

# Effectiveness of Lifestyle Interventions among College Students: An Overview

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## Abstract

College students are young adults in a transition phase who have the potential for positive behaviour changes via lifestyle interventions. These primary prevention strategies are expected to be more realistic and cost-effective, as compared with clinical treatment and can even be helpful in developing countries. A number of the intervention approaches via various techniques have shown significant and beneficial changes in dietary and exercise habits among college students. All the interventions with in the duration of 1 month to 7 months have shown significant improvement in the dietary and physical activity habits of the college students. These interventions also resulted in significant improvement in fruits and vegetables consumption as well as in behavioural control and weight loss. Some studies have reported that intervention resulted in improvement in health behaviour, and in physical fitness along with increased self-regulatory strategies. However, short-term lifestyle changes are evident as reflected in several studies but the long-term effectiveness of interventions is unknown. Therefore, long term effectiveness of the interventions need to focused for the behavioural change.

**Keywords:** College students; Transition; Intervention; Lifestyle

## Introduction

The prevalence of overweight and obesity is reaching epidemic proportions in the world over the past decades [1,2]. It affects people across gender, racial, and ethnic groups. Demographic shifts, sedentary lifestyle, could be a reason for this health transition. It has numerous negative physical, psychological [3,4] and financial consequences which affect not only the overweight and obese individual, but also one's social environment.

## The burden of transition phase

With the rise in obesity trends across the population it is important to look closely to different phases of life cycle. After alarming rates seen among children and adolescents, college goers may also be a vulnerable to obesity. The transition to college often results in drastic changes and the years following can give extremely stressful time to them. Researchers have revealed that during this phase there is a high rate of involvement in unhealthy behaviours that may impact their nutritional status [5-10]. The health behaviours that are found to contribute to obesity are overeating, consuming foods high in sugar, sodium, fat, frequent snacking on non-nutritional foods, and alcohol and caffeine consumption [7,8]. This weight gain among students may lead to physical and emotional problems that could continue into adulthood. Therefore it is important to address this problem as young adults enter this high-risk transition period.

## Addressing the problem

The increasing prevalence of obesity highlights the need for improved preventive strategies to overcome this public health problem. A wide variety of obesity treatments are available including diet, exercise, behavioural modification, pharmacological treatment and surgery. But, the magnitude of the problem has shifted the focus from the clinical treatment of obesity towards obesity prevention strategies that address the socio-cultural, economic, environmental and lifestyle-related causes. College students particularly have poor dietary and physical activity habits. Healthy eating and adequate physical activity are not considered as high priorities among them [11]. Therefore, interventions focussing on the adoption of healthy nutrition habits,

incorporating regular physical activity in day to day life and refraining from substance abuse should be implemented. As a result, there is an urgent need to develop effective life-style interventions strategies at early stage of life for long term health benefits.

## Lifestyle interventions

Lifestyle comprises an individual's actions and behaviours of choice, which can affect health status. It includes different components such as nutrition, physical activity, and health awareness, which contributes to one's health [12]. Thus lifestyle programs might assist in one's behavioural change. Lifestyle programs are multi-factorial interventions that are designed for individuals or groups according to their risk factor status and the needs of the subjects. These include promoting healthy lifestyle habits, dietary counselling, physical exercise training, and behavioural change targets [13]. These programs can be delivered either by face-to-face contact in small groups, or via media based strategies which covers large masses or through mixed approach. Most of the previous studies have used various behaviour change theories such as Social Cognitive Theory (SCT), the Transtheoretical (stage of change) Model (TTM), Health Belief Model (HBM), Theory of Reasoned Action (TRA) or Theory of Planned Behavior (TPB), Protection Motivation Theory (PMT), Behaviour learning, Ecological theory to shape the interventions.

## Behavioural change theories

**Social cognitive theory (SCT):** This theory is also known as social

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learning theory (SLT) and was developed by Bandura [14]. It explores the mutual interactions of people and their environments, and the psychosocial determinants of health behavior [15,16]. According to SCT, there are many constructs which are as follows:

- Reciprocal determinism- It describes the dynamic interaction of an individual, environment and behaviour and the way they influence each other.
- Behavioural capability- It states that an individual must possess knowledge and skills to perform a behavior.
- Expectations- These are the results of an individual anticipation on the outcome of different behaviour patterns.
- Self-efficacy- It emphasizes the importance of the confidence in one's ability to take action and overcome barriers or to successfully perform behaviour.
- Observational learning (modeling)- It is the behavioural acquisition that occurs by watching the actions and outcomes of others behavior
- Reinforcements- These are the responses to a person's behavior that increase or decrease the likelihood of reoccurrence of the behavior.

