



Research article

Sociocultural factors affecting drive for muscularity among male college students in Malaysia

Akira Sai^{a,*}, Takuro Furusawa^b, Mohd Yusof Othman^c, Daiki Tomojiri^d, Wan Fatihah Zaimah Wan Zaini^e, Charlene Sze Yunn Tan^f, Nur Izzati Binti Mohamad Norzilan^b^a Graduate School of Health Sciences, Hokkaido University, Japan^b Graduate School of Asian and African Area Studies, Kyoto University, Japan^c Institute of Islam Hadhari, National University of Malaysia, Selangor, Malaysia^d Center for Southeast Asian Studies, Kyoto University, Japan^e Department of Accounting and Finance, Management and Science University, Selangor, Malaysia^f Faculty of Accountancy, Finance and Business, Tunku Abdul Rahman University College, Wilayah Persekutuan, Kuala Lumpur, Malaysia

ARTICLE INFO

Keywords:

Psychology
Body image
Ethnicity
Muscularity
Social media
Malaysia

ABSTRACT

Compared with females, little research on muscularity and the sociocultural influences on this domain has been conducted with males in non-Western societies. The current study explored these sociocultural predictors of drive for muscularity among Malaysian male college students, specifically in terms of ethnicity and exposure to media (i.e., Internet and social media). In total, 166 male college students from two universities in Kuala Lumpur were asked to rate the questionnaires as to muscularity-oriented attitudes and behaviours. Multivariable general linear model analyses revealed that being Chinese was a strong predictor of muscularity-oriented attitudes and behaviours. In addition, modern media, particularly, Internet use and the number of followers on Instagram, was found to significantly predict males' drive for muscularity. Overall findings suggest that males of particular ethnic groups may be at higher risk for negative body image compared to the other ethnic populations and modern media use may accelerate drive for muscularity, which may also in turn place males at higher risk for excess muscularity-oriented thoughts and behaviours.

1. Introduction

Body image in males has been historically understudied to date, whereas a great deal of research concerning physical attractiveness has been conducted on females. While being thin is highly valued among females in Western societies as a societally-accepted ideal body (Ricciardelli and McCabe, 2001), a growing number of research has showed that a society places an increasing emphasis on a muscular physique in both Western and non-Western contexts, where males aspire to both leanness and muscularity (Frederick and Haselton, 2007; Grogan and Richards, 2002; Leit et al., 2001; Pope et al., 1999; Swami and Tovee, 2005a). That is, males may react to thinness that has been focused as a primary beauty standard of females in a different way, taking into account that muscularity in male populations is an important dimension to better understand body image (Olivardia et al., 2004). For instance, males reported higher levels of drive for muscularity than did females (McCreary and Saucier, 2009). A study with adolescent boys in the

United States, the desire to be thinner among boys was not related to perceived or actual encouragement to lose weight from their parents compared to girls (Thelen and Cormier, 1995). Another study assessing sociocultural influences on body image concerns and body change strategies among indigenous and non-indigenous adolescent girls and boys in Australia reported that boys scored higher on measures of assessing strategies to increase muscles than did girls in both indigenous and non-indigenous groups (Ricciardelli et al., 2004). In explanation, these findings suggest that encouragement to lose weight results in adverse effects on children conforming to masculinity (Ricciardelli and McCabe, 2001; McCreary et al., 2005). In this light, recent studies have sought to understand muscularity within a socio-political context, that is, a need for dominance and power (Swami, 2016; Swami et al., 2013). Also, drive for muscularity has been associated with a range of adverse outcomes indicating muscle dysmorphia (Davison and McCabe, 2005; Hallsworth et al., 2005; Irving et al., 2002; Leone et al., 2005; Olivardia et al., 2004; Pope et al., 1993; Smith and Hale, 2005). Taken together, these studies

* Corresponding author.

E-mail address: akira.sai@hs.hokudai.ac.jp (A. Sai).

discussed earlier suggest that examining muscularity plays a significant role in understanding males' body image. Simultaneously, it is also important from a clinical viewpoint, because it may identify the groups that need proper prevention and intervention insofar as body image concerns permeates males in the present society.

