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Beliefs about Causes of Obesity: A Comparison of Australian Doctors, Psychologists and Community Members

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Abstract

The current study aimed to investigate differences in beliefs about causes of obesity between Australian doctors, psychologists and a community sample. Forty-one doctors, 66 psychologists and 98 community members completed questionnaires regarding beliefs about causes to obesity, including measures of obesity stigma. The results showed a consistent pattern of beliefs across groups, with all three groups having strong beliefs about behavioural and psychological causes to obesity. Further, results showed that the three groups did not have particularly strong or weak antifat attitudes and although they did not have overly favourable attitudes towards obese people, their attitudes were not highly negative. However, stronger antifat attitudes were found to be predictive of beliefs about behavioural and psychological causes, while weaker antifat attitudes were predictive of beliefs about biological causes of obesity.

Keywords: Obesity; Stigma; Doctors; Psychologists; Beliefs

Introduction

Overweight and obesity are widely recognised as leading health concerns in Australia and other developed nations. Results of the Australian Bureau of Statistic's Health survey 2011-2012 [1] indicated the obesity prevalence was 63.4% compared to 61.2% in 2007-08 and 56.3% in 1995. Furthermore, recent projection analyses indicate that the rapid increases in these prevalence rates are set to continue at least until 2025 [2]. In the simplest terms, obesity is the result of excess energy consumption relative to energy expenditure [3]. However, the increasing prevalence of obesity has demanded that the underlying causes of obesity be closely examined [4]. This research has identified that the aetiology of obesity is extremely complex. Factors implicated in the development of obesity include genetic, environmental, social, political, and psychological [3]. The primary objective of the current study was to investigate differences in the beliefs about causes of obesity held by doctors, psychologists, and community members.

More recent literature has focused on the role of societal and environmental factors in the development of obesity; this has been termed an "obesogenic environment" [5]. This research has identified that over the last century significant lifestyle changes, particularly in developed nations, have worked to promote overeating and under-activity [3]. Additionally, the current monocrop agricultural systems of developed nations allow processed, high calorie, nutrient deficient foods to be sold at very low prices, while nutrient rich, unprocessed foods are comparatively expensive to produce and consume [6]. Additionally, the processed, high calorie foods are consistently marketed to vulnerable audiences, such as children [7].

Although theories of obeseogenic environments provide insight into why prevalence rates have increased so rapidly, understanding environmental factors has not provided a sufficient explanatory model of obesity. Therefore, obesity research has recently become the focus of psychological literature, which has investigated the role of individual behavioral and emotional factors in obesity [4]. A highly researched behavior commonly associated with weight gain and weight loss, is physical activity.

The relationship between low levels of physical activity and weight gain has been well established [7]. Longitudinal studies have consistently demonstrated an association between decreased activity levels and increases in obesity. Although the relationship between activity levels and obesity is widely accepted, the correlational nature of this research has failed to identify the causal direction of this relationship: whether low levels of activity cause obesity, or whether obesity causes low levels of activity [4].

Eating behaviours have also been investigated. This research has focused on investigating differences between obese and normal weight people in terms of how much food they eat, what time of day they eat, and emotional reasons behind eating [8]. However, none of this research has demonstrated consistent differences between eating behaviours of obese and normal weight individuals [4]. One area that has been more consistently implicated in obesity is the type of food eaten. Research has demonstrated that obese people eat a higher proportion of fat and lower proportion of carbohydrate, when compared to normal weight individuals [9].

Obesity stigma

While the physical consequences of obesity are undeniable, recent literature indicates that the social and psychological consequences of obesity can be equally debilitating [10]. Over the past decade, a considerable body of literature has emerged demonstrating that stigma and stereotype towards obese people is widespread and can have a detrimental impact on many areas of life for affected individuals [11]. This review has identified that common obesity stereotypes categorize obesity as a disability stemming from the individual's lack of self-discipline and willpower [10].

