

# Transiting out of Full-time National Service: A Qualitative Study of Barriers and Motivators of Weight Change in Young Adult Men

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## Research article

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# Abstract

## Background

A higher prevalence of obesity in men compared to women, particularly amongst those 18 to 40 years of age, has been observed in Singapore. We hypothesised that poor adaptation during the transition out of full-time National Service (NS) among young men may have contributed to weight gain and we sought to understand these underlying drivers.

## Methods

In-depth interviews were conducted with young men (n=26; aged 19-25 years), 12 months after they had completed full-time NS. The interviews were guided by the health belief model to elicit perceived factors influencing weight change during the transition period, as well as barriers and motivators in weight management. Data was collected and cross-checked by two researchers, and analysed using the thematic analysis approach.

## Results

The participants generally perceived themselves to be less fit and less healthy one year later, as compared to during full-time NS. They felt that reduced physical activity levels and unhealthy eating behaviours contributed to their perceived weight gain. However, they did not have immediate concerns about their perceived change in weight. While most were aware of the benefits of regular physical activity, benefits of healthy eating were rarely mentioned. Many did not view healthy lifestyle behaviours as a current priority, citing reasons which included: Time pressures, incongruence with current lifestyle, or poor self-motivation. Other barriers included a lack of access to healthy food choices and insufficient common leisure time to exercise with peers. Motivators for these lifestyle behaviours were mostly intrinsic, including interest in a particular sport, having personal fitness goals and personal preferences for healthy food options. Participants also described healthy eating as a means to compensate for inactivity or unhealthy food choices. Extrinsic motivators included peer influence, access to sports facilities, healthy food options and monetary incentives.

## Conclusion

There remains a need to educate young men transiting out of full-time NS on lifestyle, weight and health, and address their misconceptions in particular. Creating a healthy environment and providing appropriate incentives would be important to facilitate a smooth transition out of full-time NS, minimising the risk of unhealthy weight gain in young men.

## Background

Obesity is a health condition of rising global concern as it raises the risk of a range of non-communicable diseases including hypertension and diabetes mellitus (1–3). Globally, overweight and obesity prevalence

rates among adults surged by 27.5% over 33 years (4). Similarly in Singapore, overweight and obesity rates have increased alarmingly over a 10 year period, from 26.2% in 1997 to 36.2% in 2017 (5).

The Singapore Prospective Study Program found that adult individuals (n = 2483) who gained the most weight and greatest waist circumference (WC) over a period of 8–10 years belonged to the young adults (aged 18–29 years) (6). This finding concurs with studies in other countries, demonstrating that young adults are the most susceptible to weight gain (7–11). Weight gain in young adults has been attributed to major transitions (7, 8), such as moving out of family homes and starting university (12), that may be associated with poor dietary choices (13) and sedentary behaviours (14).

Interestingly, local statistics in 2010 revealed that obesity prevalence rates in young men (aged 18–29 years) was three times higher than in young women (15.4% vs 5.8%) (15). This is contrary to findings in the United States (7, 16), where obesity rates were higher among young women (aged 18–34 years) instead. We speculate that this disparity in obesity rates between genders may be partially due to mandatory full-time National Service (NS), which all Singaporean males are required to undergo for two years on completing post-secondary education (17). The US Millennium Cohort Study (n = 38686) found that males were vulnerable to a rapid weight gain at the time of discharge from the military (18) and attributed this finding to a high energy consumption despite a decrease in energy expenditure. High overweight and obesity rates were also observed in other conscription cohorts in Germany, Austria, Norway and Iran (19, 20). It is unclear if the same applies to young Singaporean men after a period of transiting out of a highly structured environment characterised by compulsory physical activity and limited dietary options.

While interventions have attempted to curtail the rise of obesity among young men, low attendance rates from “not being able to reach, engage and retain young men successfully” (21–23) have often affected their efficacy and success rates. Another plausible factor is that interventions had been designed without much understanding of young men’s perceptions towards leading a healthy lifestyle (24), hence resulting in a mismatch in design and implementation. For interventions to be effective, barriers and motivators driving healthy lifestyle choices in this age group and cultural setting should be elucidated.

While there has been a steady rise in the number of studies exploring these perceived barriers and motivators in Australia (22, 24, 25) and the United States (26, 27), it remains unclear if these findings are relevant to young men in a multi-ethnic Asian context like Singapore. This study aims to understand the factors, barriers and motivators that drive certain lifestyle choices in young men in Singapore (aged 19–25 years) when transiting out of full-time NS. Additionally, we assessed changes in their body weight and waist circumference 12 months after this transition.