When examining males' body image, ethnicity is one of the important factors that need to be taken into account. Unlike other Asian societies, Malaysia is an ethnically heterogeneous society. Although the fact that its prevalence of obesity is strikingly high among Asian countries and this public health issue is more problematic among females is in no dispute (Ng et al., 2014; NCD Risk Factor Collaboration, 2016), indeed, some researchers have argued that Malaysians, which represents Malays, Indians and Chinese that are the three principal ethnic groups in this country, have different optimal body mass indexes (BMIs) due to different body compositions (Deurenberg et al., 2002; Deurenberg-Yap et al., 2000), and this has led the scholars to propose that these cultural groups have different perceptions towards body weight and attractiveness (Ricciardelli et al., 2007; Swami and Tovee, 2005a, 2005b). For instance, Ismail et al. (2002) showed that Indian and Malay females had higher obesity prevalence than did Chinese females, whereas obesity prevalence was higher in Chinese males than in Malays and Indians. Another study by Mellor et al. (2009) reported that BMI among adolescents was higher in Malay than in Chinese and Indians along with the results showing more engagement in strategies to increase lose weight and increase muscle in Malay and Indian adolescents. Similarly, recent evidence also showed that BMI among female college students in Kuala Lumpur was higher in Malays than the other two cultural groups, with Malay females scoring higher on a subscale (i.e., body shame) of the measure assessing body attitudes than did the others (Sai et al., 2018). That is, Malays, Chinese and Indians that represent the three major ethnic groups in Malaysia are important target populations, as these ethnic groups may react to drive for muscularity at different levels due to different body frames (i.e., BMI). Besides, cultural backgrounds of these ethnic groups may exert a great influence on perceptions of body among the members (Swami, 2016; Yang et al., 2005). However, as discussed earlier, Western norms of attractiveness may also exert a strong influence (Pomper, 2010). Taken together, Malaysians males may experience these dual cultural pressures as well as aspire to different levels of muscularity, which may consequentially place them at greater risk of body image disturbance.

Besides the need for examining males' body image among these ethnic groups, other sociocultural factors should also be taken into account. Some recent studies have also suggested that individual preferences towards one's body are a result of 'individual differences' (Swami and Tovee, 2005a, 2005b; Yates et al., 2004). Numerous studies suggest that 'individual differences' are socioculturally influenced and determined, which indicates the complex triad of family, peers and media (Dittmar, 2005; McCabe and Ricciardelli, 2003; Mellor et al., 2009; Ricciardelli and McCabe, 2004; Schaefer et al., 2015; Smolak et al., 2005). Indeed, in certain developing countries in Asia, such as Malaysia where the society has experienced rapid economic development along with technological advancements, assessing the great influence of media given a dramatic increase in the use of social media may serve to better understand Malaysian males' body image (Poushter, 2016). For instance, According to Young (2017), 1 in 3 min spent online is devoted to social media, also linked with the result that overall Internet users are mostly accessing social media via mobile devices rather than computers. In support, Poushter (2016) found that smartphone ownership among Malaysian people has dramatically increased in recent years indicating that 88% of those aged from 18 to 34 own smartphones with 68% of adults using the Internet. On the basis of these findings, Western ideals of attractiveness for males (i.e., drive for muscularity) may permeate young Malaysian males through mobile devices, and hence Internet.

Indeed, mounting research has revealed the great influence of contemporary media that represents Facebook and Instagram on a range of body image domains including body image concerns (e.g.,

internalization of Western ideals, body surveillance, and drive for thinness) (for a review, see Fardouly and Vartanian, 2016). In this term, specifically, certain activities on social media platforms have been reported such as exposure to a variety of appearance-related images, which in turn generates appearance comparisons (Fardouly et al., 2017; Hargreaves and Tiggemann, 2004; Meier and Gray, 2014; Tiggemann and Slater, 2013), and social sharing and clicking 'like' that could lead to one's popularity or endorsed physical attractiveness (Chua and Chang, 2016; Tiggemann et al., 2018), and leaving appearance-related comments (Tiggemann and Barbato, 2018; Tiggemann et al., 2018). As to the current situation of social media use in Malaysia, although a handful of studies have addressed this domain, some study has provided that online activities among Malaysians predominantly involve information searching and socializing (Yusop and Sumari, 2013), and Facebook is seemingly the biggest platform for these activities among college students (Jafar-karimi et al., 2016). In other words, young Malaysian people such as college students may engage in these online activities on a daily basis and therefore in turn engender a host of media-related body image concerns as discussed above. In this light, an increase in number of friends on Facebook and followers on Instagram may accelerate exposure to appearance-related images as well as socializing activities on these platforms, which may in turn elevate drive for muscularity in males. Furthermore, given the fact that Instagram is more image-based compared to Facebook (Fardouly and Vartanian, 2016), these two social media platforms may generate different effects on muscle-building attitudes and behaviors.

However, as there is little theoretical or empirical work to date on these dimensions in Malaysian males' body image, who live in a particular ethnically-heterogeneous environment, further research is needed to understand more fully the nature of muscularity and identify the target population that are at higher risk for negative body image by exploring factors affecting drive for muscularity including BMI, ethnicity, and media influences.

The primary focus of the present study was on investigating predictors of drive for muscularity among Malaysian male college students of these ethnic groups accompanied by modern media influences (i.e., social media). Based on the reviewed literature in Western and non-Western contexts as discussed earlier, the following were hypothesized:

1. Malay and Indian male college students would report greater drive for muscularity than Chinese counterparts
2. Ethnicity would be a significant predictor of drive for muscularity among Malaysian male college students
3. The longer males use Internet, the higher their drive for muscularity would become due to possible exposure to extensive body ideals
4. An increase in number of friends on Facebook and followers on Instagram would accelerate drive for muscularity among male college students, whereas the two social media platforms would also generate different effects on drive for muscularity