**Transtheoretical model (TTM):** This model was developed by Prochaska and DiClemente [17]. It describes individual's motivation and readiness to change a behavior. According to this model a person systematically progresses through five stages i.e. precontemplation, contemplation, preparation, action and maintenance. Precontemplation is the time when individual has intention of taking action because the individual is unaware of any health consequences or problem with current behavior. Contemplation describes a time when the individual is aware that there is a problem and is intended to take action to resolve the problem. This stage usually takes about 6 months. Preparation is the time when the individual is getting ready to take action, usually within 30 days, and has taken some behavior steps in this direction. Action designates the time when individual has changed behaviour and noticeable changes are happening. Maintenance refers to attempts made by the individual to maintain the changed behavior for at least six months. Relapse may also be a last stage as individual might return to the previous pattern of behaviour [14,18].

**Health belief model (HBM) :** The HBM was developed by Irwin Rosenstock [19]. This model addresses the individual's perceptions of the threat posed by a health problem, the benefits of avoiding the threat, and factors influencing the decision to act [15,16]. There are mainly six main constructs that influence people's decisions to take action. The constructs are:

- Perceived susceptibility- Believe that they are susceptible to the condition
- Perceived severity- Belief the condition has serious consequences
- Perceived benefits- Belief taking action would reduce their susceptibility to the condition or its severity
- Perceived barriers- Belief that the costs of taking action are compensated by the benefits
- Cue to action- Are exposed to factors that prompt action
- Self-efficacy- Confidence in one's ability to successfully perform an action

**Protection motivation theory (PMT):** This theory states that the fear can motivate people to change behavior. This theory is similar to the HBM in a way that it encompasses a number of concepts from the HBM. The concepts of this theory are perceived severity, perceived vulnerability, threat appraisal, coping appraisal, response efficacy, and self-efficacy. According to this theory protection motivation includes two appraisal processes i.e. threat and coping. Similar to the HBM, the threat appraisal process is determined by perceived susceptibility and perceived severity. The second appraisal process is coping appraisal. Coping appraisal is determined by the usefulness of the response (response efficacy) and confidence in one's ability to perform the behaviour (self- efficacy).

**Theory of planned behavior (TPB) or Theory of reasoned action (TRA):** The TRA was developed by Martin Fishbein and Icek Ajzen [20]. Ajzen extended this theory and developed the TPB in 1985. Both the theories examine the relations between an individual's beliefs, attitudes, intentions, behavior, and perceived control over the behavior. According to these models, behavioural intention is influenced by a person's attitude toward performing a behavior and by beliefs about whether individuals who are important to the person approve or disapprove of the behavior. Perceived behavioural control is an additional component in TPB. It describes about the beliefs that one uses to control over performing the behaviour [15,16].

**Ecological theory:** This theory emphasizes the interaction between the ecology systems. It highlights inter relationship between intrapersonal, interpersonal and environmental factors. An ecological perspective shows the advantages of multilevel interventions that combine behavioral and environmental components. It assumes that individual's efforts towards behavioural change are more likely to succeed in the presence of supportive environment. It has two key concepts first, behavior affects, and is affected by, multiple levels of influence; and second, individual behavior shapes, and is shaped by, the social environment. The levels of influence include intrapersonal or individual factors, interpersonal factors, community factors which include institutional, community and public policy factors [15,21].

- Individual or Intrapersonal Level- Individual behavior is the fundamental unit of group behavior. It includes one's knowledge, attitudes, beliefs, and personality traits that influence behavior.
- Interpersonal level- It includes family members, coworkers, friends, and peers. It explores the interactions of people and their surroundings.
- Community level- This level explores about how social systems function and offer strategies that work in a variety of settings, such as health care institutions, schools, worksites, community groups, and government agencies [15].

## Overview of studies

**Intervention approach:** The Lifestyle interventions that have been conducted in past have used different approaches: In-person approach, online approach and mixed approach. Several past studies have shown the benefits of the intervention among college students. Many studies have shown significant and beneficial changes in dietary habits and physical activity of college students after the implementation of nutrition interventions via various techniques and methods [22-25].

**In person approach:** This type of approach is usually direct and involves a confrontational meeting with individual/groups in person, to encourage them. This also involves active participation from the

individual/groups. Some of the studies have used this type of approach (Table 1).