## Methods

### Study design

This study adopted a qualitative approach in the form of in-depth interviews and was conducted in adherence to the requirements outlined in the consolidated criteria for reporting qualitative research (COREQ) checklist (28). It was granted ethical approval by the Institutional Review Board at the National University of Singapore (B-16-290).

## Participants and setting

Recruitment was conducted during designated Health and Safety days among six military units with a spectrum of vocations, encompassing participants of diverse backgrounds. Interested participants approached a booth with researchers from the University to obtain detailed information of the study and provide their informed consent. Only full-time NS men in their final six months of service, and who were between 19 and 25 years of age were included. They were required to be Singapore citizens or permanent residents of Chinese, Malay or Indian ethnicity, able to read and understand English, and have internet access on their mobile phones or on a smart device at home.

## Data collection

At the recruitment booth, anthropometric measurements of the participants were taken and recorded by trained personnel. Participants' height was measured using a stadiometer and recorded to the nearest one decimal place. Participants' weight and WC were measured in duplicate using a weighing scale and measuring tape respectively, recorded to the nearest one decimal place, and averaged. Body Mass Index (BMI) ( $\text{kg}/\text{m}^2$ ) was calculated by taking weight (kg) divided by the square of height (m). Additionally, participants were sent an online questionnaire to provide demographic information including age, ethnicity, household income, residential area and education level.

The participants visited the study site at the University 12 months from the recruitment visit. Anthropometric measurements of weight, height and WC were taken, followed by an in-depth interview. The interview sessions were conducted in English and were facilitated by two trained researchers. An audio recorder and notepad were used to capture the information collected and was cross-checked by the same two researchers after the interview. Cash reimbursement was issued for the participants' time and travel.

The questions asked during the interview sessions were modified from and loosely based on the revised Health Belief Model (HBM), a framework explaining and predicting individual health-related behaviours (29). This revised framework comprises of six constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, perceived self-efficacy and cues to action. For the purpose of this study, we developed the interview guide and questions asked included type of lifestyle changes post full-time NS, perceived factors that influence weight change and perceived consequences of weight change (**Additional File 1**). Questions to understand the perceived benefits of, barriers preventing, and motivators driving a healthy lifestyle were also asked.

## Data analysis

The audio recordings were transferred to a password-protected computer and encrypted hard drive and were transcribed by a transcription company. The NVIVO 10 computer programme was used to facilitate the data analysis process with an independent qualitative researcher overseeing the process. A deductive approach analysis was adopted (30), allowing for an in-depth exploration of HBM theory driven concepts. A coding template was developed *a priori* based on the research questions, which were then applied to the data.

Themes and sub-themes from the data were identified and clustered under headings that directly relate to the research questions. These were summarised using the HBM in Fig. 1. The term “*army*” was used colloquially by the young men in reference to full-time NS and is prevalent in some quotes in the **Results** section and in Tables 2 and 3. All themes were presented in weighted order with the most frequently mentioned first.

## Results

Out of the 260 participants recruited, 33 (13%) participants returned for the 12-month study visit and 26 (10%) participated in the interview. Participants were predominantly Chinese (88.5%), mostly full-time university students (92.3%) and half (46.2%) were middle-income and below. At recruitment, their mean age was  $20.6 \pm 1.2$  years, mean BMI was in a healthy range of  $22.7 \pm 2.1$  kg/m<sup>2</sup> and mean WC was  $77.1 \pm 7.4$  cm. At the 12-month study visit, mean BMI was  $22.5 \pm 2.0$  kg/m<sup>2</sup> and mean WC was  $78.0 \pm 6.9$  cm. The mean change in weight from the recruitment visit to 12 months post full-time NS was  $-0.6$  kg, while the mean change in WC was  $+0.9$  cm (Table 1).

Table 1  
Demographic characteristics of young men (n = 26)

Characteristics	n (%) or Mean $\pm$ SD
Age at recruitment	20.6 $\pm$ 1.2
Ethnicity	
Chinese	23 (88.5%)
Malay	1 (3.8%)
Indian	2 (7.7%)
Household income (SGD)	
<\$2000	6 (23.1%)
\$2000-\$5999	6 (23.1%)
\$6000-\$9999	5 (19.2%)
>\$10000	3 (11.5%)
Did not report	6 (23.1%)
Residence type	
HDB <sup>a</sup> 1–3 room flat	5 (19.2%)
HDB 4–5 room (executive) flat	17 (65.4%)
Private condominium or house	3 (11.5%)
Did not report	1 (3.8%)
Highest education level	
Secondary ('O' / 'N' level)	2 (7.7%)
Post-Secondary ('A' level/ Polytechnic diploma)	24 (92.3%)
Employment status 12 months post full-time NS	
Student (full-time)	24 (92.3%)
Working	2 (7.7%)
Weight (kg) at recruitment	69.8 $\pm$ 9.3
Weight (kg) at 12 months post full-time NS	69.2 $\pm$ 8.6
BMI (kg/m <sup>2</sup> ) at recruitment	22.7 $\pm$ 2.1

<sup>a</sup> HDB: Owner-occupied public housing built and sold by the Housing and Development Board (31).