2. Method

2.1. Participants and procedures

Participants, including both undergraduate and graduate students, were recruited at two universities representing one located in outskirts of Kuala Lumpur (college A: $N = 82$) and the other in the city (college B: $N = 79$). The principal investigator approached each school in advance to obtain research approval. Participants were given a full explanation in documents that identified the researcher and provided contact details, clearly noting that the research was aimed at investigating males' attitudes towards muscularity and muscle-building behaviours. The documents outlined potential risks and expected benefits of the research. The documents also described confidentiality of the collected information and voluntary participation, indicating that each participant could terminate his participation at any time should he experience physical and

mental discomfort or for any other reason. Participants were required to provide informed consent before proceeding to the actual survey. Ethical approval for this study was obtained by the Ethics Committee of Graduate School and Faculty of Medicine, Kyoto University (E2496). The present study was conducted strictly in accordance with the Declaration of Helsinki.

The total number of participants who returned usable questionnaires was 82 at college A, 79 at college B. They were categorised into four main ethnic groups: Malay, Chinese, Indian and others.

2.2. Measures

2.2.1. Drive for muscularity

Drive for muscularity was measured using the Drive for Muscularity Scale (DMS) that comprises 15 items rated on a 6-point Likert scale ranging from 1 (Always) to 6 (Never) (DMS: McCreary and Sasse, 2000). The DMS consists of two subscales representing Muscularity-Oriented Body Image Attitudes (MBI-A: 7 items, e.g., 'I wish I were more muscular,' 'I think I would feel more confident if I had more muscle mass' and 'I think that my arms are not muscular enough') and Muscularity-Oriented Behaviours (MB: 8 items, e.g., 'I lift weights to build up muscle,' 'I feel guilty if I miss a weight training session' and 'I think about taking anabolic steroids'). Two subscales and total scores were extracted by the mean of items and hence ranged from 1 (MBI-A and MB) to 6, respectively. Higher scores reflected greater levels of muscularity-pursuing attitudes and engagements in muscularity-enhancing behaviours. The present study also successfully proved great internal consistency and reliability of this scale given Cronbach's α ranging from 0.86 to 0.91 including two subscales (DMS-Attitudes & Behaviours) and all measures.

Since English is one of the official languages and widely spoken throughout Malaysia, the current study used the original English versions of the SATAQ-M and DMS for each participant. All respondents were well educated in English and could understand and answer all items except for a few cases. If students could not understand the questions, we assisted them by translating the items into Bahasa Melayu (the other official Malaysian language) or Chinese with those who are bilingual at least (English and Bahasa Melayu or English and Chinese) or trilingual (English, Bahasa Melayu and Chinese), which is considered to be normal in light of the multicultural growth environment in this country.

Moreover, the participants answered demographic and personal questions about their age, height, weight, ethnicity (Malay, Chinese, Indian, or other), religion (Islam, Christianity, Buddhism, Hinduism, other, or none), length of time (in years) living in an urban area (Kuala Lumpur), hours of television watching per day (fewer than 2 h, 2–5 h, or more than 5 h), hours per day spent using social networking services (SNSs; less than 1 h, 1–5 h, or more than 5 h), hours per day on the Internet (less than 1 h, 1–5 h, or more than 5 h), number of 'friends' on Facebook (fewer than 200 or not a Facebook user, 200–600, or more than 600), number of accounts users following on Instagram (fewer than 200 or not an Instagram user, 200–600, or more than 600) and number of followers on their own account of Instagram (fewer than 200 or not an Instagram user, 200–600, or more than 600).

2.3. Statistical analyses

Calculation of the DMS scores and internal consistency scores (Cronbach's alpha) were conducted using R (R Studio) (R Core Team, 2017). The following subsequent analyses were conducted. Analysis of variance (ANOVA) and multiple comparisons were conducted for differences in each variable that may account for DMS (MBI-A and MB, respectively) scores with BMI. Correlation coefficients were analysed between BMI and DMS scores. Multiple regression analyses were conducted in general linear models to examine relationships between each variable and DMS scores. The standard for statistical significance was set at $p < 0.05$.

3. Results

Table 1 shows a descriptive data of the study participants. The table presents the percentage of each group in each variable that were hypothesized to predict drive for muscularity among male college students including mean and standard deviation of BMI. The mean age of the participants was 20.41 years ($SD = \pm 2.53$), and the mean BMI was 23.35 kg/m^2 ($SD = \pm 5.05$).

Table 2 summarized bivariate data between each variable and DMS scores. Analysis of variance (ANOVA), and subsequently multiple comparisons were conducted between each group of listed variables. Significant differences were found in ethnicity on DMS-Attitude ($p < 0.05$), in hours using Internet (between <1 h/day and 5 + hours/day) on DMS-Behavior ($p < 0.05$), number of Facebook friends (between <200 and 200–600 friends, 200–600 and 600 + friends) on DMS-Attitude ($p < 0.05$), and no of Instagram followers (between <200 and 600 + followers) on DMS-Behavior ($p < 0.05$).

