

## Behavioral change readiness among obese adolescents in Jakarta, Indonesia

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**ABSTRACT**

**BACKGROUND** Prochaska's transtheoretical model of behavioral change process, consisting of stages and processes of change, should be monitored to evaluate obesity management, particularly in adolescents. Two of four processes of change are supporting relationships, which promote behavioral change, and weight management actions, which are activities that push individuals to a particular direction in patients' weight loss progress. This study aimed to determine the participants' current stages of change, nutritional status, and their relationship with the processes of change.

**METHODS** This cross-sectional study used secondary data collected in 2018 from 115 obese adolescents aged 15–21 years in Jakarta, Indonesia, using an Indonesian-translated and validated questionnaire adapted from Andrés et al's study. The questionnaire evaluated participants' processes of change, focusing on scores of supporting relationships (5 items) and weight management actions (10 items).

**RESULTS** Of the participants, 71.3% were classified as obese grade I, and 28.7% were obese grade II. Most participants were in the contemplation (31.3%) and action (31.3%) stages. The mean supporting relationships and weight management actions scores were different between participants with obese I and obese II (66.67 versus 80,  $p = 0.004$ ; 64.17 versus 70,  $p = 0.008$ , respectively). Meanwhile, no differences were identified in supporting relationships and weight management actions scores in all stages of change.

**CONCLUSIONS** Adolescents with obesity and higher BMI (based on the obesity grading of the WHO Asia Pacific) tended to have significantly higher scores for supporting relationships and weight management actions, indicating that external reinforcement and immediate weight loss actions played pivotal roles in readiness for behavioral change.

**KEYWORDS** adolescent, obesity, stages of change, transtheoretical model

The World Health Organization (WHO) defines obesity as a condition characterized by abnormal or excessive accumulation of body fat.<sup>1,2</sup> From 2013 to 2018, the prevalence of adult obesity in Indonesia sharply increased. Additionally, approximately 30% of Jakarta's population is experiencing obesity, with an increasing trend observed in adolescents.<sup>3,4</sup> Childhood obesity is a common phenomenon with numerous repercussions, including type II diabetes, hypertension,

coronary artery disease, and stroke, which are twice as likely in children with obesity compared to children with normal body weight.<sup>5–7</sup> During adolescence (i.e., 15–24 years), puberty causes significant physical, cognitive, social, and emotional changes. Moreover, external factors, such as social support from peers and family members, influence behavioral development.<sup>8,9</sup> A lack of support and negative perceptions from peers may lead adolescents with obesity to become

hostile and resentful toward others; therefore, having supportive peers and family members is important in addressing obesity.<sup>9</sup> Considering the potential long-term effects and complications associated with obesity, particularly concerning age and behavioral characteristics, immediate action must be taken to reduce its prevalence among adolescents.<sup>10</sup>

The “gold standard” for obesity management includes behavioral treatment, dietary guidance, and physical activity.<sup>10</sup> Prior studies have suggested that behavioral change is a crucial driving factor for weight loss. Subsequently, one method for assessing behavioral change is to determine individuals’ current stages and processes of change. In 1997, Prochaska and Wayne introduced the transtheoretical model of behavioral change, consisting of five stages: precontemplation (no intention to change in the foreseeable future), contemplation (intention to change in the next 6 months), preparation (intention to change in 30 days), action (action taken to change  $\leq 6$  months), and maintenance (action taken to change  $\geq 6$  months). These stages demonstrate a temporal dimension and continuity of the behavioral change process for the processes of change: emotional reevaluation, weight consequences evaluation, weight management actions, and environmental restructuring (including supporting relationships).<sup>11–13</sup>

Both the stages and processes of change are closely related to the behavioral change continuum, showing that the two components co-exist.<sup>13</sup> By determining an individual’s stage of change, correlated processes, and their relevance, interventions can be tailored to that stage, which increases the success rate.<sup>12,13</sup> Based on the transtheoretical model, Andrés et al<sup>11,12</sup> developed a questionnaire to assess the five stages and four processes of change. This study aimed to determine the stages of behavioral change in adolescents with obesity, evaluate the processes of change using their supporting relationships and weight management actions scores, and identify any significant mean differences in behavioral change process scores among participants at different stages of change and with varying nutritional statuses.

## METHODS

### Study design

This cross-sectional study used secondary data previously collected by a research team from the

Southeast Asian Ministers of Education Organization Regional Center of Food and Nutrition in Jakarta, Indonesia. The study participants were high school students from SMAN 21 Jakarta and first-year university students from Universitas Indonesia. Participants were recruited using a consecutive (non-probabilistic) sampling method to determine their stages of change and assess their behavioral change processes based on supporting relationships and weight management actions scores. Various educational settings were used for data collection to recruit participants within a diverse age range covering all phases of adolescence according to Sawyer et al,<sup>8</sup> who classified adolescence into three stages: early adolescence (10–14 years old), late adolescence (15–19 years old), and young adulthood (20–24 years old). This study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Indonesia (No: 0525/UN2. F1/ETIK/2018).