Characteristics	n (%) or Mean ± SD
BMI (kg/m <sup>2</sup> ) at 12 months post full-time NS	22.5 ± 2.0
Waist circumference (cm) at recruitment	77.1 ± 7.4
Waist circumference (cm) at 12 months post full-time NS	78.0 ± 6.9
<sup>a</sup> HDB: Owner-occupied public housing built and sold by the Housing and Development Board (31).	

## Changes in lifestyle within 12 months after transiting out of full-time NS

When participants were asked about their lifestyle changes after leaving full-time NS, many reported feeling more liberated. As one participant said, *“I get to make my own choices. Uh there's no one nagging at me to do stuff ...more freedom to plan my schedule.”* When asked about the aspects of their lifestyles that have changed, two key themes emerged. Almost all the participants reported major changes in their diet, followed by changes in exercise-related physical activity (PA) levels post full-time NS, as compared to during full-time NS. Some changes in stress levels and sleeping patterns were also mentioned, albeit less common.

### Dietary changes

Nearly all participants reported changes in eating frequencies and meal timings. As reported by one, *“My meal times...(are) the same as in the army, except I don't eat breakfast (now) but do eat supper (refers to meal before bedtime) quite regularly now”*. Many participants also reported having less consistent mealtimes, as mentioned by one participant, *“I wake up a bit late like let's say 11 or 12 then I don't eat breakfast.”* Several participants also reported poorer diet quality with the inclusion of *“more processed foods”* and *“more fatty foods”* in their diets. A few mentioned that they had less restriction on their food choices, with the freedom to *“just eat anything [they] want”*.

### Changes in physical activity levels

Most participants reported a decrease in PA levels one year later and mentioned that they felt less fit in their current lifestyles compared to during full-time NS. As reported by a participant, *“...after [transitioning out of full-time NS], I can see my physical fitness drop quite drastically.”* In addition, most participants engaged in different forms of PA post full-time NS. Less high-intensity PA and a greater emphasis on recreational exercises were reported. As mentioned by a participant, *“now it's more of playing games and sports rather than carrying heavy loads”*.

### Changes in stress levels and sleep patterns

Some participants reported higher stress levels from their studies e.g. having to meet assignment timelines, post full-time NS. A few also cited that their current stress took a different form from that during full-time NS. As reported by a participant, *“this stress is different lah [sic]. It's more self, there's*

*more independency*". It appeared that to some, the stress came from having to take responsibility of certain life choices instead of depending on instructions from an authoritative figure. A few participants also reported sleeping later in the night or having a lack of sleep.

## Individual beliefs towards weight change

Participants were asked about their own susceptibility to weight change, factors they perceived to influence weight change, and consequences of this weight change.

## Perceived susceptibility to weight change

More than half the number of participants (n = 15) reported a perceived gain in weight after the transition while a few (n = 4) reported a perceived loss in weight. Contrary to perceptions, a decrease in actual weight was observed in more than half of the participants (n = 16). The others had some weight gain (n = 6) or had no change in weight (n = 4).

## Perceived factors influencing weight change

When asked about factors contributing to their perceived weight change, decrease in PA levels was the most common factor. Many participants mentioned that their current lack of exercise-related PA contributed to weight gain, as reported by one, *"Definitely exercising less as compared to when I was in army"* and mentioned by another, *"I don't really exercise anymore - like on a daily basis, but uh I would still like... have basketball training twice a week."*

Conversely, some participants felt that their lack of exercise-related PA contributed to weight loss instead, as remarked by one participant, *"because you don't workout... so like you lose muscle mass, so like you become lighter."* Despite a majority of participants exercising less, a few reported engaging in higher levels of exercise-related PA, resulting in them gaining weight gain through bulking up. *"I was like uh gymming... so I like want to gain more muscle all these, yeah so the weight increase lah [sic]."*

Dietary changes were a common determinant of weight change, with many participants attributing the consumption of unhealthy food to weight gain following their transition out of full-time NS. As described by one participant, *"now it's like a lot of potato chips, a lot of maybe ice cream..., and then if it's at home then it's easy to grab... it's very easy to uh gain."* Furthermore, some suggested that an increased in food intake caused their weight gain, as reported by one participant, *"I gain a bit of weight because I was eating a lot more."* A few attributed a decrease in their food intake to weight loss.