Standard multiple regressions, where selected variables were entered to examine the relationships between the sociocultural variables and drive for muscularity. In this case, the sociocultural variables, specifically ethnicity (Malays, Chinese and Indians) and media (time spent on Internet, number of friends on Facebook and followers on Instagram), and BMI were entered into equation. A summary of each of the individual predictors of each DMS subscale (DMS-Attitude and DMS-Behavior) is provided in Table 3.

On the DMS-Attitude subscale, the significant predictors were being Chinese and 600 and more followers on Instagram. On the DMS-Behaviour subscale, being Chinese and 600 and more followers on Instagram were also significant predictors, whereas using Internet for 5 h and more was found to be a negative predictor.

4. Discussion

The primary aim of the present study was to investigate sociocultural factors affecting drive for muscularity in a sample of male college students in Malaysia. The results highlighted that ethnicity, time spent on media (i.e., Internet), the number of friends on Facebook and followers on Instagram were significantly associated with drive for muscularity. Indeed, these sociocultural variables were found to be significant predictors of muscularity-oriented attitudes and behaviours. Broadly speaking, these findings are consistent with earlier discussion on sociocultural influences, specifically ethnic backgrounds and media exposure, on males' body image, that is everyday males' body image is susceptible to a range of sociocultural factors existing in their everyday lives.

In the first instance, the results of this study showed that there were ethnic differences on the DMS scores (i.e., DMS-Attitude). Although some studies have suggested that Malays, Chinese, and Indians that represent the main three ethnic groups in Malaysia have different body image (Mellor et al., 2009; Swami and Tovee, 2005a), the fact that Chinese males scored higher on the DMS subscale (i.e., attitude) than did the other ethnic groups runs counter to our hypothesis that Malays and Indians would score higher than Chinese. Indeed, in multiple regression analyses, being Chinese was a strong predictor of both muscularity-oriented attitudes and behaviours. One possible explanation is that Chinese males' body frames are relatively smaller compared to those of Malays and Indians and hence Chinese males may aspire to greater muscularity so as to negate their positions of subordinate muscularity. In support, several studies have suggested to date that the three main ethnic groups in Malaysia have different optimal BMIs, representing that body composition (e.g., skeletal muscles) may be different among these ethnic groups (Deurenberg-Yap et al., 2000; Deurenberg et al., 2002; Ismail et al., 2002). Another explanation is that Chinese males may also seek muscularity as a means of achieving success and gaining society's recognition in addition to 'cerebral qualities (e.g., academic achievement)' that has been argued in Chinese contexts by some studies (Cheng et al., 2016; Ricciardelli et al., 2007; Swami, 2016; Yang

Table 1. Demographic data of study participants.

Participants (n = 161)	
Characteristic	Frequency/Mean (SD)
College	
A	50.9%
B	49.1%
Age	20.41 (SD = 2.53)
Ethnicity	
Chinese	46%
Indian	6.2%
Malay	44.7%
Other	3.1%
Religion	
Christian	14.9%
Islam	47.2%
Buddhist	27.3%
Hindu	4.3%
Other	6.2%
Years in urban area	
<1 year	5%
1–4 years	24.8%
5 + years	70.2%
Hours watching TV	
<2 h/day	52.2%
2–5 h/day	41%
5 + hours/day	6.8%
Hours using SNSs	
<1 h/day	11.8%
1–5 h/day	56.5%
5 + hours/day	31.7%
Hours using internet	
<1 h/day	5%
1–5 h/day	50.3%
5 + hours/day	44.7%
No of Facebook friends	
<200	15.5%
200–600	31.1%
600+	53.4%
No of Instagram follows	
<200	30.4%
200–600	43.5%
600+	26.1%
No of Instagram followers	
<200	36.6%
200–600	37.9%
600+	25.5%
BMI	23.35 (SD = 5.05)

et al., 2005). Clearly, further research is needed to examine potential associations with these traditional cultural values. In summary, Chinese males in Malaysia may attempt to develop greater musculature than the counterparts from other ethnic groups, and this higher level of drive for muscularity may place Chinese males at higher risk for negative body image (e.g. lower self-esteem, exercise dependencies and muscle dysmorphia).

Significant differences were found in the groups of using Internet on muscularity-oriented behaviours. In addition, muscularity-oriented behaviours were significantly predicted by engaging in Internet use for longer hours. This is unexpected because, initially as discussed earlier on the current situation on media use, we hypothesized that Internet would be one of the primary sources of providing its users with frequent chances of being exposed to extensive body ideals, which in turn may promote

higher levels of muscle-building attitudes and behaviours. It is possible that some males did not spend time searching muscularity-related contents. However, notably, the results of this study may serve as important information for prevention and intervention of obesity among young populations as excess indulgence in media use may discourage its users to engage in actual behaviours to lead their healthy lives given its toxic nature. Indeed, a study with children and adolescents in the State of Qatar (Bener et al., 2011) confirmed that childhood obesity was most prevalent in children who spent using Internet for more than 3 h. The recent study with the children and adolescents in Turkey also argued that Internet addiction is significantly associated with increased BMI among these study populations (Bozkurt et al., 2018). Although the present findings showed that reduced levels of drive for muscularity was caused by internet use for longer hours, this study reemphasized that internet indulgence is prevalent among young populations and in turn may place them at higher risk for lifestyle-related diseases, representing obesity, and hence this study may serve as a useful tool for health practitioners to tackle this great public health concern.