Clear and consistent stigmatisation and discrimination towards obese people has been documented in three major areas of living: employment, education, and healthcare [12]. Studies addressing obesity stigma in the workplace have reliably demonstrated that overweight people face considerable disadvantages at all stages of employment, but particularly during the hiring process [13]. Empirical studies have demonstrated that the prestige and achievement of obese individuals is commonly underestimated and that obese people are at significant disadvantage when being considered for promotion [13].

Obesity stigma in healthcare

Due to the many negative health consequences of being overweight or obese, these people have more regular contact with health professionals than normal-weight people [14]. Despite this, discrimination and stigmatization of obese people in healthcare setting is widespread [12]. Research in different health settings has demonstrated pervasive weight-based stereotypes are present in nurses, dietitians, and fitness professionals [15]. This literature has shown common stereotypes perceive obese people as lazy, non-compliant, and lacking in self-control. Not surprisingly, obesity stigma has been linked to poorer treatment outcomes for obese patients [16].

Ogden and Flanagan [17], compared 73 British GPs' and 311 lay people's beliefs about the causes of, and solutions to obesity. Their results indicated that GPs generally believed that obesity is caused by behavioral and psychological factors, whereas lay people believed that biological factors caused obesity. Psychological factors identified in the study included low self-esteem, depressed mood, and lack of self control. Psychologists' beliefs about causes of obesity however, were not examined. Nor has the alignment of these beliefs with those of other health professionals and the general community. As such, the current study aimed to build on findings by Ogden and Flanagan [17], through applying their methodology to an Australian sample. The primary objective of the current study was to investigate differences in beliefs about causes of obesity between Australian doctors, psychologists, and a community sample.

Based on these aims and the literature summaries above, the following hypotheses were developed. First, considering the findings of Ogden and Flanagan [17] it was hypothesized that Australian doctor' and community members' beliefs about the causes and treatment of obesity would align with the beliefs of their British counterparts. It was hypothesized:

H1: Doctors would show stronger endorsement of the psychological and behavioral causes of obesity when compared to a community sample, while the community sample would show stronger endorsement of biological causes.

Although no research exists regarding psychologists' beliefs about obesity, the second hypothesis predicted that their training in understanding psychological influences of behavior would lead to stronger endorsement of psychological causes of obesity.

H2: The psychologist group would show stronger endorsement of psychological causes of obesity compared to the doctor and community groups.

Consistent with literature demonstrating that obesity stigma is widespread in healthcare settings and within the wider community [11] it was predicted that all three groups would show high levels of antifat attitudes and poor attitudes towards obese people. However, in line with illness perception model theory it was predicted that doctors would show higher levels of obesity stigma than the other two groups, due to their perception of obesity as a preventable and controllable disease [18]. As such, the third hypothesis was:

H3: Doctors would have higher levels of obesity stigma (stronger antifat attitudes and poorer attitudes towards obese people) when compared to the psychologist and community groups.

H4: Psychologists would have weaker antifat attitudes and more favorable attitudes towards obese people when compared to the doctor and community groups.

H5: Occupation group (psychologist, doctor, community) would be a significant predictor of beliefs about biological, psychological, behavioural, social, and structural causes. Furthermore, it was predicted that obesity stigma would have predictive abilities over and above that of occupation group.

Methods

Design

The study implemented a cross-sectional design using questionnaires to measure beliefs about the causes of obesity. Medical doctors, psychologists, and members of the general public completed questionnaires. In contrast to Ogden and Flanagan [17], the current study surveyed medical doctors of any specialty to improve data collection.

Participants

Participants were recruited through social media and newsletters of professional societies. Two hundred and five participants completed the questionnaires. The overall sample consisted of 41 medical doctors, 66 psychologists, and 98 members of the general public. Participation in the study was completely voluntary and no incentives were offered. The total sample consisted of 171 females and 34 males and was an educated sample, with 109 participants having completed post-graduate level education and 61 having a bachelor level qualification. The mean age of the doctors was 30.15 years (S.D.=4.66), mean age of the psychologists was 41.14 years (S.D.=12.28), and mean of the community group was 31.43 years (S.D.=10.10).