Interestingly, several participants highlighted the idea of energy input versus output in influencing weight change. They emphasised that a delicate balance was required between one's diet and PA level, and consuming more than the amount one was expending would lead to weight gain. As explained by one participant, *"I eat more than like the amount that I exercise so of course, that would lead to me gaining weight."*

Stress was also reported to play a secondary role in affecting both PA levels and diet. Some felt that stress in their lives led them to *“eat more food”* while a few mentioned that stress lowered their motivation *“to do anything”*.

## Perceived consequences of weight change

When asked if weight changes would affect or had affected them, most participants were indifferent about the consequences of their weight change, saying that they had *“never really thought about it”* or that it was *“not really a concern”*. Some participants felt that the effects of their current lifestyle were still reversible, as noted by a participant, *“I lose and gain weight quite easily so I am not overly concerned.”* A few considered future health repercussions from excessive weight gain but were currently not too concerned, *“maybe when I get older, probably all the health problems start to creep in.”* Surprisingly, one individual perceived that the consequences of weight change was a necessary and acceptable trade-off with achieving academic goals: *“I feel that the tradeoff was necessary with um decrease in time span and exercising and the intensity of physical training, so I can fully focus on my studies.”*

## Perceived benefits, motivators and barriers

We further explored the participants' perceived benefits of, motivations towards and barriers preventing a healthy lifestyle. Perceived barriers and motivators of PA and healthy eating were classified into three themes: 1) Personal factors 2) Social factors and 3) Environmental factors. Factors were listed according to frequency, with those most frequently mentioned placed first (**Table 3**). Perceived self-efficacy, referring to one's confidence in adopting a healthy lifestyle, was not directly asked but emerged as a sub-theme.

## Perceived benefits of exercise-related physical activity and healthy eating

Most participants were aware of the benefits of regular exercise and were able to list several of them (Table 2). Of these, the beneficial impact on physical health and on physical appearance were most commonly reported. Weight loss or weight maintenance, as well as mental health benefits, such as relieving stress and finding joy in the sport, were other benefits mentioned.

In contrast to PA, fewer participants reported the benefits of healthy eating and fewer benefits were mentioned. Reported benefits centred on enhancing physical appearance, aiding weight loss and/or weight maintenance and providing physical health benefits.

Table 2  
Perceived benefits of exercise-related physical activity and healthy eating

Benefits of exercise-related physical activity		Benefits of healthy eating	
Benefits	Representative quotes	Benefits	Representative quotes
Physical health	<i>I exercise to keep fit.</i>	Enhanced physical appearance	<i>Cos my friend who went on this kind of diet...his body became very nice, then I was like oh that's healthy.</i>
	<i>Exercise helps to keep our body like fit and also... reduces the risk of you getting like... maybe chronic illnesses in the future.</i>	Weight loss or weight maintenance	<i>I was trying to lose weight, not gain muscle or anything so I cook healthier.</i>
Enhanced physical appearance	<i>I want to look good. I want to look fit.</i>	Physical health	<i>It helps my body recover faster (from gym).</i>
Weight loss or maintenance	<i>One of my friends... he started running every week... after a period of time, I could tell that he definitely slimmed down. Yeah he used to be quite fat but he slim down.</i>		
Mental health			
Relief stress	<i>Exercise can also help to relieve stress.</i>		
Deriving joy	<i>I just doing it for fun. Like its fun that's why I do it, if not I don't bother.</i>		

## Perceived barriers to exercise-related physical activity and healthy eating

Regarding barriers, personal factors were most frequently mentioned. A substantial number reported that exercise was not a current priority or they found no reason to exercise at this stage in life. As mentioned by a participant, *"Like if I have free time, I don't mind doing it."* Most participants reported having time constraints due to academic work taking precedence over exercising. Some participants reported feelings of 'laziness' and tiredness from school or working life, which hindered their motivation to exercise. This was contrasted to time during full-time NS, when physical training was mandatory. As depicted by a participant, *"just the motivation (to exercise) not there anymore compared during the (full-time) NS life."*

Similarly, for healthy eating, a number of participants did not view healthy eating to be a priority or need, prioritising taste over nutritional value. Several participants reported a lack of time to prepare, plan and cook healthy foods or eat regularly due to the busyness of school. Several participants also reported

feeling 'lazy' to adhere to healthy eating habits, while a few mentioned that they were unable to curb their cravings for unhealthy food options.

Social factors were also mentioned by some participants to be barriers to exercising and healthy eating. Finding friends with common interests or finding a common time to exercise together, was reported to be challenging for several participants. In parallel, a handful of participants mentioned that peer pressure and being compelled to follow their friends' unhealthy food choices were impediments to healthy eating. Environmental barriers also played a role. A few participants cited a lack of convenience in accessing sports facilities, while several reported limited availability of healthy food options when dining out, easy access to unhealthy food options and higher prices of healthy foods as barriers to healthy eating.

