Loneliness and Subjective Evaluations of Physical Health: The Underlying Mechanism of Body Image

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Loneliness has been shown to have robust associations with our health. However, little is known about the degree to which loneliness shapes our perceptions of physical health, which has been shown to have unique contributions to our overall health status. Therefore, this study aimed to examine the relationship between loneliness and perceived physical health. We tested body image as a potential underlying mechanism unique to this relationship, while accounting for the previously established mechanisms of stress and self-esteem. For comparison purposes, we tested this model with depression and anxiety as outcome variables. 319 Malaysian young adults (133 males and 186 females) aged 23.05 on average completed an online questionnaire containing our measures. Results revealed that higher loneliness was associated with higher depression, higher anxiety, and lower perceived physical health. Parallel mediation analyses showed that there were significant indirect effects of loneliness on perceived physical health and psychological outcomes through perceived stress and self-esteem. Indirect effects through body image were only significant for perceived physical health and not for psychological outcomes. Overall, these findings highlight the value of reducing stress and improving self-evaluations, particularly body image, in healthcare interventions designed to mitigate the health-debilitating effects of prolonged loneliness in young adults.

Keywords: anxiety, body image, depression, loneliness, subjective health

Since the start of the COVID-19 pandemic in December 2019, preventative measures have been implemented by governments globally to control the spread of the virus. Measures such as social distancing and stay-at-home mandates have inflated the experience of loneliness among citizens worldwide (Beam & Kim, 2020). Defined as the discrepancy between an individual's desired social interactions and the degree to which such desires are met by meaningful social relationships and interactions (Hawkley & Cacioppo, 2010), loneliness has long been recognised as a 'silent epidemic' (Peate, 2018). Indeed, loneliness has been found to be a robust predictor of reduced happiness and negative health outcomes (Cacioppo et al., 2006a; Holt-Lunstad, et al., 2015). While there is a substantial amount of research done on the role of loneliness in predicting physical and mental health, few have examined how it relates to another important dimension of health, which is the subjective evaluation of one's physical health status. Understanding how individuals perceive their physical health may be especially important within the COVID-19 context as such perceptions

may shape behaviours that may affect one's health. For instance, individuals who perceive themselves as physically fit may adhere less to COVID-19 safety behaviours therefore heightening the risk of exposure to the virus. On the other hand, people who underestimate their physical health may also over-adhere to safety behaviours (Inbar & Shinan-Altman, 2021), thus increasing anxiety or social isolation, which may be detrimental to their mental health in the long run. Thus, the current study examined the association between loneliness and subjective evaluations of health during the COVID-19 pandemic in Malaysia.

Loneliness and Health Outcomes

Loneliness is bad for our health. Lonelier individuals tend to experience more physical health issues such as cardiovascular problems, stroke, accelerated aging, dementia, and mortality risks (Hawkley & Cacioppo, 2010; Rico-Uribe et al., 2018; Thurston & Kubzansky, 2009) and psychological health problems such as increased anxiety (Chang, 2013; Muyan et al., 2016) and depressive symptoms (Cacioppo et al., 2006a; Diehl et al., 2018). More importantly, lonelier people also perceive themselves to be less physically healthy (Ermer & Proulx, 2019; Kang et al., 2012; Thanakwang, 2009).

Perceived physical health is a holistic measure of health, which in addition to capturing attitudes, values, and experiences of health (Bevans et al., 2014), takes into account signs of illnesses that are not biomedically traceable via physical examinations (Eriksson et al., 2001). It has been shown to be a reliable indicator of current and future health status, which, in turn, predicts mortality (Benyamini, 2011; Idler & Benyamini, 1997). Despite the importance of perceived physical health as a dimension of health, it remains understudied. The few studies that have examined the link between loneliness and perceived physical health have focused solely on older adults (Ermer & Proulx, 2019; Kang et al., 2012; Thanakwang, 2009), presumably due to the high prevalence rates of loneliness in this population (Nyqvist et al., 2017). Therefore, there is a gap in literature regarding the association between loneliness and perceived physical health among the younger population. Addressing this gap would be particularly important during this COVID-19 pandemic as recent studies have highlighted a surge in loneliness amongst young adults since the implementation of self-isolation measures (Lee et al., 2020; Tull et al., 2020).