Notably, followers on Instagram was a significant predictor of both muscularity-oriented subscales. In this regard, on the basis of earlier discussion that Instagram is more image-focused platform than Facebook (Fardouly and Vartanian, 2016), it is possible that Malaysian males may aspire to and build more developed musculature to post their elaborated physiques so as to attract their followers. Specifically, the appealing behaviours may include an attempt to obtain more likes from followers. In this support, Yusop and Sumari (2013) reported that a majority of young Malaysian adults use social media mainly for socializing with other users, specifically engaging in social sharing and clicking 'like'. Future research should explore the associations between specific characteristics of social media (e.g., 'like') and number of followers to understand more fully the influences of these image-based social media on males' body image. In summary, this present findings showed that social media usage is indeed significantly associated with drive for muscularity among young males in this technologically advanced modern society. As some researchers (Liu and Ma, 2018) have warned that social media addiction has a positive link to smartphone addiction and excess Internet use, the present findings should be treated cautiously that modern media use may promote excess muscularity-oriented thoughts and behaviours among young males, which may consequentially place them at a host of negative outcomes, both physically and mentally.

4.1. Limitations

Although the current study successfully highlighted the effects of exposure to media on body image among city-dwelling male college students, there are some aspects that remain understudied and hence need further investigation to develop a richer picture of drive for muscularity among Malaysian males. First, recent work has shown that the degree to which males are driven for building muscle mass is dependent on specific purposes for muscularity (e.g., whether the individual trains for exclusively aesthetic-based competitions or functionality) (Hallsworth et al., 2005; Pickett et al., 2005). In relation to this, several studies have warned that males who engage in a bodybuilding process have a disposition to 'reverse anorexia', in other terms, 'bigorexia' or 'muscle dysmorphia.' This can subsequently cause negative physical and psychological reactions such as using steroids and the pathological thought that one's body is too small or not muscular enough. The thought discussed above has been reported to cause social impairments (e.g., poor interpersonal relationships) and excess behaviours to develop greater musculature (Davison and McCabe, 2005; Leone et al., 2005; Pope et al., 1993; Smith and Hale, 2005). Extensions of the present study should clarify the specific purposes of muscle-building attitudes and behaviours among males and test drive for muscularity among each group of men separately so as to detect health risks separately among these populations.

Table 2. Bivariate relationships between each sociocultural variable and the Drive for Muscularity subscales.

	DMS Attitude		DMS Behavior	
	Mean	p Value	Mean	p Value
College^a				
A	3.52	0.11	2.99	0.83
B	3.76		3.03	
Age^a				
		0.12		0.7
Ethnicity^a				
Chinese	3.86	<0.05	3.09	0.64
Indian	3.17		2.73	
Malay	3.50		2.94	
Others	3.26		3.28	
Religion^a				
Buddhist	3.80	0.40	2.86	0.55
Christian	3.83		3.33	
Hindu	3.35		2.84	
Islam	3.53		3.01	
Other	3.49		3.00	
Years in urban area^a				
<1 year	3.84	0.75	3.27	0.09
1–4 years	3.69		3.30	
5 + years	3.61		2.88	
Hours watching TV^a				
<2 h/day	3.68	0.54	2.84	0.11
2–5 h/day	3.64		3.22	
5 + hours/day	3.34		3.00	
Hours using SNS^a				
<1 h/day	3.43	0.41	3.36	0.31
1–5 h/day	3.62		2.95	
5 + hours/day	3.76		2.98	
Hours using internet^a				
<1 h/day	3.75	0.59	3.75	<0.05
1–5 h/day	3.70		3.13	
5 + hours/day	3.55		2.79	
No of Facebook friends^a				
<200	3.61	<0.05	3.09	0.27
200–600	3.33		2.80	
600+	3.83		3.11	
No of Instagram follows^a				
<200	3.46	0.28	2.71	0.06
200–600	3.74		3.09	
600+	3.67		3.22	
No of Instagram followers^a				
<200	3.54	0.07	2.82	<0.05
200–600	3.53		2.93	
600+	3.93		3.41	
BMI z-score^b				
		0.95		0.31

^a ANOVA, ^b Spearman's correlation, ^{c, d} Multiple comparisons.

Second, the present study did not explore the effects of specific backgrounds of people affecting modern-age men's body image perceptions. [Smith and Hale \(2005\)](#) showed that those obsessed with training reported a low level of life satisfaction, suggesting difficulties in socializing. In their study, particularly, single males were more likely to engage in excess training than those who were in romantic relationships. In other studies, the presence of friends ([Salvy et al., 2009](#)), particularly female friends were reported to be likely to affect males' body image and body change behaviors (e.g., physical activity, muscle mass enhancement) ([Ricciardelli et al., 2004](#)). Therefore, it is crucial to identify the environment surrounding a particular person for a better understanding of sociocultural factors exerting different effects on the desire to attain muscularity.