## **Perceived motivators of exercise-related physical activity and healthy eating**

A majority of participants reported intrinsic motivators such as taking genuine interest in a sport and achieving their goal of passing mandatory fitness tests. Beside these personal factors, social influence from peers or family was also a strong motivator reported by many. Monetary incentive was a motivator for some and a few were compelled to exercise with the knowledge of sports facilities nearby.

Personal factors also motivated healthy eating in some participants such as an individual's habit of cooking healthy foods regularly and a personal distaste for unhealthy foods. Interestingly, several participants reported displaying compensatory behaviour by eating healthily to compensate for their lack of PA and/or unhealthy food choices. As explained by a participant, *"Because if I don't do anything about my physical change, like activity, maybe I can do something about my diet."*

A few participants commented that their food choices were largely influenced by peer pressure and /or their family's choice of food.

Table 3  
Barriers and motivators of exercise-related physical activity and healthy eating

Barriers preventing exercise-related physical activity and healthy eating		Motivators towards exercise-related physical activity and healthy eating		
	Barriers	Representative quotes	Motivators	Representative quotes
Personal	The belief that physical activity and healthy eating are neither a need nor priority	<i>I think it's mostly just 'cos I am not overweight. I think that's the main reason. If I were overweight, I think I will exercise a lot more.</i>	Having an interest in the sport	<i>Oh it's like hobby lah [sic], I have been playing since young so I enjoy it, I enjoy playing basketball.</i>
		<i>In the army like you are somewhat being forced to exercise whereas... now it depends on your own decisions...for me, I'm not that kind of person that's... crazy about exercising.</i>		<i>It's a habit and a hobby ah so it's like I will find a way somehow some way to go to the gym and just workout.</i>
	Insufficient time to exercise or eat healthily due to academic or work precedence	<i>Because most of the time you will be at home studying already. There is no like spare or free time to go for like a three hour jog like that.</i>	Inner self-motivation	<i>To me, it's like if I want to workout, I workout. If - if I don't want to, you can send me 10 prompts, 100 prompts, I will still ignore the prompt.</i>
		<i>I rather use the time to do work.</i>	Achieving personal fitness goals	<i>I do running and statics, as it will prepare for my IPPT (Individual Physical Proficiency Test).</i>
		<i>I also spend overnight in school, um... I - I just eat in the school, in the school canteen which isn't very healthy because it's like outside food.</i>	Personal food preferences	<i>I cannot take too sweet drinks or ice cream like it just doesn't taste good to me.</i>
	Feelings of laziness and/or tiredness	<i>No exercise because mostly lack of energy lah [sic] ...from school and work lor [sic].</i>	Feelings of laziness and/or tiredness	<i>No exercise because mostly lack of energy lah</i>

				<i>[sic] ...from school and work lor [sic].</i>
		<i>If I want to eat an apple, I need to like slice them myself. I a bit lazy so I was - rarely do that ah [sic].</i>	Eating healthily as a form of compensation for lack of physical activity and/or unhealthy diet choices	<i>If I feel that eat a lot of oily food or fatty food, it's likely I will go for the healthy options.</i>
	Unable to curb unhealthy food cravings	<i>I will want to eat a lot of junk food so I will buy a lot then I will eat, eat.</i>		
Social	Peer influence preventing exercise	<i>It's hard to get people to like... find a common time to... to kick... to like come together and play la [sic].</i>	Peer influence encouraging exercise	<i>Sometimes when my friends ask me out, yeah then I will exercise then.</i>
	Peer influence to eat unhealthily	<i>If they always go eat fast food, obviously you hang out with them you will follow them what.</i>	Familial influence encouraging exercise	<i>My family usually encourages me to run more, and even exercise more.</i>
			Peer influence to eat healthily	<i>When they encourage us to eat more healthily then we will feel more motivated to do.</i>
			Familial influence to eat healthily	<i>My mum from young, like she, she cooks from young and like she will cook healthy food.</i>
Environmental	Inconvenient access to sports facilities and healthy food options	<i>Like because my house isn't a condo<sup>a</sup> so if I want to go swimming, I have to pack my stuff then go to the swimming pool and swim... Then take a bus</i>	Convenient access to sports facilities and healthy food options	<i>Convenience is definitely a thing. Like I think someone who has a gym nearby and a pool nearby and this kind of thing</i>

	<i>home. Then I feel that it's like very like lech eh [troublesome].</i>		<i>would definitely be more encouraged to do so.</i>
	<i>There is not a lot of healthy food outside.</i>		<i>Uh convenience plays a part, like if they have (brown rice) then... you know like might as well, yeah.</i>
Easy access to unhealthy food options	<i>It's a lot more convenient to get like fast food.</i>	Monetary incentives to exercise	<i>What else will motivate me? I don't know if I get money from working out, yeah then I will definitely.</i>
Expensive prices of healthy food	<i>Healthy stuff tend to be quite expensive so that's like a major deterrence, the price.</i>		
<sup>a</sup> Condos refer to condominiums, a form of private housing.			