Procedure and materials

Prior to data collection, ethics approval for the study was obtained through the Bond University Human Research Ethics Committee. All participants completed the survey in an online format, using the survey software program: Survey Monkey. Prior to completing the questionnaire, participants were provided with an explanatory statement, which provided a brief overview of the purpose of the study.

Attitudes towards obese people

First, participants' attitudes towards obese people were assessed using the *Attitudes Towards Obese Persons Scale* (ATOPS) [19]. The ATOPS is a 20-item scale, respondents indicate the extent to which they agree with each statement using a six-choice Likert Scale, ranging from *-3: Strongly Disagree*, to *+3: Strongly Agree*. Some items in the ATOPS were modelled on items included in Yuker and Block's [20] Attitudes Towards Disabled Persons Scale. The authors formulated additional items to complete the ATOPS. All items were selected

according to face validity and previous utility in measuring attitudes [19]. Reliability coefficients have been found to range between .81 in graduate student samples, to .84 in a fat acceptance community group sample.

Antifat attitudes

Participants also completed the *Antifat Attitudes Questionnaire* (AFA) [21]. The AFA consists of 13 items that measure three distinct components of antifat attitudes: prejudice towards fat people (dislike), belief in the controllability of weight (willpower), and the individual's self-relevant fear of fatness (fear of fat). Items are responded to using a 10-point Likert Scale, ranging from *0: Very Strongly Disagree*, to *9: Very Strongly Agree*. Higher scores indicate stronger antifat attitudes. Reliability coefficients for each scale have demonstrated that the dislike scale is the most consistent score obtained from the AFA (α=0.84). As the willpower and fear of fat scales contain only three items each, their reliability coefficients have been shown to be lower, however still adequate (α=0.66 and .79 respectively).

Beliefs about causes of obesity

Consistent with Ogden and Flanagan's [17] study, participants were asked to rate 15 statements regarding the possible causes of obesity, using a scale ranging from *1: Disagree Strongly*, to *5: Agree Strongly*. The scale was developed to reflect previous qualitative and quantitative research results, which described beliefs about the causes of obesity [22,23]. Consistent with these studies, items included in the scale varied in terms of personal responsibility, and reflected biological, psychological, behavioral, social and structural causes of obesity [17]. Reliability analyses using Cronbach's alpha revealed that each of the biological, psychological, behavioral, social, and structural subscales had adequate reliability (0.6, 0.5, 0.8, 0.8, and 0.7 respectively).

Demographics

Participants were asked to describe their age, gender, and level of education. Additionally, to facilitate calculation of BMI, participants were asked to estimate their height and weight. To determine differences in beliefs about obesity in different professions, participants were asked to identify their area of occupation. Options included medical practitioner, psychologist, other health worker, student, and other. The last three options were combined prior to analysis to form a community sample group.

Results

Preliminary analyses

Inspection of the data revealed that three participants had not completed all measures and therefore scores were unable to be computed on the beliefs about causes of obesity scales. As these scores were central to the focal analyses these participants were deleted from the dataset. Additional analysis revealed one univariate outlier on the beliefs about causes of obesity scales that was greater than three standard deviations from the scale means. Inspection of the raw data revealed that this participant had selected the lower extreme on all items. Therefore the responses were deemed to be invalid and the scores were excluded from further analysis. Data screening for multivariate outliers revealed that the Mahalanobis distance exceeded critical χ^2 values (at α=0.001) for 12 cases across the beliefs about causes of obesity variables. However, inspection of Cook's distance revealed that none of these data points were influential (>1). Therefore outliers were retained in the sample to preserve power.

The G*Power3 software [24] was used to conduct an a-priori power analysis to determine a minimum sample size for the hierarchical multiple regression analysis. The results of this analysis indicated that to detect large effects (f^2=0.35) with 95% power at an alpha level of .05, a minimum of 67 participants would be required for the proposed 6 predictor values.

For the purposes of the regression analysis, the single three-level occupation variable was dummy coded into two variables. The first dummy variable was coded to distinguish the doctor group from the psychologist and community groups and the second distinguished the psychologist group from the doctor and community groups. Finally, preliminary regression and analysis of variance (ANOVA) investigation revealed that demographic variables of age, level of education, and gender were significant predictors of beliefs about biological causes of obesity. Therefore these variables were included as control variables in the focal regression analyses.