Finally, future studies are needed to elucidate how specific activities on social media (e.g., Facebook, Instagram), such as leaving comments and clicking 'likes', or hash tagging impact body image perceptions of males ([Tiggemann and Barbato, 2018](#); [Tiggemann et al., 2018](#)). [Fardouly and Vartanian \(2016\)](#) have noted that Instagram is more media-based compared to traditionally text-based Facebook, providing users with more chances of comparison with other people. Although there are few convincing articles relating social media to male body image at the moment, it is important to consider the contents of the accounts of the users and what they follow and what images they post.

An additional sampling-related limitation is the recruitment of study participants who were predominantly Malay- and Chinese Malaysians. There were subsequently few Indians, and this may have biased the

Table 3. Results of multiple regressions with drive for muscularity.

Variable	Drive for muscularity			DMS Behavior		
	coefficient	SE	p	coefficient	SE	p
	Model R ² : 0.09			Model R ² : 0.08		
	p < 0.01			p < 0.01		
Ethnicity (Indian = 0)						
Malay	0.62	0.32	0.05	0.5369	0.3706	0.15
Chinese	1.01	0.32	<0.01	0.7855	0.3672	<0.05
Hours using internet (<1 h/day = 0)						
1–5 h/day	-0.11	0.37	0.77	-0.7537	0.4348	0.09
5 + h/day	-0.28	0.37	0.45	-1.1146	0.4366	<0.05
Facebook friends (<200 = 0)						
200–600	-0.41	0.25	0.10	-0.3111	0.289	0.28
600+	0.04	0.24	0.88	-0.1042	0.2793	0.71
Instagram followers (<200 = 0)						
200–600	0.08	0.18	0.65	0.1888	0.2112	0.37
600+	0.45	0.21	<0.05	0.6702	0.2421	<0.01
BMI z-score	0.01	0.07	0.89	0.1201	0.087	0.17
Intercept	3.03	0.44	<0.001	3.1688	0.5176	<0.001

results. This is because the majority of students at college A comprise Malays while students at college B comprise predominantly Chinese students. Future researchers should consider securing equal numbers of study participants across cultural groups and also target ethnic minority people living in east Malaysia to reflect more diverse outcomes such as adherence to traditional cultural values (Swami, 2016).

To the best of our knowledge, the present study is the first attempt to explore the sociocultural influences in male body image, particularly in term of the social media influence in Malaysia. Given that a growing number of studies have shown negative modern media influences on body image among young females and males in these modern times including a host of negative physical and psychological outcomes, the present work adds to these literature by showing that social media indeed has an impact on drive for muscularity among males in non-Western contexts, that is Malaysia. In this sense, the present findings may provide health practitioners with important information that is useful for the development of preventive strategies (e.g., interventions) to tackle media-related negative body image among males.

Declarations

Author contribution statement

A. Sai: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

T. Furusawa: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

M. Y. Othman, W. F. Z. Wan Zaini, C. S. Y. Tan: Performed the experiments.

D. Tomojiri: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

N. I. B. Mohamad Norzilan: Contributed reagents, materials, analysis tools or data.

Funding statement

This work was supported by the Inter-Graduate School Program for Sustainable Development and Survivable Societies at Kyoto University, and commissioned by the Japan Society for the Promotion of Science (JSPS) as a part of the Program for Leading Graduate Schools.

Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Acknowledgements

The authors would like to show their deepest gratitude to each of the study participants at the two universities who are hidden corresponding authors, and all the people in Malaysia for their warm hospitality. Also, the authors would like to show their heartfelt appreciation to Prof. S. Takeda, late Prof. M. Nishibuchi, and the other faculty at Kyoto University for their advice and continuous support and Prof. T. Yamauchi for providing the corresponding author with a new wonderful research environment (Hokkaido University) to help complete this submitting process.

References

- Bener, A., Al-Mahdi, H.S., Ali, A.I., Al-Nufal, M., Vachhani, P.J., Tewfik, I., 2011. Obesity and low vision as a result of excessive Internet use and television viewing. *Int. J. Food Sci. Nutr.* 62, 60–62.
- Bozkurt, H., Özer, S., Şahin, S., Sönmezgöz, E., 2018. Internet use patterns and Internet addiction in children and adolescents with obesity. *Pediatr. Obes.* 13, 301–306.
- Cheng, H.L., McDermott, R.C., Wong, Y.J., La, S., 2016. Drive for muscularity in Asian American men: sociocultural and racial/ethnic factors as correlates. *Psychol. Men Masc.* 17, 215–227.
- Chua, T.H.H., Chang, L., 2016. Follow me and like my beautiful selfies: Singapore teenage girls' engagement in self-presentation and peer comparison on social media. *Comput. Hum. Behav.* 55, 190–197.
- Davison, T.E., McCabe, M.P., 2005. Relationships between men's and women's body image and their psychological, social, and sexual functioning. *Sex. Roles* 52, 463–475.
- Deurenberg, P., Deurenberg-Yap, M., Guricci, S., 2002. Asians are different from Caucasians and from each other in their body mass index/body fat percentage relationship. *Obes. Rev.* 3, 141–146.
- Deurenberg-Yap, M., Schmidt, G., Van Staveren, W.A., Deurenberg, P., 2000. The paradox of low body mass index and high body fat percentage among Chinese, Malays and Indians in Singapore. *Int. J. Obes.* 24, 1011–1017.
- Dittmar, H., 2005. Vulnerability factors and processes linking sociocultural pressures and body dissatisfaction. *J. Soc. Clin. Psychol.* 24, 1081–1087.
- Fardouly, J., Vartanian, L.R., 2016. Social media and body image concerns: current research and future directions. *Curr. Opin. Psychol.* 9, 1–5.