## Perceived self-efficacy

Interestingly, a proportion of participants commented on the influences full-time NS had on them. They felt that full-time NS had helped instilled greater self-discipline, increased their mental strength and taught them ways to exercise. “[The effect of full-time NS] is... much more discipline. The importance of exercise and more importantly, the ways to exercise I guess.” However, there was little or no mention of full-time NS influencing their subsequent diet and sleep habits.

## Discussion

This qualitative study explored factors, barriers and motivators influencing perceived weight change and tracked body weight changes in a group of Asian young men 12 months post full-time NS. Many of them thought they had gained weight following the transition out of full-time NS and attributed this to decreasing PA levels and increasing consumption of unhealthy food. Despite the perceived weight gain, many did not display immediate concerns. Also, knowing the benefits of regular exercise-related PA and healthy eating did not lead them to prioritise the healthy lifestyle, citing reasons of time constraints, inertia to comply or lack of access to sports facilities and healthy food options. Motivators towards a

healthy lifestyle tended to be intrinsic, while extrinsic motivators included peer or familial influence and environmental factors.

Many young men reported engaging in less exercise-related PA and indulging in more unhealthy food one year later, compared to during full-time NS. This concurs with findings from the Millennium Cohort Study whereby moderate-to-vigorous activity declined significantly in those who were discharged than those who were still in the military (-17.8 percentage points vs. -2.7 percentage points) (32). In addition, a lower diet quality was reported post full-time NS. A Finnish study revealed that conscripts (mean age: 20.7 years) tended to favour fast food, soft drinks and beer in their free time (33) and the consumption of vegetables was low during leave days, reflecting a penchant for energy-rich, nutrient-poor foods in off-duty conscripts.

The indifference young men in this study showed towards the consequences of their perceived weight gain was of greater concern. Mendis et al. had similar findings, whereby Australian young men (n = 30; aged 17–25 years) at an increased risk of developing chronic diseases (WC  $\geq$  94 cm) were nonchalant of the consequences of weight gain, citing that weight gain was not an issue *“that affected them personally at this stage of their lives.”* Moreover, some Australian young men believed being overweight was normal and acceptable, citing added advantages associated with a big build (25). It appears that physical appearance is a primary concern for many young men, a finding that was also reflected in our study.

Contrary to perceptions of weight gain, slight decreases in actual body weight and BMI and increases in waist circumferences were observed in our group of young men. Studies have demonstrated that a lack of PA can result in weight loss due to decreased muscle mass (34), while high WC has been associated with reduced PA levels (35, 36) and unhealthy food choices (37, 38). This is of concern as WC is an established risk indicator for future cardiovascular diseases, particularly in Asians compared to Caucasians (39, 40). These results suggest that in young adult men, particularly those leaving the structured environment of full-time NS, weight and BMI alone may not be useful indicators of adiposity. This is especially so since weight gain is often gradual and may not be immediately apparent to create much concern for action. Instead, monitoring WC changes may be more indicative of changes in body composition and increased adiposity, at least in the short term. An emphasis on the prevention of weight gain, particularly increases in WC, through information platforms preferred by young adults e.g. social media, may be an alternative way of promoting health in this age group.

Understanding barriers and motivations driving certain lifestyle choices in this pivotal period of young adulthood would go a long way in establishing healthy lifestyle habits for the future. This study found that the main barriers to engaging in exercise-related PA were personal factors such as not viewing exercise as a priority, time constraints and exhibiting inertia to resume routine exercise. These findings concur with results from earlier studies that young men generally experienced a lack of time, motivation and commitment to exercise regularly (24, 25, 27, 41). Busy lifestyles among young men such as a full class schedule, work and social activities (27) resulted in the prioritisation of these obligations over PA. Social and environmental factors further compound this problem, adding to existing barriers.

Our findings are congruent with findings from earlier studies whereby discouragements from friends and family, a lack of people to exercise with (41) and family upbringing tapered towards a sedentary lifestyle (24) hindered PA. Environment barriers such as costs of gym memberships, difficult access to different sporting activities (24) and lack of sporting facilities (41) were also not uncommon in deterring young men from exercise-related PA. This highlights the importance of creating readily-accessible and reasonably-priced sports facilities to cater to this age group. Perhaps incentives in the form of subsidised gym memberships would be a viable initiative to spur young men towards engagement in regular exercise-related PA (25).

