and self-efficacy. This could also be explained by the availability and low price of fruits, coupled with good information about their importance as sources of minerals and vitamins. Another finding was that only 15.5% of boys and 11.7% of girls ate the fat of meat. This reinforces the strong relationship between self-efficacy and behaviour. On the other hand, their areas of greatest vulnerability concerned their inability to eat boiled chicken without frying and to eat food without salt.

These points should be noted when planning nutrition education programmes addressing preparatory-school pupils.

Recommendation

Health education strategies for heart disease should be included in a comprehensive school health programme to help develop healthy dietary behaviour and lifestyle from an early age in order to reduce the incidence of coronary heart disease. The programme should focus not only on knowledge of diet and coronary heart disease but also on teaching people how to obtain healthy food. More attention should be paid to culture, customs, socioeconomic factors and beliefs because these are key factors which affect health behaviour.

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Correction

Oral health survey in 12-year-old children in the Islamic Republic of Iran, 1993–1994. EMHJ Vol.4 No.2. August 1996, page 338, by S.M. Seyedein, M.R. Zali, M.V. Golpaigani, H. Yazdani and S. Nourhalouchi.

The correct name in Arabic of the first author should read سيد مجتبى سيدين