Demographic characteristics

Demographic characteristics of doctor, psychologist, and lay participants are displayed in Table 1. The results showed that all three groups had more females than males. However the difference in number of males and females was smallest within the doctors group. Additionally the majority of the sample was of White Australian ethnicity and had at least a bachelor degree level of education. The overall sample had a mean BMI of 25.18. Of the sample 13.2% had a BMI that would classify them as obese, and an additional 20.1% of the sample had a BMI that would place them in the overweight range.

Variable	Doctor	Psychologist	Community
Age	Mean=30.15 S.D.=4.66 Range=25-54	Mean=41.14 S.D.=12.28 Range=23-64	Mean=31.43 S.D.=10.10 Range=16-61
Gender	Male=17 Female=24	Male=7 Female=59	Male=10 Female=88
Ethnicity	White Australian=36 Chinese=2 Irish=1 Korean=1 European=1	White Australian=60 European=5 Arab-Chinese=1	White Australian=92 British=3 European=2 Middle-Eastern=1
BMI	Mean=23.02 S.D.=2.89 Range=17.93–30.76	Mean=25.77 S.D.=6.17 Range=18.07–52.03	Mean=25.70 S.D.=6.64 Range=18.37–51.07
Note: Standard deviations are presented in parentheses below the mean for each cell			

Table 1: Doctor, psychologist and community member participant demographic characteristics.

Focal analyses

Beliefs about causes of obesity: Scores for beliefs about causes of obesity for doctors, psychologists and community members are

summarized in Table 2. A between-groups multivariate analysis of variance (MANOVA) was conducted to test the prediction that beliefs about causes of obesity would differ between the three occupation groups. The assumption of equality of covariance was violated, Box's M=47.91, F=1.53, p=0.032. However, violation of this assumption is only problematic when group sizes are smaller than 30 participants. As all three groups were larger than 30 participants, the more robust Pillai's trace was used. Using Pillai's trace, there was a significant effect of occupation group on beliefs about the causes of obesity, V=0.14, F(10, 396)=2.93, p=0.001, partial η^2=0.07. Separate univariate ANOVAs on the causes variables revealed a significant main effect of occupation on beliefs about psychological causes F(2, 201)=6.72, p=0.001. Additionally, the effect of occupation on beliefs about behavioral causes approached significance, F(2,201)=2.69, p=0.07. Non-significant effects of occupation were found on beliefs about biological causes, social causes, and structural cause's variables. The significant main effect of occupation on beliefs about psychological causes of obesity was followed up using a Tukey HSD post-hoc test. The mean beliefs about psychological causes score was found to be significantly higher for the community group (M=12.08, SD=1.62) than the psychologist group (M=11.06, SD=1.92). Furthermore, the mean beliefs about psychological causes score was significantly higher for the doctor group (M=11.54, SD=1.78) than the psychologist group.

Cause	Doctor	Psychologist	Community
Biological	10.24 (2.18)	11.08 (2.45)	10.55 (2.76)
Psychological	11.54 (1.78)	11.06 (1.91)	12.08 (1.62)
Behavioural	13.63 (1.41)	12.91 (1.95)	13.37 (1.55)
Social	11.02 (2.44)	10.66 (2.35)	10.30 (2.40)
Structural	11.49 (1.80)	10.75 (2.31)	11.23 (2.42)
Note: Standard deviations are presented in parentheses below the mean for each cell.			

Table 2: Means and standard deviations for scores on the beliefs about causes of obesity scale for doctors, psychologists, and community members.

Obesity related attitudes: One-way between groups ANOVAs were used to investigate differences in scores on the AFA and ATOPS measures between occupation groups. This analysis revealed significant differences in scores on the AFA between occupation groups F(2,23)=4.04, p=0.019, η^2=0.04. Post-hoc analysis was completed by way of Tukey HSD tests. These results revealed that the doctor group (M=56.24, SD=20.42) held stronger antifat attitudes than the psychologist group (M=44.63, SD=20.14). However, there were no significant differences between the community group scores when compared to the doctor group and the psychologist group (M=49.87, SD=20.91). The ANOVA statistic for ATOPS scores was not significant, indicating that occupation group did not significantly influence positive attitudes towards obese people. Therefore, ATOPS scores were excluded from further analyses.