### Sampling techniques

The number of samples needed was determined using a mean comparison formula for unpaired numeric data analysis ( $n_1 = n_2 = 2 \times [(Z_a + Z_b) \times s / (x_1 - x_2)]^2$ ), with  $Z_a = 1.96$ ,  $Z_b = 0.84$ ,  $s = 16.59$ ,  $X_1 = 48.72$ ,  $X_2 = 42.54$ . Based on this calculation, the minimum number of samples required was 113; thus, 115 participants were recruited for the original study. The inclusion criteria were high school and first-year university students, aged 15–21 years, had a body mass index (BMI) of  $\geq 25$  kg/m<sup>2</sup> (classified as obese according to the WHO Asia Pacific at the time of data collection). All participants provided their informed consent. The independent variables in this study were BMI and the stages of change. The dependent variables were the processes of change as determined by participants’ supporting relationships and weight management actions scores.

### Data collection and statistical analysis

The research data were collected in both settings using an integrated form. The first questionnaire collected informed consent and sociodemographic data. Furthermore, the processes of change were assessed using an Indonesian-validated questionnaire containing 34 questions adapted from Andrés et al’s study<sup>11</sup> on the application of behavioral change processes for managing adult obesity in the United Kingdom (Cronbach’s alpha

for supporting relationships: 0.861 [0.595–0.815], weight management actions: 0.878 [0.547–0.657]). However, only 32 out of 34 questions were analyzed, in accordance with a prior study by Andrés et al.<sup>11</sup> The questionnaire included five items related to supporting relationships and 10 related to weight management actions; possible scores ranged from 1 to 5. The scores for each process were later accumulated and rounded to the nearest hundredth.<sup>11,12</sup>

Following data collection, statistical analyses were performed using SPSS software version 20 (IBM Corp., USA). We first conducted univariate analysis to assess participants' sociodemographic data, which are presented as descriptive statistics of frequencies (and percentages), means (standard deviation), and medians (interquartile ranges). We assessed continuous variables for normality using the Kolmogorov–Smirnov test ( $n > 50$ ). The variable data were not normally distributed; therefore, Mann–Whitney and Kruskal–Wallis tests were used for bivariate analysis to determine the relationships among BMI, the five stages of change, and the processes of change (as measured by supporting relationships and weight management actions scores).  $p$ -values of  $< 0.05$  indicated statistical significance.

## RESULTS

Of the 115 adolescents, 71.3% were grade I obese (BMI 25–30 kg/m<sup>2</sup>), and 28.7% were grade II obese (BMI  $\geq 30$  kg/m<sup>2</sup>). Most participants were in the contemplation and action stages (both 31.3%), suggesting that most had already advanced into the middle to later stages of change with moderate to high scores for supporting relationships and weight management actions (Table 1).

We individually assessed each questionnaire items related to supporting relationships and weight management actions. The average scores of individual supporting relationships items ranged from 2.99 (1.009) to 3.58 (0.943). Item 32, “people around me support me in trying to lose weight,” had the highest average score among participants; item 33, “I have someone who listens to me when I need to talk about me being overweight,” had the lowest average score (Table 2).

A similar trend was observed in weight management actions scores, ranging from 2.59 to 3.59. Item 15, “I avoid places where I eat a lot,” had the lowest average score among the participants. Item 18, “I have learned skills that reduce my desire to eat (i.e., distracting

**Table 1.** Sociodemographic characteristic proportions of the study participants

Characteristics	n (%) (N = 115)	Mean (SD)	Median (IQR)
Male sex	58 (50.4)	-	-
Education	-	-	-
High school	59 (51.3)		
University (first-year)	56 (48.7)		
Age (years)		17.32 (1.61)	16.29 (3)
15–19	109 (94.8)		
20–21	6 (5.2)		
BMI (kg/m <sup>2</sup> )	-	28.64 (3.87)	27.31 (5)
Nutritional status	-	-	-
Obese grade I	82 (71.3)		
Obese grade II	33 (28.7)		
Stages of change		-	-
Precontemplation	9 (7.8)		
Contemplation	36 (31.3)		
Preparation	20 (17.4)		
Action	36 (31.3)		
Maintenance	14 (12.2)		
Process of change scores			
SR	-	69.97 (14.84)	73.33 (20)
WMA	-	64.75 (11.53)	65 (15)

BMI=body mass index; IQR=interquartile range; SD=standard deviation; SR=supporting relationships; WMA=weight management actions

