

## A comparative study on the energy expenditure using traditional and modern kitchen tools

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### ABSTRACT

The present study was conducted to know the effect of modern and traditional tools on energy expenditure of women and to recommend the energy efficient tools on the basis of subjective responses. For this purpose, ten shops from two markets of Ludhiana city were selected randomly to know the availability of tools in the market. For calculating energy expenditure, ten tools were also standardized. The experiments were performed on 15 female subjects of 25 – 35 years of age having permissible range of physiological parameters *viz.*, heart rate, blood pressure, height, weight. Subjective responses were also taken while using the traditional and modern kitchen tools. Results showed that modern kitchen tools were found to be more efficient in reducing energy to considerable extent in almost all activities. Maximum number of respondents showed positive attitude for the use of modern kitchen tools as they felt that these tools are less hazardous, reduce physical efforts and body pain and are also convenient to use. Therefore, these modern tools are recommended over traditional methods or tools so that to minimize the strain of homemakers and also to make them free for other profitable and useful jobs.

**KEY WORDS :** Energy expenditure, Physiological parameters, Subjective responses, Traditional/modern tools

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### INTRODUCTION

With all the modern facilities and accessories available for the kitchen, a homemaker needs no longer consider preparing family meals an unwelcome chore. The cooking area is now not a poky old place full of soot and smoke. A modern kitchen tool now-a-days is heart of a home and therefore, the homemakers should not ignore essentials of having and maintaining such kitchens (Romola, 2002).

In recent times, the number of working women has increased considerably in urban areas. Constant interruptions and unexpected demands on her time and energy disturb the pattern of her work and she may end up, tense and tired. A number of kitchen gadgets and tools are available these days to make meal preparation activity a real pleasure. On the other hand, traditional methods used by housewives in the past led to physical and physiological stress. But today's women are lucky enough as technological advancement has brought many latest tools in the market which are helpful in decreasing worker's efforts. Therefore, the present study was undertaken with the following objectives to ascertain the effect of modern

and traditional kitchen tool on energy expenditure of respondents and to recommend the energy efficient tools on the basis of subjective responses.

### METHODOLOGY

The present study was conducted in two phases *i.e.* survey and lab. experiments. For knowing availability of kitchen tools in the market, a market survey was conducted in main two markets in Ludhiana city. Five shops each were randomly selected from these two selected markets making total number of shops ten. Ten tools which were most commonly sold in the market were selected for experiment. The most routinely performed and highly preferred activities by respondents done with these selected ten modern tools were selected for the laboratory experiments and the quantum of work had been standardized by taking the help from the faculty members of Food and Nutrition Department, College of Home Science, PAU, Ludhiana and as presented in Table 1.

In total, 15 respondents were selected for experiment. The general profile of the respondents is

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presented in Table 2.

For calculating the energy expenditure while using traditional and modern kitchen tools, the following formula was used which, was given by Varghese *et al.* (1989).

**Table 1 : Standardization of selected activities for laboratory experiments (one time menu for 4-5 families members)**

Activity	Quantity	Tools used	
		Traditional	Modern
Peeling	1 kg potatoes	Knife	Peeler
Chopping	½ kg onions	Knife	Chopping board
Grating	½ kg onions	Flat grater	Improved grater
Slicing	½ kg tomatoes	Knife	Tomato slicer
Juice extraction	10 <i>Mausami</i>	Hand juicer	Improved juicer
Mashing	½ kg peeled potatoes	<i>Katori</i>	Potato masher
Beating	4 eggs	Spoon	Beater
Churning	50 gms curd	<i>Madhani</i>	Churner
<i>Poori</i> pressing	20 <i>poories</i>	<i>Chakla balen</i>	<i>Poori</i> presser
Chips making	½ kg peeled potatoes	Knife	Chips maker

Energy Expenditure (kJ/min) = 0.159 x Heart rate (bmin<sup>-1</sup>) - 8.72

Further, subjective responses for each tool was taken on five point scale varying 1-5 *viz.*, 1 for fully disagree

and 5 for fully agree.