Predicting Beliefs about causes of obesity: Hierarchical multiple regression (HMR) analyses were employed to test the hypothesis that occupation group and obesity-related attitudes can account for a significant proportion of the variance in beliefs about the causes of obesity. Control variables of age, gender, and level of education were entered at Step 1, the two dummy occupation variables were entered at Step 2, and the AFA scores were entered at Step 3.

Biological: Results of HMR analysis for beliefs about biological causes are presented in Table 3. At Step 1, age, gender and level of education together accounted for a significant 7.20 % of variance in beliefs about biological causes. However, only age and gender accounted for significant portions of the variance independently. Women had stronger beliefs about biological causes than men, and older people held stronger beliefs about biological causes than younger people. At Step 2, occupation did not account for a significant amount of variance over and above that accounted for in Step 1. At step 3, inclusion of AFA scores accounted for an additional 2.7% of the variance in beliefs about biological causes. Overall, the model accounted for 10.10% of the variance in beliefs about biological causes F(6,197)=3.68, p=0.032. By Cohen's (1988) conventions, a combined effect of this magnitude can be considered small f^2=0.08.

Step	Predictor	R^2	ΔR^2	ΔF	sig	Step 1 β	Step 2 β	Step 3 β
1.	Age	.072	.072	5.17	.002	.20**	.20*	.19*
	Gender					.18**	.19*	.16*
	Level of Education					-.04	-.06	-.06
2.	Occupation 1 (doctor)	.074	.002	.196	.822		.04	.05
	Occupation 2 (Psychologist)						.05	.03
3.	AFA	.101	.027	5.94	.016			-.17*
Note: Sig=Probability significance value, *p<.05, **p<.01								

Table 3: Hierarchical regression analysis predicting beliefs about biological causes of obesity.

Psychological: Results of HMR analysis for psychological causes are presented in Table 4. At Step 1, the control variables accounted for a significant 4% of the variance in beliefs about psychological causes. However, only level of education was a significant predictor of beliefs about psychological causes, with people with a lower level of education having stronger beliefs about biological causes of obesity. At Step 2, the inclusion of the occupation variables accounted for an additional 2.9% of variance in beliefs about psychological causes, with the general community group showing stronger beliefs than the doctor and psychologist groups. At Step 3, inclusion of AFA scores accounted for a further 5.8% of the variance in beliefs about psychological causes, where stronger antifat attitudes predicted stronger beliefs about psychological causes of obesity. Overall the model accounted for 12.7% of the variance in beliefs about psychological causes F(6,197)=4.77, p<.001, with a medium effect size f^2=0.15.

Behavioral: Results of HMR analysis for behavioral causes are presented in Table 5. At Step 1, the control variables accounted for a

non-significant 2.4% of the variance in beliefs about behavioral causes [25]. At Step 2, the inclusion of the occupation variables did not contribute significantly to the variance accounted for.

Step	Predictor	R^2	ΔR^2	ΔF	Sig	Step 1 β	Step 2 β	Step 3 β
1.	Age	.040	.040	2.80	0.041	-.10	-.05	-.045
	Gender					-.01	-.02	.03
	Level of Education					-.15*	-.07	-.06
2.	Occupation 1 (doctor)	.069	.029	3.09	.048		-.11	-.13
	Occupation 2 (Psychologist)						-.21*	-.19*
3.	AFA	.127	.057	12.97	.000			.25***
Note: Sig=Probability significance value, *p<.05, **p<.01, ***p<.001								

Table 4: Hierarchical regression analysis predicting beliefs about psychological causes of obesity.