**Table 2.** Score for questionnaire about supporting relationships

Questionnaire item	Mean (SD)	Median (IQR)
I am aware that there are more and more people who encourage me to lose weight	3.46 (1.033)	3 (1)
My family and friends praise me for not overeating	3.02 (0.951)	3 (0)
My family and friends congratulate me when I manage to lose weight	3.25 (1.037)	3 (1)
People around me support me in trying to lose weight	3.58 (0.943)	4 (1)
I have someone who listens to me when I need to talk about me being overweight	2.99 (1.009)	3 (2)

IQR=interquartile range; SD=standard deviation

**Table 3.** Score for questionnaire about weight management actions

Questionnaire item	Mean (SD)	Median (IQR)
I look for information about the types of food that could help me lose weight	3.59 (0.996)	4 (1)
I try to put food away to avoid nibbling	3.28 (1.086)	3 (2)
I tell myself positive things to avoid overeating	3.44 (0.847)	3 (1)
I try not to have food in sight	2.95 (1.020)	3 (2)
When I really want to eat, I do activities to avoid it	2.78 (0.905)	3 (1)
I avoid places where people eat a lot	2.59 (0.932)	3 (1)
I have learned skills that reduce my desire to eat (e.g., distracting myself)	3.58 (1.023)	4 (1)
When I am on a diet, I avoid eating with people who I overeat with	2.96 (1.066)	3 (2)
I avoid buying high-calorie food	3.28 (1.001)	3 (1)
To avoid overeating, I prefer eating at home or cooking my own food	3.41 (0.996)	3 (1)

IQR=interquartile range; SD=standard deviation

**Table 4.** Analysis of obesity grading and behavioral change process with SR and WMA scores

	SR score, median (IQR)	<i>p</i>	WMA score, median (IQR)	<i>p</i>
BMI		<b>0.004*</b>		<b>0.008*</b>
Obese grade I	66.67 (20)		64.17 (14.17)	
Obese grade II	80 (20)		70 (10)	
Stages of change		0.215 <sup>†</sup>		0.192 <sup>†</sup>
Precontemplation	60 (23.33)		60 (11.67)	
Contemplation	73.33 (18.33)		64.17 (12.92)	
Preparation	73.33 (20)		65 (14.58)	
Action	73.33 (26.67)		68.33 (11.67)	
Maintenance	70 (8.33)		69.17 (13.75)	

IQR=interquartile range; SR=supporting relationships; WMA=weight management actions

\*Mann-Whitney test, significant if  $p < 0.05$ ; <sup>†</sup>Kruskal-Wallis test, significant if  $p < 0.05$

myself),” and item 2, “I look for information about the types of food that could help me lose weight,” had the highest average scores (Table 3).

Participants with higher BMIs had significantly higher average supporting relationships and weight management actions scores ( $p < 0.05$ ). In contrast, the differences in mean scores for supporting relationships

and weight management actions between the stages of change were not statistically significant (Table 4).

## DISCUSSION

This study indicated that the participants were already in the middle stages of behavioral change,

as they were willing to embark on their weight loss journey. On average, most participants had sufficient support systems and took action to manage their weight; this is further strengthened by the questionnaire items found to have the highest average scores. Furthermore, the findings showed that social support and data accessibility are two crucial aspects of supporting relationships and weight management actions for adolescents to further motivate themselves to transition toward the later stages of change, suggesting that external reinforcements and direct action are important for obesity management.

No significant differences were found across the stages of change for supporting relationships and weight management actions scores. However, BMI was statistically significantly related to the scores for both (supporting relationships and weight management actions), indicating that participants with higher BMIs had better support and took more action to lose weight.

This study was based on prior research by Andrés et al,<sup>11,12</sup> who evaluated the transtheoretical theory model for managing obesity in adult populations (with an average age of  $32.03 \pm 12.88$  years) in the United Kingdom. Following Andrés et al,<sup>11,12</sup> the present study only assessed supporting relationships and weight management actions scores because, compared to those with low scores in these categories, most participants with higher scores were in more advanced stages of change, which ranged from preparation to maintenance. These findings support those of the original study, which reported that emotional reevaluation and weight consequences evaluation (in the form of self-reevaluation) tended to occur in the earlier stages of change (from precontemplation to contemplation), while environmental restructuring (supporting relationships) and weight management actions tended to occur in the later stages (from action to maintenance).<sup>13</sup>

Andrés et al<sup>11</sup> found that most participants were in the action (38.27%) and maintenance (34.50%) stages. Similarly, we identified contemplation and action as the most prevalent stages (each 31.3%). Moreover, their findings revealed that the highest average supporting relationships and weight management actions scores were found in the action stage. In contrast, the present study found that the contemplation, preparation, and action stages had the highest average supporting relationships scores,

while the maintenance stage exhibited the highest weight management actions score.