Largely similar to PA, the drive to eat healthily was impeded largely by personal factors. The belief that healthy eating was not a priority or need and a prioritisation of taste over nutrition were main personal barriers. This finding coincided with an earlier study that reported young men (aged 18–24 years) disliked the taste of fruits and vegetables (27), hence being a huge deterrent to eating healthily. Taste ranked the top factor influencing food choices over factors like nutritional value among adults in both an American (42) and Singaporean study (43), highlighting that nutritional concerns were of a lower priority compared to taste when making food choices. Furthermore, the perceived effort required to adhere to healthy eating patterns regularly was also a huge deterrent (24). Similar to earlier studies reporting that young men have insufficient time to plan, shop, prepare and cook healthy meals (44, 45), the young men in our study reported time constraints as another major barrier. With insufficient time to cook healthy meals at home, most young men would resort to eating out. However, environmental factors such as lack of access to healthy food (43, 46) and higher costs of healthy foods (24, 43) then become barriers to healthy eating. Interestingly, the idea of masculinity as a barrier to eating healthily emerged in many studies conducted in Western countries (24, 26, 45–47) but did not present itself in this study, possibly due to cultural differences.

Motivators of exercise-related PA were mostly intrinsic, followed by social influences. The current findings are consistent with earlier studies that reported that the feeling of accomplishment in learning and developing new sports skills (24) was a huge driver of PA. Previous meta-analyses have revealed that mastery-approach goals were generally positively associated with performance attainment (48, 49), supporting the notion that the desire to achieve certain levels of fitness standards can often drive PA. Peer or familial influences also encouraged the engagement of exercise-related PA. A British study revealed that adults (aged 22–51 years) felt compelled to exercise when committed to a team because of the expectations of others (50), concurring with findings from this study whereby more than half of young men reported the importance of peer influence on their exercise regimen. Monetary incentives also appeared to entice young men to do more exercise in this study. This observation is supported by a study that revealed young adults and men were more likely to prefer receiving financial incentives over older people and women in health behaviour studies (51). Mendis et al.'s study also revealed that young men were more receptive to gym memberships than cash incentives (25) perhaps because gym memberships addressed the issue of the high costs of these memberships and provided motivation to exercise, especially if a group of friends received these gym vouchers together.

Similarly, dominant motivators to eating healthily were intrinsic factors and social influences. Intrinsic factors such as personal preferences and palates were reported and supported by earlier studies that men are more likely to select food based on “habit” and “taste” than women (27, 42, 52). Social influences driving healthy eating were also reported and supported by previous findings (24, 45). This is not surprising considering that eating is a “national obsession” in Singapore and a means of socialising with friends and family (43). Interestingly, many were motivated to eat healthily as a form of compensation for the lack PA and/or unhealthy food choices. This behaviour, known as compensatory health behaviour, may be detrimental long-term as they do not “effectively compensate for all negative effects” of the unhealthy behaviour (53, 54). Hence addressing these misconceptions is imperative.

## Strengths and limitations

Strengths of the current study include being the first to investigate and establish barriers and motivators influencing lifestyle in young men transiting out of a highly regulated environment of full-time NS in a multi-ethnic Asian context. The methodology of using in-depth interviews instead of focus groups ensured freedom of expression without being conscious of others in a social setting. Limitations of the current study include poor retention rates leading to a small sample size (n = 26). Furthermore, as the majority of our participants were university students (92.3%) and of Chinese ethnicity (88.5%), there might be sampling bias and thus our results may not be generalisable to young men in other professions and of other ethnicities.

## Conclusion

This qualitative study uncovered motivators towards and barriers preventing regular exercise and healthy eating among young men post full-time NS in a multi-ethnic Asian context. Although young men are a generally hard-to-reach group (22, 55, 56), our findings are valuable in informing health promotion strategies and interventions in this age group and young people in general. Mitigating key barriers and enforcing key motivators would enable better transition out of full-time NS or other types of military service not only in the Asian context, but may also be applicable to countries which have short-term mandatory training for their citizens. Further research can be conducted to better understand weight changes in young men over a longer period of time post full-time NS or after leaving military service.

## List Of Abbreviations

**BMI:** Body mass index; **COREQ:** Consolidated criteria for reporting qualitative research; **HBM:** Health belief model; **IPPT:** Individual physical proficiency test; **NS:** National service; **PA:** Physical activity; **WC:** Waist circumference.

## Declarations

## Ethics approval and consent to participate

This study was given ethical approval by the National University of Singapore's Institutional Review Board (Reference Code: B-16-290 and Approval Number: NUS 3290). The authors declare that written informed consent was obtained from all participants. This method of consent was approved by the NUS IRB.