Ha and Caine-Bish [25] studied the effectiveness of 15-week nutrition intervention program to promote consumption of fruits and vegetables among 80 college students. These 3 times a week intervention entailed a 50 minutes nutrition class. The lectures covered topics like the importance of nutrition related to prevention of chronic diseases; increasing consumption of fruits, vegetables, and whole-grain products; encouraging low-fat dairy product consumption; discouraging over-reliance on dietary supplements; and promoting an active lifestyle. The results of the study compared pre and post fruits and vegetables intake, which showed significant increase in consumption patterns. Gender differences were also seen in the improved consumption.

Sallis et al. [26] examined the impact of theoretically-derived mediators of health behaviour change. This 16 weeks GRAD (Graduate Ready for Activity Daily) course comprised 50-minute lecture and a 1-hour and 50-minute peer-led discussion and activity

class each week. The course content included topics of exercise and behavioural science like introduction to behaviour change and physical activity, environments for activity, goal setting, time management, personal benefits/costs of activity, body image, self-talk, social support, enjoyment of activity, stress management, relapse prevention, introduction to, flexibility, lifestyle activity, cardiovascular exercise, energy cost of exercise strength, nutrition for health, weight management, injury prevention, circuit systems, mental health and physical activity. The study results showed significant effects of self-efficacy on time and relapse prevention, and friends' social support among women and physical activity barriers among men showing sex differences in the impact of the health behavioural change mediators. Thus it can be concluded that these mediators of behaviour change may help in improving the interventions.

Another study by Finckenor and Byrd-Bredbenner [27] used pre action stage oriented change processes of the TTM to shape the intervention program. This 14 weeks program comprising eleven

Author (Year)	Design	Intervention type	Sample size	Duration of intervention	Summary of findings
<b>In-person approach</b>					
Sallis et al. (1999)	Non Experimental	Lectures+Activity	338	16 weeks	For women- significant effects for social support from friends (P<0.006), experiential and behavioral process of change (P<0.0001), self-efficacy for making time (P<0.001) and For man- no significant change in any variable except behavioral processes of change (P<0.001) for resisting relapse P<0.002).
Finckenor and Byrd-Bredbenner (2000)	Non Experimental	Lectures	110	14 weeks	No significant reduction in mean fat intake and progression in mean stage of change
Anetor et al. (2012)	RCT	FGDs	398	8 weeks	Positive significant change in eating habits (P<0.05)
Ha and Caine-Bish (2009)	Non Experimental	Lectures	80	15 weeks	Significant increase in fruits and vegetables consumption (P<0.005), and decrease fast food consumption (P<0.05)
Ha et al. (2009)	Non Experimental	Activities+Lectures	80	15 weeks	Increased total milk and decreased soft drink consumption (P<0.05)
Keeler et al. (2013)	Case control	Peer mentors	17 women	8.3 weeks	Improvement in exercise stage of change (P ≤ 0.01)
Topp et al. (2011)	Non Experimental	Lectures	30	10 weeks	Improvement in physical fitness and perceived benefits to exercise and decreased perceived barriers to exercise and healthy diet (P<0.05)
Woods et al. (2002)	RCT	On campus leisure facilities, exercise classes and lectures	186	28 weeks	Improvement in exercise stage of change (P<0.05)
<b>Online approach</b>					
Poddar et al. (2010)	Experimental	Online	294	5 weeks	Increased use of self-regulatory strategies (P=0.038) and self-efficacy(P=0.049) for consuming dairy products (three servings/day)
Poddar et al. (2012)	Experimental	Online	211	8 weeks	Improved total dairy intake (P=0.012) and self-regulation(P=0.000)
Kwan et al. (2013)	Non Experimental	Online	65	6 weeks	Significant interaction on perceived behavioral control (P<0.001)
Franko et al. (2008)	RCT	Online	287	24 weeks	Increased social support, self-efficacy and improved attitude toward dietary and exercise change (P<0.05)
Harvey-Berino et al. (2012)	Non Experimental	Online	336	12 weeks	Significant reduction in weight (P<0.001)
Dour et al. (2013)	Case control	Online	653	12 weeks	Improved weight-related health behaviours (P<0.05)
<b>Mixed approach</b>					
Richards et al. (2006)	RCT	Online+personal	437	16 weeks	Fruit and vegetable consumption increased significantly (P<0.001)
Shahril et al. (2013)	RCT	Lectures+brochures+text messages	417	10 weeks	Improved dietary intake by increasing their energy intake (P=0.006), calcium (P ≤ 0.001), thiamine (P=0.03), fish (P=0.004), eggs (P=0.03) and dairy products (P=0.005), vitamin C, fruits, milk and decreased processed food intake (P<0.001)
Gow et al. (2010)	RCT	Lectures+Online discussion	159	12 weeks	Reduced BMI (P<0.05)

RCT- Randomised Control Trial, FGDs- Focus Group Discussions

**Table 1:** Studies of life style interventions in college students.

lessons of 15 minutes each produced reduction in dietary fat reduction and progression in the stage of change.