The Underlying Mechanisms of Stress and Self-evaluation

Apart from examining how loneliness predicts subjective evaluations of health, it is also important to understand the different mechanisms underlying this relationship. Much of the research investigating the link between loneliness and physical health has largely supported the biological pathways of stress and physiological stress responses (Hawkley & Cacioppo, 2007; Xia & Li, 2018). Individuals higher in loneliness display exaggerated physiological responses, such as elevated cortisol levels (Quadt et al., 2020) and chronic activation of the hypothalamic–pituitary–adrenal axis (Xia & Li, 2018), which are indicative of greater physiological stress. Apart from physiological stress, perceived stress has also been shown to mediate the relationship between loneliness and general health outcomes (Segrin & Passalacqua, 2010) which is likely extendable to psychological health outcomes such as depression and anxiety as well (Mirón et al., 2019).

In addition to stress, extant research also highlights the role of negative self-evaluations as another mediator of the relationship between loneliness and health (Ypsilanti et al., 2019). According to evolutionary theories (Cacioppo et al.,

2006a), lonely individuals experience an implicit hypervigilance towards social threats to safeguard themselves from hostile interactions. However, in safe social environments, this self-preservation focus may paradoxically result in self-defeating hostility (Cacioppo et al., 2014) which activates behavioural and neurobiological mechanisms that exacerbate adverse health outcomes (Hawkley & Cacioppo, 2010). Indeed, affective and cognitive features of lonelier individuals tend to feature a range of negative affect and attitudes towards the self, such as self-deprecation, self-blame, and low self-esteem (Heinrich & Gullone, 2006), which in turn have been consistently linked to a plethora of psychological health issues (Cacioppo et al., 2006b) and lower psychological well-being (Azlan et al., 2017). In particular, self-esteem, which defines the subjective self-evaluation of one's worth, represents an important aspect of one's self-concept that is central to the psychological well-being of young adults (MacDonald & Leary, 2012; O'Dea, 2012). Low levels of self-esteem have been empirically shown to mediate the relationship between loneliness and psychological health outcomes such as depression and anxiety (Rossi et al., 2020; Uba, et al., 2020).

While self-esteem may represent the general overview of one's self-evaluation, research has also highlighted the importance of considering physical-related attributes in health perceptions among young adults (Molenaar et al., 2020). Hence, we tested the role of body image, which parallels self-esteem as a body-specific form of self-evaluation (O'Dea, 2012; Sundgot-Borgen et al., 2020), as a mediator whilst taking into account stress and self-esteem as additional mediators.

Body Image as a Mediator

Body image is generally defined as a multifaceted construct encompassing the various feelings, perceptions, thoughts, and behaviours an individual has in relation to their own body (Cash, 2004; Tylka, 2012). Individuals with negative body image tend to experience dissatisfaction or distress related to physical characteristics such as body shape or weight (Rodgers et al., 2011) while those with positive body image are more likely to appreciate and accept the uniqueness and functionality of their body (Tylka, 2012).

In general, individuals with better body image tend to experience less psychological symptoms and also rate their physical health as better (Wilson et al., 2013; Winter et al., 2017). This may be partly due to the higher likelihood of those who are more appreciative of their bodies to habitually engage in health enhancing behaviours and self-care practices which strengthens their physical and mental health (Wood-Barcalow et al., 2010). It is also worth noting that qualitative studies have highlighted physical appearances to be one of the key indicators of health among young adults (Molenaar et al., 2020). In fact, a study by Powell et al. (2013) found that disgust towards physical aspects of the self was a stronger predictor of depressive symptoms compared to disgust related to personality or behaviour, highlighting the importance of body-related appraisals in investigating psychopathology. Given the sociocultural emphasis on certain physical attributes as standards of beauty and health in this day and age, it is no surprise that body image may play an important role in the health perception of young adults (Idema et al., 2019).

To the best of our knowledge, no study to date has tested whether these pathways of stress and self-evaluation (as indicated by self-esteem and body image) extend to subjective perceptions of physical health. Considering that psychological health and physical health are intertwined constructs (World Health Organization, 2013), we expected both these pathways to mediate

the relationship between loneliness and perceived physical health.