- Fardouly, J., Pinkus, R.T., Vartanian, L.R., 2017. The impact of appearance comparisons made through social media, traditional media, and in person in women's everyday lives. *Body Image* 20, 31–39.
- Frederick, D.A., Haselton, M.G., 2007. Why is muscularity sexy? Tests of the fitness indicator hypothesis. *Pers. Soc. Psychol. Bull.* 33, 1167–1183.
- Grogan, S., Richards, H., 2002. Body image: focus groups with boys and men. *Men Masculinities* 4, 219–232.
- Hallsworth, L., Wade, T., Tiggemann, M., 2005. Individual differences in male body-image: an examination of self-objectification in recreational body builders. *Br. J. Health Psychol.* 10, 453–465.
- Hargreaves, D.A., Tiggemann, M., 2004. Idealized media images and adolescent body image: "Comparing" boys and girls. *Body Image* 1, 351–361.
- Irving, L.M., Wall, M., Neumark-Sztainer, D., Story, M., 2002. Steroid use among adolescents: findings from Project EAT. *J. Adolesc. Health* 30, 243–252.
- Ismail, M.N., Chee, S.S., Nawawi, H., Yusoff, K., Lim, T.O., James, W.P.T., 2002. Obesity in Malaysia. *Obes. Rev.* 3, 203–208.
- Jafarkarimi, H., Sim, A.T.H., Saadatdoost, R., Hee, J.M., 2016. Facebook addiction among Malaysian students. *Int. J. Infor. Educ. Technol.* 6, 465–469.
- Leit, R.A., Pope Jr., H.G., Gray, J.J., 2001. Cultural expectations of muscularity in men: the evolution of Playgirl centerfolds. *Int. J. Eat. Disord.* 29, 90–93.
- Leone, J.E., Sedory, E.J., Gray, K.A., 2005. Recognition and treatment of muscle dysmorphia and related body image disorders. *J. Athl. Train.* 40, 352.
- Liu, C., Ma, J., 2018. Development and validation of the Chinese social media addiction scale. *Pers. Individ. Differ.* 134, 55–59.
- McCabe, M.P., Ricciardelli, L.A., 2003. Sociocultural influences on body image and body changes among adolescent boys and girls. *J. Soc. Psychol.* 143, 5–26.
- McCreary, D.R., Sasse, D.K., 2000. An exploration of the drive for muscularity in adolescent boys and girls. *J. Am. Coll. Health* 48, 297–304.
- McCreary, D.R., Saucier, D.M., 2009. Drive for muscularity, body comparison, and social physique anxiety in men and women. *Body Image* 6, 24–30.
- McCreary, D.R., Saucier, D.M., Courtenay, W.H., 2005. The drive for muscularity and masculinity: testing the associations among gender-role traits, behaviors, attitudes, and conflict. *Psychol. Men Masc.* 6, 83.
- Meier, E.P., Gray, J., 2014. Facebook photo activity associated with body image disturbance in adolescent girls. *Cyberpsychol., Behav. Soc. Netw.* 17, 199–206.
- Mellor, D., McCabe, M., Ricciardelli, L., Yeow, J., Daliza, N., 2009. Sociocultural influences on body dissatisfaction and body change behaviours among Malaysian adolescents. *Body Image* 6, 121–128.
- NCD Risk Factor Collaboration, 2016. Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants. *The Lancet* 387, 1377–1396.
- Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., Gakidou, E., 2014. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet* 384, 766–781.
- Olivardia, R., Pope Jr., H.G., Borowiecki III, J.J., Cohane, G.H., 2004. Biceps and body image: the relationship between muscularity and self-esteem, depression, and eating disorder symptoms. *Psychol. Men Masc.* 5, 112–120.
- Pickett, T.C., Lewis, R.J., Cash, T.F., 2005. Men, muscles, and body image: comparisons of competitive bodybuilders, weight trainers, and athletically active controls. *Br. J. Sports Med.* 39, 217–222.
- Pomper, D., 2010. Masculinities, the metrosexual, and media images: across dimensions of age and ethnicity. *Sex. Roles* 63, 682–696.
- Pope Jr., H.G., Katz, D.L., Hudson, J.I., 1993. Anorexia nervosa and "reverse anorexia" among 108 male bodybuilders. *Compr. Psychiatr.* 34, 406–409.
- Pope Jr., H.G., Olivardia, R., Gruber, A., Borowiecki, J., 1999. Evolving ideals of male body image as seen through action toys. *Int. J. Eat. Disord.* 26, 65–72.