An intervention study done by Stice et al. [28] on undergraduates for 15 weeks used in-person approach i.e. seminar, presentations and class discussions. It was implemented twice a week for 1.5 hours and showed significant change in BMI.

Another study by Gow et al. [29] evaluated the impact of a 6 week intervention program on weight change, dietary intake, and nutrition knowledge among female undergraduate students. The program included 45 minutes sessions comprising lectures, assignment, discussions. The results showed significant changes in the BMI of the subjects.

A study done in south west Nigeria by Anetor et al., [30] revealed improvement in disease related eating habits among college students (16-25 years) after incorporating nutrition education for eight weeks. This programme comprised Focus Group Discussions (FGDs) on topics like disease related dietary factors, food pyramid, importance of nutrition facts, healthy and unhealthy eating which were scheduled one hour per weekly.

Keeler et al. [31] investigated the effect of a peer-led, tailored nutrition and exercise adherence intervention (FitU) on exercise stages of change, intuitive eating, and barriers to healthy eating and exercise in 17 college females. This 8-10 weeks intervention comprised 30 to 60 minutes based on student's needs. Various interactive handouts and incentives like T-shirt, a cookbook and water bottle were given to increase program effectiveness. Overall, the FitU program did report satisfactory results with major improvements to dietary and exercise patterns/thoughts.

Some other studies have also used this method and have shown significant changes i.e. reduction in weight and BMI [32] decreased body fat % through low-intensity aerobic exercise program for 12 weeks [33] and decreased WHR through 4 month exercise advice and positive reinforcement [34].

**Online approach:** The internet has become a major component of everyone's lives and is considered as the promising delivery channel of interventions especially for adolescents and young adults. Numerous online interventions that encourage people to increase exercise and to adopt healthy lifestyle have been used by various researchers and also have shown a positive effect.

Poddar et al. [35] used this approach on the 211 college students dairy intake to study the effect of SCT variables. This 8 weeks intervention addressed self-efficacy, outcome expectations, self-regulation, and social support for consuming dairy and low-fat dairy products and was delivered in modules, with one module per week. The topics included significance of total/low-fat dairy intake during young adulthood, ways to increase, total recommended intakes, and places to find dairy/low-fat dairy foods on campus, measuring dairy intake against recommended intake, and reading food labels on dairy products. The improved dairy intake was seen from study results.

Another 5-weeks online intervention study by Poddar et al. [36] showed improved self-efficacy, outcome expectations and self-regulation to increase intake of dairy products by college students. The e-mail messages, posted information, and behaviour checklists were used for disseminating education.

Kwan et al. [37] checked the feasibility and efficacy of a website-

delivered physical activity intervention 'Active Transition' aimed at university student's physical activity cognitions and self-regulatory skills. This 6 weeks intervention was based on the TPB. It delivered weekly topics on behavioural, normative, control beliefs in physical activity, as well as goal-setting, action planning, relapse prevention, and behavioural maintenance. The initial 2 weeks intervention targeted on students motivation and coping strategies to deal with lifestyle barriers. The 3<sup>rd</sup> and 4<sup>th</sup> week focused on behavioural modification techniques and the final weeks of the intervention focused on relapse prevention and behavioural maintenance. The study findings suggested significant benefit in spite of low intervention usage.

Another internet based nutrition and physical activity education intervention named; MyStudentBody.com-Nutrition (MSB-N) reported improvement in dietary habits but not in physical activity status of the college students. This program comprised web sessions (1) three information links (Ask the Expert, Student Voices, College News); (2) Rate Myself assessment (questions that are part of the website that are used to provide feedback to the user); (3) four main topic pages (Nutrition 101, Eating on the Run, Weighing In, Fitness); and (4) Resources. The sessions included text-based and audio information, interactive activities, and goal-setting areas [38].