At Step 3, inclusion of AFA scores accounted for a significant 16.3% of the variance in beliefs about behavioral causes, with stronger antifat attitudes predicting stronger beliefs about behavioral causes of obesity. Overall, the final model accounted for 19.6% of the variance in beliefs about psychological causes $F(6, 197)=8.02$, $p<.001$, with a medium effect size $f^2=0.24$.

Step	Predictor	R2	ΔR2	ΔF	Sig	Step 1 β	Step 2 β	Step 3 β
1.	Age	.024	.024	1.61	.189	-.13	-.09	-.07
	Gender					-.05	-.02	.05
	Level of Education					-.04	-.02	.00
2.	Occupation 1 (Doctor)	.033	.010	1.01	.366		.06	.03
	Occupation 2 (Psychologist)						-.08	-.05
3.	AFA	.196	.163	38.94	.000			.42***
Note: Sig=Probability significance value, ***p <.001.								

Table 5: Hierarchical regression analysis predicting beliefs about behavioral causes of obesity.

Social and structural: Results of HMR analysis for beliefs about social causes indicated that the control variables, occupation and AFA scores did not account for a significant proportion of the variance in beliefs about social causes. Overall, the model accounted for a non-significant 2.8% of the variance in beliefs about social causes of obesity. Similarly, for beliefs about structural causes of obesity, the model accounted for a non-significant 2.3% of the variance. Full results are presented in Tables 6 and 7 respectively.

Step	Predictor	R^2	ΔR^2	ΔF	Sig	Step 1 β	Step 2 β	Step 3 β
1.	Age	.017	.017	1.12	.341	-.03	-.01	-.01
	Gender					.02	.05	.06
	Level of Education					.13	.12	.12
2.	Occupation 1 (Doctor)	.026	.009	.96	.385		.11	.11
	Occupation 2 (Psychologist)						.02	.02
3.	AFA	.028	.002	.50	.480			.05
Note: Sig = Probability significance value								

Table 6: Hierarchical regression analysis predicting beliefs about social causes of obesity.

Step	Predictor	R2	ΔR2	ΔF	Sig	Step 1 β	Step 2 β	Step 3 β
1.	Age	.004	.004	.236	.871	.01	.07	.07
	Gender					.02	.06	.06
	Level of Education					-.06	-.02	-.02
2.	Occupation 1 (Doctor)	.023	.019	1.96	.144		.08	.08
	Occupation 2 (Psychologist)						-.12	-.12
3.	AFA	.023	.000	.042	.837			-.02
Note: Sig=Probability significance value								

Table 7: Hierarchical regression analysis predicting beliefs about structural causes of obesity.

Discussion

The primary objective of the current study was to investigate differences in the beliefs about causes of obesity held by doctors, psychologists, and community members. Analysis of beliefs about causes of obesity revealed strong beliefs about behavioral causes of obesity (eating too much, not enough exercise) across all three groups. For the doctor and community groups, beliefs about biological causes were the area of weakest beliefs. Amongst psychologists, beliefs about social causes were weakest. The hypothesis that Australian doctors would has similar to the beliefs of British doctors, was partially supported. Consistent with Ogden and Flanagan's [17] findings, the results showed that doctors had stronger beliefs about psychological causes of obesity when compared to the community sample. However, in contrast, no significant differences were found in beliefs about biological or behavioral causes between the doctor and community groups.

It is possible that the high level of education of the current sample contributed to the community group having a better understanding of factors causing obesity than the lay participants surveyed by Ogden and Flanagan [17]. Alternatively, obesity and its causes have received considerable attention in popular media in recent years. Therefore, the lack of difference between the community group and the doctor group might be due to changes in community understanding of obesity over the period since Ogden and Flanagan's study was conducted.

It was predicted that psychologists would have stronger beliefs about the psychological causes of obesity when compared to the doctor and community groups, but this was not supported. Rather, psychologists had significantly weaker beliefs about the psychological causes of obesity than the other two groups, and this might be a reflection of teaching and practice standards in the field of psychology. These standards encourage consideration of biological, psychological and social factors, which may have contributed to the development of a patient's presenting problem [26].