The Present Study

The aim of the current study was to examine the relationship between loneliness and perceived physical health. Given the lack of studies among the younger population, these associations were tested on a sample of young adults in Malaysia. This will also be the first study to test for the indirect effects of loneliness through body image. In order to test for the unique contribution of body image as a mediator, we accounted also for the contributions of perceived stress and self-esteem in a parallel mediation model. We additionally tested this model with depression and anxiety as outcomes to compare its applicability across different health outcomes. In line with previous findings, we hypothesised that (H1) there would be negative relationships between loneliness and health outcomes, whereby higher loneliness would predict poorer perceived physical health and higher depressive and anxiety symptoms. Specifically, (H2) more loneliness would predict poorer health outcomes through higher perceived stress, lower self-esteem, and lower body image.

In our examination, we also considered the key variables that may confound our findings. These include sex, subjective socioeconomic status, physical activity, body mass index (BMI), and relationship status. For instance, it has been found that women are more likely than men to report poorer perceived health (Wang et al., 2013). Additionally, studies have identified sex differences in body image and self-esteem, whereby females have consistently reported higher levels of body image dissatisfaction (Feingold & Mazzella, 2016) and lower self-esteem (Bleidorn et al., 2016) than males. Besides sex differences, individuals reporting lower subjective socioeconomic status are more likely to experience poorer perceived health (Cundiff & Matthews, 2017), poorer mental health outcomes (Uecker & Wilkinson, 2020), and higher levels of perceived stress (Steen et al., 2020).

Moreover, regular engagement in physical activity has been correlated with better perceived health (Han, 2021) and lower levels of perceived stress among college-aged students (Ge et al., 2020). Individuals with higher BMI scores are also more likely to report poorer perceived health (Bradshaw et al., 2017) and higher levels of body image dissatisfaction (Wilson et al., 2013). Lastly, studies have shown that young adults who are involved in a romantic relationship report fewer depressive symptoms and feelings of loneliness compared to their single peers (Beckmeyer & Cromwell, 2019).

Method

Participants and Procedure

This research was part of a larger project on interpersonal experiences and wellbeing among Malaysian young adults, which was reviewed and approved by the Monash University Human Research Ethics Committee. To qualify for participation, individuals had to be Malaysian by nationality, aged between 18 to 30 years, comfortable with completing a questionnaire in the English language, and comfortable with responding to questions about their close relationships and sexual experiences.

Participants were recruited online via snowball sampling using personal contacts of research assistants and through posts on social networking sites. Individuals who were interested to participate in the study provided their contact details to the research assistants. They were then sent the link to the online questionnaire, which was hosted on Qualtrics. Participants were informed that their completion of the

questionnaire implied consent in the explanatory statement, which was presented to them at the start of the online questionnaire. Participants were paid MYR 30 (MYR 1 = approximately USD 0.24) for their participation. Data collection began on 15 May and ended on 4 October 2020, which was within the period of the Movement Control Order initiated in response to the COVID-19 pandemic in Malaysia.

A total of 386 responses were recorded. After removing duplicates and incomplete responses to the body image, loneliness, and health variables, we were left with 319 participants (133 men and 186 women) who were aged 23.1 years on average (SD = 2.6) with BMIs ranging from 13.7 to 44.6. About half (52.4%) were of Chinese ethnicity, 24.8% Malay, 16.0% Indian, and 6.9% identified as mixed race, native or other Southeast Asian races. A power analysis was conducted after data collection but prior to testing our study's hypotheses. Our sample size was deemed sufficient following Fritz and MacKinnon's (2007) recommendations of between 173 – 261 participants to achieve a power of 0.80 for our analyses.

Instruments

Loneliness

Participants completed the six-item version of the revised UCLA Loneliness Scale (ULS-6; Neto, 2014). Participants rated each item on a scale of 1 (*Never or almost never*) to 5 (*Always or almost always*). Item scores were averaged to form a loneliness score, where higher values indicated more loneliness (α = .89).