In 2017, Karintrakul et al<sup>14</sup> assessed the behavioral change readiness of women with obesity in Thailand based on the transtheoretical model as an intervention for obesity. They found that BMI was a statistically significant factor in participants at different stages of change in the control and intervention groups ( $p < 0.001$ ). In addition, they assessed other parameters of obesity such as body weight, body impedance analysis (consisting of percent body fat, fat mass, and muscle mass), and weight circumference, which also mostly showed significant results, except for muscle mass. However, other studies reported contradictory findings to our results. For example, one previous study found that adolescents with obesity received significant support from parents and close friends, but no data were available on the relationship between BMI and familial support.<sup>15</sup> However, they found a relationship between BMI and teacher support, suggesting that the higher one's BMI, the lower the perceived support. Another study on social support and obesity in adult African-American women found that a lower BMI was related to higher support from friends in exercising because they perceived a higher possibility of weight loss; meanwhile, older populations living in rural areas had significantly more encouragement from family and friends to eat a healthy diet.<sup>16</sup> Similarly, a study of African-American university students showed that having a BMI above the threshold for overweight and obesity had no statistically significant relationship with social support.<sup>17</sup> This phenomenon might occur because students typically seek independence from their parents while receiving support from their peers; therefore, obesity would not be related to the amount of social support they gain from others. In addition, a study of medical students in Sudan found that weight management actions were associated with BMI.<sup>18</sup> Although physical activity did not show any statistically significant results, significant differences in BMI were observed between students with varying eating behaviors, including uncontrolled, conscious restraint, and emotional eaters.<sup>18</sup>

This study focused on participants from late adolescents to young adults, including high school and first-year university students.<sup>8</sup> High school students in late adolescence tend to have a stronger sense of self-identity than younger adolescents while adjusting to physical changes.<sup>8</sup> They begin to develop

independence and the desire to connect with their peers.<sup>8</sup> Social support from peers can facilitate positive lifestyle changes in students at this age.<sup>8</sup> In contrast, first-year university students are young adults with higher emotional stability and a firmer sense of identity and independence; nevertheless, they still highly value friendships while beginning to develop romantic interests.<sup>8</sup> Transitioning from high school to university involves several lifestyle changes, including new living arrangements, academic surroundings, peer relationships, and greater independence and responsibilities.<sup>19,20</sup> During this period, social support from teachers and friends is crucial in helping first-year university students develop a sense of belonging and engage in group activities. The presence of social support is significantly related to higher quality friendships, leading to better adaptation for students during their first academic year.<sup>20</sup> Therefore, first-year university students have distinctive living circumstances compared to high school students, with numerous new methods for gaining reinforcement and support while navigating the next stage of personal and academic life.

Regardless of the diverse findings in previous research, the current study's findings indicate the potential role of the processes of change in weight management. One study reported that supporting relationships and weight management actions are associated with weight management.<sup>21</sup> High school adolescents who were overweight or obese and had more support from their family and friends showed greater diet and physical activity improvements in a follow-up model. Weight management should be a crucial component of adolescents' lives as they start to gain independence, receive less parental supervision, and be more influenced by their peers. Furthermore, social support could further facilitate behavioral change in weight management, leading people to take action toward weight loss. In the present study, the scores and analysis results could reflect the lack of supporting relationships and weight management actions, along with lower levels of awareness about obesity and its management among participants.

This study had some limitations. First, we used secondary data obtained through convenience sampling during the initial data collection period, and we did not perform randomization to sort the participants. Although the number of participants was sufficient, the lack of randomization might have led to biases that compromised the reliability of the

statistical analyses of the results. Second, no follow-up was performed to further assess participants' stages and processes of change after the initial encounter, thereby limiting the scope of the results and strength of the analysis. Finally, the processes of change, as part of the transtheoretical model established by Prochaska et al,<sup>13</sup> have not been frequently studied, especially by Indonesian researchers, despite the strong potential to enhance behavioral interventions related to obesity in adolescents. Therefore, finding relevant prior studies and relating the findings to the general Indonesian population was challenging. Although the authors are optimistic that interest in this specific topic will increase over time, the concept of the transtheoretical model itself is beneficial for behavioral change in multiple studies, regardless of the intervention or examined health problem.

In conclusion, adolescents with obesity and higher BMI (based on the obesity grading of the WHO Asia-Pacific) tended to have significantly higher scores for supporting relationships and weight management actions, indicating that external reinforcement and immediate weight loss actions play pivotal roles in readiness for behavioral change. No significant differences were found between participants' current stages of change and their scores for supporting relationships or weight management actions; however, increasing trends in average scores in each consecutive stage of change were observed for each category. Further research with better methodologies is recommended to diversify the target populations, prevent biases, and increase the quality of the findings. These findings can be incorporated into other observational studies and applied in interventional programs based on the transtheoretical model and behavioral change process to manage obesity in adolescents.

#### **Conflict of Interest**

The authors affirm no conflict of interest in this study.

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