## OBSERVATIONS AND DISCUSSION

Average values of energy expenditure (kJ/min) of selected subjects (15) while performing the selected activities with traditional and modern kitchen tools have been presented in Table 3. It reveals that maximum average energy expenditure in kJ/min was found in juice extracting activity (8.06 kJ/min) followed by *poori* pressing (7.63 kJ/min), grating (6.84 kJ/min), beating (6.57 kJ/min), churning (6.40 kJ/min) and peeling (6.23 kJ/min). Whereas, energy expenditure for chips making and chopping was 6.20 and 6.03 kJ/min, respectively with traditional kitchen tools and the minimum for mashing (5.92 kJ/min) and slicing activity (5.56 kJ/min). Varghese *et al.* (1989) also reported that energy expenditure on household tasks ranged from 1.35 Kcal/min to 3.4 Kcal/min.

Table 3 further reveals that maximum energy expenditure was found in juice extracting activity (7.22 kJ/min) followed by chips making (5.89 kJ/min), *poori* pressing (5.85 kJ/min) and grating (5.71 kJ/min) while working with modern kitchen tools. Whereas, energy expenditure in activities like churning, chopping, peeling, beating, mashing and slicing were found to be minimum.

When the comparison was made in mean energy expenditure by calculating change in per cent increase while using traditional and modern tools (Table 3), it was found that maximum change in per cent increase of energy expenditure was found in *poori* pressing (52.41) with the use of *poori* presser as compared to *chakla balen* followed by grating (40.29), beating (24.92), mashing (24.08), churning (22.41) while using modern tools. The less change in per cent increase was found in case of

**Table 2: Physical and physiological parameters of the selected subjects**

Sr. No.	Age (years)	Heart rate (bmin <sup>-1</sup> )	Blood pressure (mmHg)	Weight (kg.)	Height (inches)
1.	25	76	124/78	52½	62
2.	25	78	126/80	53	64
3.	25	77	120/80	52.5	64½
4.	25½	74	118/79	54½	60
5.	25½	75	119/79	56	60
6.	26	76	120/82	52½	60½
7.	26	77	127/79	53	63½
8.	26	79	125/74	54½	64
9.	26	78	126/78	52	63
10.	27	76	121/71	53	62½
11.	27½	75	120/80	56½	62
12.	27½	77	120/80	56	63
13.	27	77	123/79	55½	63
14.	27	73	117/76	52	62½
15.	34	79	120/80	54½	63

**Table 3 : Average energy expenditure (kJ/min) of subjects while performing activities with traditional and modern kitchen tools**

Activities	Traditional kitchen tools				Modern kitchen tools				Change in per cent increase	t-value
	At rest	During activity	Increase over base	Per cent increase	At rest	During activity	Increase over base	Per cent increase		
Peeling	3.65±0.42	6.23±70.00	2.58	70.69±44.41	3.53±0.31	5.60±0.59	2.07	58.64±25.00	12.05	2.43*
Chopping	3.53±0.37	6.03±0.56	2.50	70.69±11.27	3.54±0.37	5.65±0.64	2.08	58.28±10.50	12.41	2.84*
Grating	3.51±0.23	6.84±0.72	3.33	94.91±19.75	3.69±0.22	5.71±0.86	2.02	54.62±44.71	40.29	4.01*
Slicing	3.63±0.44	5.56±0.69	1.93	53.28±20.30	3.53±0.41	5.37±0.56	1.84	52.07±17.21	1.21	1.31
Juice extraction	3.51±0.37	8.06±1.06	4.55	129.63±34.82	3.32±0.59	7.22±0.78	3.99	117.51±56.25	12.12	3.30*
Churning	3.35±0.27	6.40±0.34	3.04	90.75±18.16	3.38±0.28	5.69±0.74	2.31	68.34±16.74	22.41	5.26*
Beating	3.58±0.26	6.57±1.92	2.99	83.37±61.10	3.49±0.34	5.53±0.93	2.07	58.45±29.02	24.92	2.88*
Mashing	3.23±0.33	5.92±0.65	2.69	83.59±24.61	3.38±0.35	5.39±0.54	2.01	59.51±32.49	24.08	4.23*
Poori pressing	3.49±0.39	7.63±1.26	4.14	118.42±38.29	3.52±0.37	5.85±1.09	2.33	66.21±31.44	52.41	10.94*
Chips making	3.76±0.14	6.20±1.05	2.44	64.89±33.34	3.74±0.28	5.89±0.87	2.15	57.33±19.30	7.56	5.65*