- Poushter, J., 2016. Smartphone Ownership and Internet Usage Continues to Climb in Emerging Economies. Pew Research Center, p. 22.
- R Core Team, 2017. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.
- Ricciardelli, L.A., McCabe, M.P., 2001. Self-esteem and negative affect as moderators of sociocultural influences on body dissatisfaction, strategies to decrease weight, and strategies to increase muscles among adolescent boys and girls. *Sex. Roles* 44, 189–207.
- Ricciardelli, L.A., McCabe, M.P., 2004. A biopsychosocial model of disordered eating and the pursuit of muscularity in adolescent boys. *Psychol. Bull.* 130, 179.
- Ricciardelli, L.A., McCabe, M.P., Ball, K., Mellor, D., 2004. Sociocultural Influences on Body Image Concerns and Body Change Strategies Among Indigenous and Non-Indigenous Australian Adolescent Girls and Boys. *Sex Roles* 51, 731–741.
- Ricciardelli, L.A., McCabe, M.P., Williams, R.J., Thompson, J.K., 2007. The role of ethnicity and culture in body image and disordered eating among males. *Clin. Psychol. Rev.* 27, 582–606.
- Sai, A., Yusof, M.Y., Wan Zaini, W.F.Z., Tan, C.S.Y., Mohamad Norzilan, N.I.B., Tomojiri, D., Furusawa, T., 2018. Factors affecting body image perceptions of female college students in urban Malaysia. *Obes. Med.* 11, 13–19.
- Salvy, S.J., Roemmich, J.N., Bowker, J.C., Romero, N.D., Stadler, P.J., Epstein, L.H., 2009. Effect of peers and friends on youth physical activity and motivation to be physically active. *J. Paediatr. Psychol.* 34, 217–225.
- Schaefer, L.M., Burke, N.L., Thompson, J.K., Dedrick, R.F., Heinberg, L.J., Calogero, R.M., Anderson, D.A., 2015. Development and validation of the sociocultural attitudes towards appearance questionnaire-4 (SATAQ-4). *Psychol. Assess.* 27, 54.
- Smith, D., Hale, B., 2005. Exercise-dependence in bodybuilders: antecedents and reliability of measurement. *J. Sports Med. Phys. Fit.* 45, 401–408.
- Smolak, L., Murnen, S.K., Thompson, J.K., 2005. Sociocultural influences and muscle building in adolescent boys. *Psychol. Men Masc.* 6, 227.
- Swami, V., 2016. Masculinities and ethnicities: ethnic differences in drive for muscularity in British men and the negotiation of masculinity hierarchies. *Br. J. Psychol.* 107, 577–592.
- Swami, V., Neofytou, R.V., Jablonska, J., Thirlwell, H., Taylor, D., McCreary, D.R., 2013. Social dominance orientation predicts drive for muscularity among British men. *Body Image* 10, 653–656.
- Swami, V., Tovée, M.J., 2005a. Male physical attractiveness in Britain and Malaysia: a cross-cultural study. *Body Image* 2, 383–393.
- Swami, V., Tovée, M.J., 2005b. Female physical attractiveness in Britain and Malaysia: a cross-cultural study. *Body Image* 2, 115–128.
- Thelen, M.H., Cormier, J.F., 1995. Desire to be thinner and weight control among children and their parents. *Behav. Ther.* 26, 85–99.
- Tiggemann, M., Barbato, I., 2018. "You look great!": the effect of viewing appearance-related Instagram comments on women's body image. *Body Image* 27, 61–66.
- Tiggemann, M., Slater, A., 2013. NetGirls: the Internet, Facebook, and body image concern in adolescent girls. *Int. J. Eat. Disord.* 46, 630–633.
- Tiggemann, M., Hayden, S., Brown, Z., Veldhuis, J., 2018. The effect of Instagram "likes" on women's social comparison and body dissatisfaction. *Body Image* 26, 90–97.
- Yang, C.F.J., Gray, P., Pope Jr., H.G., 2005. Male body image in Taiwan versus the west: Yanggang Zhiqi meets the Adonis complex. *Am. J. Psychiatr.* 162, 263–269.
- Yates, A., Edman, J., Aruguete, M., 2004. Ethnic differences in BMI and body/self-dissatisfaction among Whites, Asian subgroups, Pacific Islanders, and African-Americans. *J. Adolesc. Health* 34, 300–307.
- Young, K., 2017. The Biggest Social Media Trends Shaping 2018. GlobalWebIndex. Retrieved from. <https://blog.globalwebindex.com/trends/social-media-trends/>.
- Yusop, F.D., Sumari, M., 2013. The use of social media technologies among Malaysian youth. *Proc.-Soc. Behav. Sci.* 103, 1204–1209.