Harvey-Berino et al. [39] explored the feasibility of a behavioural weight management program for college students. It encompassed 1-hour weekly "group meetings" in an online synchronous chat led by an interventionist trained in behaviour modification and online facilitation through the completion of a 45-hour training course. The Web-based intervention resources included a diet and exercise journal, nutrition and exercise educational resources, and a bulletin board for group communication, weekly tips, recipes, and BMI calculator. The assessment tools of the interventions like weekly chat meetings with a facilitator, calorie and fat gram recommendations, daily food logs, and exercise guidance showed effectiveness of online intervention.

**Mixed approach:** Many researchers have used a combination of both the intervention approach to add effectiveness to the intervention program. The mixed approach was used by Richards et al. [40] to evaluate the effectiveness of the 4 weeks intervention study. A one-item food frequency question, a 26-item food frequency questionnaire (FFQ), an 18-item decisional balance questionnaire, and a five-item self-efficacy questionnaire were used to assess the effectiveness of the intervention. The intervention used stage-based newsletters, computer-based communication, and motivational interviewing to increase the fruits and vegetables consumption among college students (18-24 years). The newsletters depicted the stage of change showing tips to improve fruits and vegetables consumption status.

In another study, this approach was used for implementing 10 weeks multimodal Nutrition Education Intervention (NEI) to improve dietary intake among university students [41]. The effectiveness was assessed by comparing pre and post dietary intake of the students. The intervention materials used three modes; conventional lecture, brochures and text messages. Conventional lectures were carried out for 1-hour session using 64-slide multimedia Microsoft PowerPoint presentation. Brochures were designed as take home messages which contained three main themes nutrition key messages like always be healthy, eat moderately, live the future. Text messaging included 13 messages based on millennium development goals which were delivered manually through Mobile Nutritional Education System (MNES). The improvement in dietary intake in the study showed that it is an effective approach for health promotion.



## Results and Discussions

In an effort to address healthy lifestyle education, researchers and educators have developed many intervention programs for college students; however, these programs are variable in approach. In this review seventeen studies were identified in which researchers have studied the dietary and physical activity intervention effectiveness among college/university students using various approaches. Current review relating to different lifestyle interventions shows that increased awareness regarding healthy lifestyle can positively influence lifestyle of college students. It also reveals that successful interventions tend to have similar features in terms of the components of intervention. The studies in this review have targeted nutrition and dietary habits of the students [25,24,27,30,35,36,40,41] self-regulation strategies [26,35-37], weight related health behaviors [29,39,38,42], improvement in physical activity [31,43,44]. All the studies have shown improvement in the dietary and physical activity habits of the college students. The review of the studies highlights how lifestyle interventions can help in the adoption of healthy lifestyle among college students. The duration of the intervention in the research studies ranged from 5 weeks i.e. 1 month to 7 months. The review showed that lifestyle interventions resulted in significant improvement in fruits and vegetables consumption as well as in behavioural control and weight loss. Some studies have reported that intervention resulted in improvement in health behaviour, and in physical fitness along with increased self-regulatory strategies. However, short-term lifestyle changes are evident as reflected in several studies but the long-term effectiveness of interventions is unknown. The variations in the improvement among the students can be attributed to the variation in the content, time duration of the intervention, intervention components and the approach used. Thus it is likely that most of the interventions approaches can be effective depending on the intervention components and its duration.

## Conclusion

This brief review compiles evidence on the effectiveness of nutrition education interventions that have been used for college/university students in different countries. It suggests that implementation of lifestyle interventions via numerous techniques are effective in bringing significant and beneficial changes in dietary and exercise habits among college students. In particular, intervention with either approach has proven to be beneficial in improving lifestyle practices. The variability in intervention content and duration was seen from the review of the studies but not much is known about the long-term efficacy of these intervention programs. Thus healthy lifestyle interventions should form an important component in the preventive strategies of many NCD's like obesity, diabetes and cardiovascular disease.

## Recommendations for Future Research

This review suggests that colleges and universities can prove to be the good venues to encourage healthier lifestyle habits among students through various strategies. This is the only time to provide specific recommendations through the most effective and economical lifestyle interventions. If prevalence of overweight/obesity persists like current trends then NCDs rates will be high among the future generations as today's young adults will be future parents. Thus, to halt this progression, there is an urgent need for developing health-promoting behaviours especially in this generation. As per the current review studies using larger samples over longer periods should be conducted. It is also important to address nutrition, physical activity and behavioural skills via tailored interventions not just to the groups but also at the individual level. It is also required to determine not only

the optimal length, intensity, but also the long-term effectiveness of lifestyle interventions. Furthermore, cost-effectiveness analyses also need to be conducted.

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