Perceived physical health

The five items from the general health subscale of the 36-item Short Form Survey (Ware & Sherbourne, 1992) were used to capture subjective evaluations of physical health. In our instructions, we specifically asked participants to complete these ratings with their physical health in mind. Participants responded to items (e.g. "In general, would you say your health is:") on a scale of 1 (*Excellent*) to 5 (*Poor*) and on other items (e.g. "My health is excellent.") on a scale of 1 (*Definitely true*) to 5 (*Definitely false*). The five item scores were averaged to form a perceived physical health score, whereby higher values indicated better physical health (α = .78).

Depression

Depression was measured using the Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001). Participants reflected on their past two weeks and rated the degree to which they were bothered by nine problems (e.g. "Poor appetite or overeating") on a scale of 1 (*Not at all*) to 4 (*Nearly every day*). These scores were averaged to form a depression score (α = .85).

Anxiety

A brief version of the State-Trait Anxiety Scale (de Vries & van Heck, 2013; original version: Spielberger et al., 1970) was used to assess the degree to which one generally feels anxious. Participants completed ten items (e.g. "I feel nervous and restless") rated on a 4-point scale (1 = *Almost never*, 4 = *Almost always*), which were averaged to form an anxiety score (α = .88).

Perceived stress

The ten-item Perceived Stress Scale (Cohen & Williamson, 1988) was used to capture psychological stress experienced by the participants in the last month. Participants rated the ten items (e.g. "In the last month, how often have you felt that you were unable to control the important things in your life?") on a scale of 1 (*Never*) to 5 (*Very often*). Item scores were averaged to form a perceived stress score, where higher values indicated more stress (α = .88).

Self-esteem

Participants completed the Rosenberg Self-Esteem Scale (Rosenberg, 1965), which consisted of 10 items that tap onto their general feelings toward themselves. Participants rated their agreement to ten items (e.g. "I feel that I have a number of good qualities.") on a scale of 1 (*Strongly disagree*) to 5 (*Strongly agree*), which were averaged to compute a self-esteem score (α = .89).

Body image

Positive body image was captured using the Body Appreciation Scale (Tylka & Wood-Barcalow, 2015). Participants rated their agreement to 10 items (e.g. "I feel good about my body") that tapped into how they felt about their bodies on a scale of 1 (*Never*) to 5 (*Always*). Item scores were averaged to obtain the body image score, where higher values indicated more positive body image (α = .95).

Sociodemographic indicators

These included variables for age, sex, ethnicity, and relationship status. Participants also provided information on their current weight and height, which were used to compute the body mass index (BMI). Participants were then grouped into their respective weight status following the prescribed BMI cut-offs for adults, i.e. those below 18.5 as underweight, 18.5 to 24.9 as healthy weight, 25 to 29.9 as overweight, and 30 and above as obese (World Health Organisation, 2004). Subjective socioeconomic status was measured using the McArthur Scale of Subjective Social Status (Adler et al., 2000) with possible scores from 1-10, where higher scores indicated higher subjective SES. Participants also reported on the intensity of their leisurely physical activity by selecting one of the following three response options: (1) Mainly seated activities, no sports or just occasionally; (2) Regular recreational exercise for at least 20 minutes a day; (3) Endurance training (at least 20-60 minutes, 3 times weekly) or strength training (at least twice a week). Participants who selected option 1 were categorized as low intensity, those who selected option 2 were categorized as moderate intensity, whilst those who selected option 3 were categorized as high intensity.

Statistical Analyses

Data analyses were performed using SPSS 27.0, α = .05. The distribution of scores for all continuous variables were examined using normal QQ-plots and skewness statistics. Univariate outliers were identified using the cut-off of z = ±3.29.

Descriptive analyses, including Pearson correlations to examine the bivariate associations between all continuous variables, were computed and presented in Table 1. T-tests were run to examine how mediating and outcome variables varied by relationship status, and sex, while one-way ANOVAs were run to examine how they varied by BMI status and physical activity (See Table 2).

To examine whether (H1) loneliness was associated with health outcomes, i.e. perceived physical health, depression, and anxiety, and whether (H2) there were indirect effects of perceived stress, self-esteem, and body image following a parallel mediation model, the PROCESS 3.4 macro for SPSS (model 4; Hayes, 2018) with 10 000 bootstrapped re-samples accelerated at 95% confidence interval was used. Prior to that, hierarchical linear regressions with covariates entered in Step 1, loneliness added in Step 2, and mediators added in Step 3 were computed for all three outcome variables to test for multicollinearity, multivariate outliers, and independence and normality of residuals.