## **Consent for publication**

Not applicable.

## **Availability of data and materials**

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

## **Competing Interests**

The authors declare that they have no competing interests.

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## **Authors' contribution**

This study was conceived and designed by MFFC, AWG and KSC. Data were collected by HXL and JKI. Transcripts were checked by HXL and ZHC. Analyses were conducted and interpreted by HXL, ZHC, BWXW and MFFC. The manuscript was drafted by MFFC, HXL and BWXW, with input from FMR, BKC, AWG and KSC. The final manuscript was reviewed and approved by all authors.

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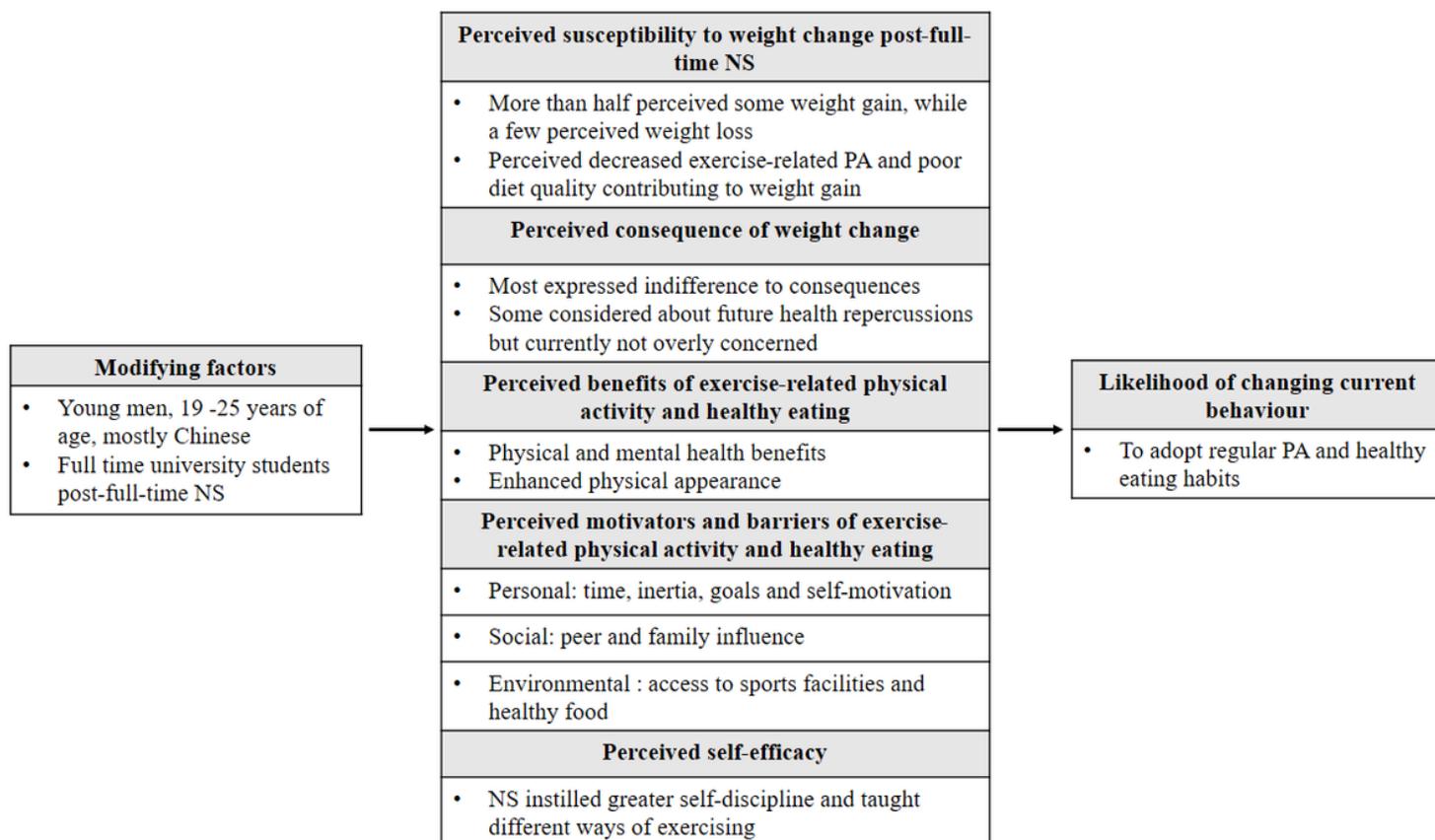
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## Figures



**Figure 1**

Themes and sub-themes using the HBM

## Supplementary Files

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