\* indicates significance of value at P=0.05

chopping (12.41), juice extracting (12.12), peeling (12.05) and chips making (7.56), whereas, least was in slicing activity (1.21). The main reason of less change in per cent increase in mean energy expenditure may be due to the reason that all the modern kitchen tools used for performing of kitchen activities required some extra efforts thus demanding more energy. It is also clear that very high percentage reduction was found in mean energy expenditure with the use of modern kitchen tools. Maximum reduction was observed in *poori* pressing (43.71%) followed by grating (40.29%) beating (31.77%), mashing (25.56%), churning (24.01%) and peeling (19.77%), whereas, less percentage reduction was found in chopping (16.80%), juice extracting (12.30%), chips making (11.89%) and least reduction was observed in

slicing *i.e.* 4.66 per cent, thus indicated that the modern kitchen tools were more efficient in reducing energy costs to considerable extent in almost all activities except slicing. Shashi (1995) revealed that in case of peeling vegetables, 28.38 per cent saving of energy was recorded with the use of vegetable peeler (6.35 Kcal) over the use of ordinary knife. Oberoi and Sandhu (2002) also observed that about 50.00 per cent energy was saved by using egg beater to beat eggs instead of using a spoon. Using vegetable peeler to peel vegetables and fruits accounted for saving of human energy upto 25.38 per cent as compared to use of knife for peeling. However, using onion chopper could save only 5.20 per cent of human energy as compared to chopping done by knife.

Paired t-test demonstrated statistically significant

**Table 4: Subjective responses regarding the use of traditional and modern kitchen tools**

Sr. No.	Parameters	Modern		Traditional	
		Mean score	Rank	Mean score	Rank
1.	More hygienic	4.60	I	2.70	IV
2.	Reduce time	4.59	II	2.49	V
3.	Interesting	4.56	III	2.41	VI
4.	Good outcome	4.44	IV	2.99	II
5.	Uniformity of product	4.44	IV	2.99	II
6.	Convenient to use	4.39	V	3.13	I
7.	Job satisfaction	4.35	VI	2.92	III
8.	Reduce physical efforts while working	4.16	VII	2.19	VII
9.	Reduce body pain and discomfort	3.28	VIII	1.90	VIII
10.	Less wastage	2.60	IX	1.03	X
11.	Less hazardous	2.04	X	1.24	IX

difference in terms of energy expenditure in all activities except slicing. Therefore, it can be concluded that modern tools were found very effective in reducing the per cent increase of mean energy expenditure.

### Subjective responses regarding the use of traditional and modern kitchen tools:

Subjective responses regarding the use of modern and traditional kitchen tools were taken and mean scores were calculated and ranks were assigned accordingly as shown in Table 4. Respondents felt that modern tools were more hygienic, they reduce time, interesting to use and outcome is good so I, II, III and IV ranks were assigned to these parameters. Whereas regarding the use of traditional kitchen tools, 'convenient to use', 'uniformity of product', 'good outcome' and 'job satisfaction' were found to be the main parameters and got I, II and III ranks, respectively. On the other hand reduce body pain and discomfort', 'less wastage' and 'less hazardous' were found to be the least important parameters and got last ranks in using both modern and traditional kitchen tools. On the whole, it was observed that respondents were more satisfied and appreciated the use of the modern kitchen tools as compared to the traditional kitchen tools.

### Conclusions:

It can be concluded from the study that maximum average energy expenditure (kJ/min) was found while using traditional juice extractor. Whereas, maximum percentage reduction in mean energy expenditure was observed during juice extraction activity with modern juice

extractor and minimum in using tomato slicer for slicing activity. Maximum percentage reduction was found in *poori*-making. It was further found that maximum agreed statements were for beating activity with spoon followed by mashing and churning. Subjects disagreed with the statements mentioned in other traditional tools. The least score was given to juice extraction activity while using traditional juicer. So, it can be concluded that the subjects showed positive attitudes towards the use of modern kitchen tools as compared to the traditional tools.

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