Results

Preliminary Analyses

All continuous variables were approximately normally distributed based on Q-Q plots and skewness statistics within the range of ±1, and free of univariate outliers. As shown in Table 1, participants, on average, reported relatively low levels of depression, anxiety, and loneliness, as indicated by mean scores below the midpoint of the scale; and scores of stress, body appreciation, self-esteem, and perceived physical health, that are around the midpoint of the scale. Pearson's correlations revealed that all variables except age were correlated with each other. Age was only positively correlated with self-esteem.

Table 1

Descriptives for Loneliness, Proposed Mediators, Health Outcomes, and Continuous Covariates (N = 319)

Variable	Pearson correlations								
	1	2	3	4	5	6	7	8	9
1 Loneliness	-								
2 Perceived physical health	-.26***	-							
3 Depression	.47***	-.41***	-						
4 Anxiety	.52***	-.46***	.67***	-					
5 Perceived stress	.51***	-.41***	.68***	.79***	-				
6 Self-esteem	-.49***	.46***	-.63***	-.71***	-.64***	-			
7 Body appreciation	-.38***	.40***	-.41***	-.47***	-.45***	.58***	-		
8 Subjective socioeconomic status	-.30***	.26***	-.28***	-.24***	-.28***	.28***	.24***	-	
9 Age	-.08	-.02	-.05	-.05	-.02	.14*	.03	.08	-
M	2.57	3.38	1.96	2.44	3.11	3.19	3.30	6.25	23.05
SD	0.90	0.82	0.63	0.67	0.67	0.78	1.00	1.58	2.56
Range	1.0 – 5.0	1.4 – 5.0	1.0 – 3.9	1.0 – 3.9	1.0 – 5.0	1.1 – 5.0	1.0 – 5.0	1 - 10	18 - 30

Note. *$p < .05$, ***$p < .001$.

Findings from t-tests and ANOVAs reported in Table 2 revealed that individuals who were single reported lower self-esteem, lower body appreciation, and higher depression than those who were in a relationship. Women reported more anxiety than men. In comparison to others, individuals who were obese felt less positively about their body, reported poorer physical health, and reported higher levels of depression. People who engaged in high-intensity physical activities for leisure felt better about their body and themselves in general, perceived themselves as more physically healthy, and are less anxious than those who engaged in low-intensity physical activities.

No significant differences were found in these variables between the moderate- and high- intensity groups.

Table 2

Sample Characteristics and Differences in Proposed Mediators and Health Outcomes

Variable	*N*	Perceived stress		Self-esteem		Body appreciation		Perceived physical health		Depression		Anxiety	
		M (SD)	*t/F*	*M (SD)*	*t/F*	*M (SD)*	*t/F*	*M (SD)*	*t/F*	*M (SD)*	*t/F*	*M (SD)*	*t/F*
Relationship status													
In a relationship	144	3.10 (0.68)	-0.08	3.31 (0.82)	2.43*	3.48 (1.00)	2.96**	3.39 (0.83)	0.22	1.88 (0.63)	-2.05*	2.41 (0.69)	-0.65
Single	175	3.11 (0.67)		3.10 (0.75)		3.15 (1.02)		3.37 (0.80)		2.03 (0.64)		2.46 (0.66)	
Sex													
Male	133	3.03 (0.69)	-1.79	3.16 (0.78)	-0.55	3.21 (1.00)	-1.36	3.39 (0.84)	0.27	1.90 (0.63)	-1.40	2.34 (0.67)	-2.27*
Female	186	3.16 (0.65)		3.21 (0.79)		3.36 (1.00)		3.37 (0.80)		2.01 (0.64)		2.51 (0.67)	
BMI category													
Healthy	175	3.05 (0.68)	0.36	3.20 (0.80)	0.71	3.36 (0.98)[a]	5.46**	3.47 (0.83)[a]	3.59*	1.88 (0.60)[a]	3.18*	2.41 (0.70)	0.26
Underweight	49	3.15 (0.62)		3.16 (0.71)		3.52 (0.88)[b]		3.22 (0.82)		2.08 (0.73)		2.48 (0.59)	
Overweight	46	3.10 (0.62)		3.31 (0.78)		3.35 (1.00)[c]		3.43 (0.79)		1.95 (0.55)		2.43 (0.75)	
Obese	36	3.19 (0.79)		3.06 (0.84)		2.71 (1.08)[a, b, c]		3.03 (0.79)[a]		2.20 (0.72)[a]		2.51 (0.75)	

Variable	*N*	Perceived stress		Self-esteem		Body appreciation		Perceived physical health		Depression		Anxiety	
		M (SD)	*t/F*	*M (SD)*	*t/F*	*M (SD)*	*t/F*			*M (SD)*	*t/F*	*M (SD)*	*t/F*
Physical activity for leisure													
Low	123	3.22 (0.64)	3.06*	3.04[a] (0.74)	4.62*	2.99[a,] (1.00)	[b] 10.43***	3.09[a,] (0.77)	[b] 14.16***	2.02 (0.63)	0.87	2.57[a] (0.64)	4.37*
Moderate	128	3.03 (0.64)		3.23 (0.82)		3.50[a] (0.98)		3.50[a] (0.79)		1.93 (0.63)		2.39 (0.66)	
High	68	3.04 (0.75)		3.39[a] (0.76)		3.50[b] (0.90)		3.66[b] (0.80)		1.92 (0.64)		2.29[a] (0.70)	

Note. Two participants did not report their current weight while 11 did not report their current height, which resulted in 13 missing values for BMI.

*$p < .05$, **$p < .01$, ***$p < .001$.

Means sharing the same superscript are significantly different from each other at $p < .05$.

Primary Analyses

Results from hierarchical linear regressions revealed that the assumptions concerning multicollinearity (all VIF < 3), multivariate outliers (Mahalanobis distance not exceeding $\chi^2_{critical}$ (10) = 29.59), and independence and normality of residuals were met. Three parallel mediation models examining the indirect effects of perceived stress, self-esteem, and body image between loneliness and health outcomes were tested. Subjective socioeconomic status, age, sex (0 = male, 1 = female), relationship status (0 = in a relationship, 1 = single), physical activity (0 = moderate and high intensity, 1 = low intensity), and BMI (0 = others, 1 = obese) were included in all models as covariates.

As indicated by the standardized total effect coefficients in Figure 1, lonelier individuals generally self-reported poorer physical health, higher depressive symptoms, and higher anxiety.

Loneliness was significantly associated with the three proposed mediators; lonelier individuals reported higher stress levels and evaluated themselves as well as their bodies less positively. However, stress, self-esteem, and body image only significantly predicted perceived physical health. As for the mental health outcomes, only stress and self-esteem were significant predictors. Indeed, the indirect effects analyses revealed that body image was only a significant mediator for the relationship between loneliness and perceived physical health, and not for the models with depression and anxiety as outcomes (see Table 3).

Overall, the negative relationship between loneliness and perceived physical health was completely mediated by increased stress, poorer self-esteem, and poorer body image. The associations between loneliness and mental health outcomes, on the other hand, were partially mediated by increased stress and poorer self-esteem only.

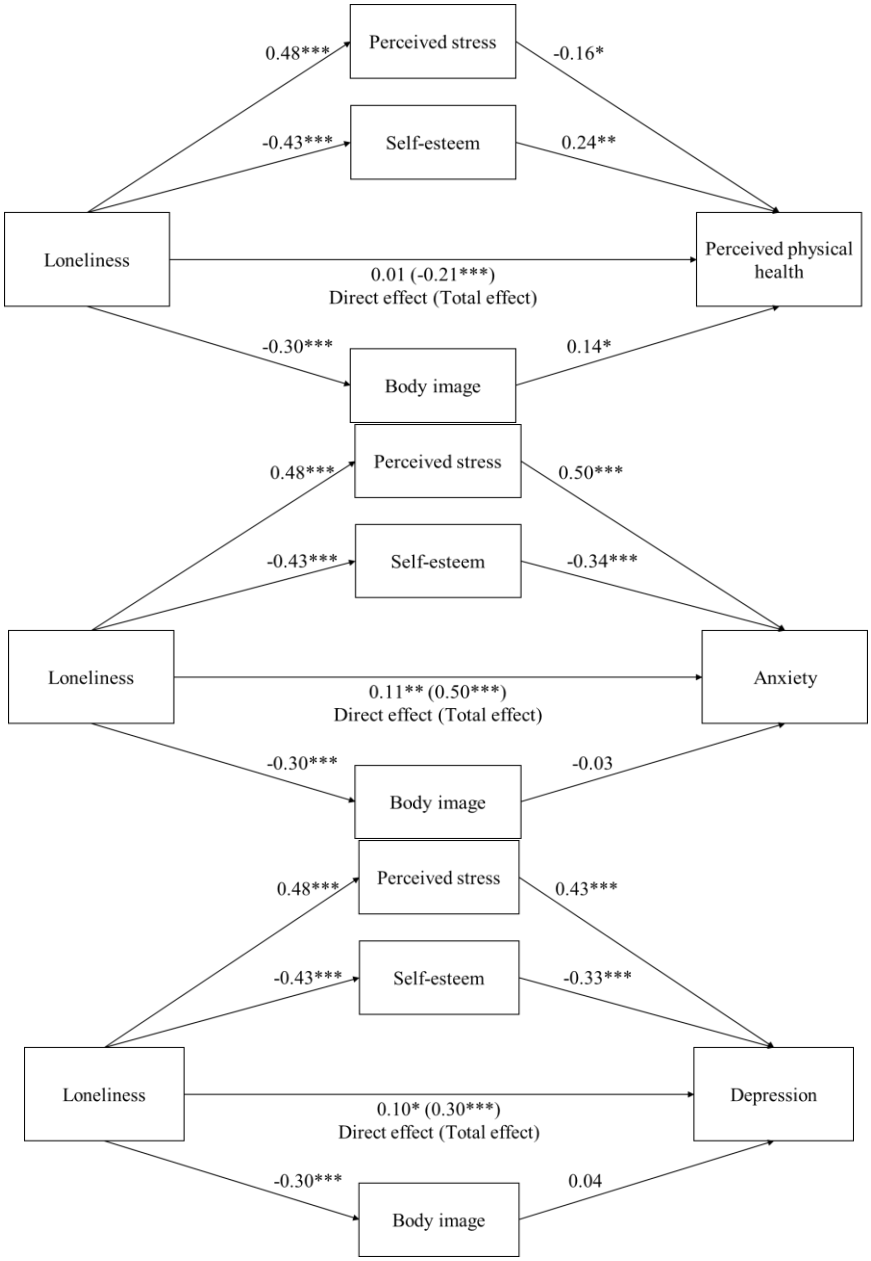

Figure 1 Indirect effects of loneliness on perceived physical health, anxiety, and depression through perceived stress, self-esteem, and body appreciation. The coefficients reported above are standardized. Due to missing values in current weight and height which were used to calculate BMI, $N = 306$. The effects on the direct path from loneliness to health outcomes depict the direct and total effects. Pattern of findings remained unchanged when covariates were removed from the models.

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 3

Indirect Effects for Parallel Mediation Models

Variable	Perceived physical health		Depression		Anxiety	
	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Perceived stress	-0.10	-0.14, -0.01	0.20	0.15, 0.27	0.24	0.18, 0.31
Self-esteem	-0.10	-0.17, -0.04	0.14	0.08, 0.20	0.14	0.10, 0.20
Body image	-0.04	-0.08, -0.01	-0.01	-0.04, 0.02	0.01	-0.01, 0.04
Total	-0.22	-0.30, -0.14	0.33	0.26, 0.41	0.39	0.32, 0.47

Note. The estimates reported are completely standardized indirect effects. The indirect effect was significant if the confidence interval did not contain a zero.

Discussion

The current study examined the associations between loneliness and health outcomes among Malaysian young adults and additionally tested the role of perceived stress, overall self-evaluation as captured by self-esteem and body-specific self-evaluation (i.e., body image) as mediators. Consistent with prior research and supporting H1, we found that higher loneliness was associated with higher depression and anxiety (Chang, 2013; Diehl et al., 2018; Muyan et al., 2016) and poorer perceived physical health among young adults, adding to the literature that previously only provided evidence of this association among older adult populations (Ermer & Proulx, 2019; Kang et al., 2012; Thanakwang, 2009).

Our findings also indicate that indirect associations between loneliness and perceived physical health were present through perceived stress, self-esteem, and body image. The association between loneliness and psychological health on the other hand, was partially mediated by perceived stress and self-esteem, but not body image – partially supporting H2.
Our findings support the stress (Segrin & Passalacqua, 2010) and self-evaluation (Rossi et al., 2020, Uba et al., 2020) pathways of the relationship between loneliness and health, providing initial evidence that these can be extended to subjective evaluations of physical health. In addition to this, another novel finding in our study is the unique contribution of the body-specific evaluation pathway, which was found to be specific to perceptions of physical health but not depression or anxiety. That body image emerged as a significant pathway between loneliness and perceived physical health, above and beyond stress and self-esteem, highlights the utility of promoting positive body image among young adults as a valuable strategy in health interventions (Gillen, 2015; Wilson et al., 2013).

Limitations and Strengths

While our findings largely support our hypotheses and are aligned with existing theoretical and empirical evidence, they are limited by the reliance of a cross-sectional design, which does not allow for conclusive evidence of a cause-and-effect relationship between the variables. For instance, body image has also been proposed to be a cause of loneliness. Individuals with a tendency to have negative views of their body, such as those experiencing eating disorders or other body image related disorders, have been

shown to be more susceptible to experiencing loneliness (Barnett et al., 2020; Teng et al., 2018). To clarify this, future research could employ longitudinal methods to examine how the relationships between loneliness, psychological health and perceived physical health develop over time through the mediating effects of perceived stress, self-esteem, and body image.

Another limitation of the cross-sectional design worth highlighting is the potential issue of restricted range effects that may decrease the likelihood of identifying meaningful associations between our variables. For example, the majority of respondents in the current study perceived themselves to be relatively healthy. Nevertheless, we argue that this does not diminish the value of our findings and in fact highlights its uniqueness as we found meaningful associations between loneliness and perceived physical health even among relatively healthy young adult populations, consistent with the pattern of findings among older adults in past literature (e.g. Ermer & Proulx, 2019; Kang et al., 2012). Nonetheless, because the current study was conducted during the COVID-19 pandemic, there is also a possibility that our associations found may have been artificially inflated given the social distancing protocols, stay-at-home measures, and fear of disease. However, we once again argue that this is unlikely because our findings, although with some novelty, largely reflect what has been theorised or shown in past studies. For example, the slightly elevated perceived stress scores in our findings have also been reflected in past studies conducted in Malaysia (Maideen et al., 2014).

Despite not being the focus of the current study, our findings related to perceived physical health could have been further enriched with objective indicators of physical health. Including objective indicators would be useful to control for variance in perceived physical health that is attributed to the existence of existing health issues (Idler & Cartwright, 2018), therefore allowing us to tease apart the impact of loneliness on actual and perceived physical health. In our work, we controlled for body mass index (BMI), which has been shown to be a useful indicator of actual physical health (Nuttall, 2015). Nevertheless, future studies could consider the use of more sophisticated markers of physical health such as cytokine Interleukin-6, which becomes elevated in our blood in response to inflammation and infection (Tanaka et al.,2014).

Conclusion

Overall, our findings confirm the widespread and deleterious impact of loneliness on both psychological and physical health. This highlights the paradox of COVID-19 preventive measures. On the one hand, they serve to protect civilians from the health-debilitating effects of the virus. On the other hand, its association with elevated loneliness levels due to its socially restrictive nature may inadvertently pose a greater immediate risk to their psychological and physical health. This in turn invites the risk that mental and general healthcare centres could be overloaded with patients experiencing deteriorating health effects due to prolonged loneliness – thus making this a public health problem. One method to reduce prolonged loneliness and its adverse consequences is by improving feelings of belongingness (Arslan, 2020). While some effort in loneliness interventions through mobile applications, online programmes, and telephone hotlines, have been observed in Malaysia, more effort needs to be put into improving its accessibility, quality of service, and sustainability. Last but not least, our mediation findings also highlight the value of interventions that target stress and self-evaluations in our fight against the silent epidemic of loneliness and its effect on our health.

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