The results of the current study indicate that effect of occupation group on beliefs about causes of obesity, as demonstrated by Ogden and Flanagan [17], may not be as robust in the Australian context. This difference may reflect differences in healthcare systems of the two countries, or as discussed above, may be indicative of changes in public knowledge about obesity.

Obesity stigma

Results of the AFA and ATOPS did not support the hypothesis that all three groups would show high levels of anti-fat attitudes and unfavorable attitudes towards obese people. Neither the AFA nor ATOPS specify cut-off scores for high or low attitudes. However, mean AFA scores for all three groups in the current study were below the mid-point of the scale (Maximum possible score=117). Similarly, mean ATOPS scores for the three groups fell close to the mid- point of the scale (Maximum possible score=120). These results suggest that the three groups did not have particularly strong or weak antifat attitudes and although they did not have overly favorable attitudes towards obese people, their attitudes were not highly negative.

These findings are in contrast to a significant body of literature, which has consistently demonstrated substantial obesity stigma in a range of settings [11,16]. However, a key difference is that the previous studies compared people's attitudes to obese people to attitudes towards non-obese people and most measured antifat attitudes within this context. Therefore, the current results suggest that obesity stigma might be less severe and attitudes towards obese people improved if comparisons are not being drawn between obese and non-obese individuals in particular settings.

Although AFA and ATOPS scores were not of the magnitude expected, the doctor group showed higher levels of obesity stigma (higher AFA scores) than the other two groups. Furthermore, the prediction that psychologists would have lower levels of obesity stigma, compared to doctors and community members was also supported.

This pattern of differences amongst groups may be explained by illness perception model theory [18] in that doctors' strong beliefs about controllable causes of obesity may have contributed to them having stronger antifat attitudes. In contrast, psychologists' broader pattern of beliefs about causes of obesity may have contributed to their weaker antifat attitudes. Alternatively, the difference may be the result of opposing professional values. For example, where psychologists place strong emphasis on being non-judgmental and establishing therapeutic relationships with patients, doctors might place more emphasis on determining symptoms and treatment.

Predicting beliefs about causes of obesity

Results partially supported that the occupation group would be a significant predictor of beliefs about causes of obesity and that obesity stigma (antifat attitudes) and would have significant predictive abilities over and above that of occupation group. Overall, occupation and antifat attitudes were not predictive of beliefs about structural or social causes of obesity. Occupation was the only significant predictor of beliefs about psychological causes of obesity, with psychologist occupation being associated with weaker beliefs. As hypothesised, obesity stigma contributed further to the model with stronger antifat attitudes contributing to stronger beliefs about psychological causes.

Antifat attitudes were found to be significant predictors of beliefs about both biological and behavioral causes of obesity. Stronger antifat attitudes predicted stronger beliefs about behavioral causes. In contrast, weaker antifat attitudes predicted stronger beliefs about biological causes of obesity. Furthermore, older age and being female were also found to be significant predictors of stronger beliefs about biological causes of obesity.

These results suggest that obesity stigma is a better predictor of beliefs about causes of obesity than occupation type. However, effect sizes for the results were small to medium and each of the significant regression models left a large proportion of the variance unaccounted for. This indicates that other factors outside of antifat attitudes and occupation group play a substantial role in determining beliefs about causes of obesity. Furthermore, the current results were not successful in predicting beliefs about social or structural causes of obesity.

While the current study contributed to the field through exploring psychologists' beliefs about obesity, there are a number of limitations of the study. First, the size of the doctor group in the current study was smaller than desired. More equal sample sizes of the three occupation groups might have produced a clearer relationship between occupation and beliefs about causes of obesity. Furthermore, the overall sample had an overwhelming majority of female participants. Although gender was controlled for in focal analyses, it is possible that the high number of female participants acted as a confounding variable. The area of the study that is most likely to have been affected by this confound is the AFA and ATOPS scores. As females tended to have more favorable attitudes to obese people and lower antifat attitudes, the lower than predicted AFA scores, and higher than predicted ATOPS scores might be a reflection of mostly female sample.

In regards to study design, the cross-sectional design limited the extent to which the results could be analysed and interpreted. For example, as the study did not have a manipulated independent variable, it was not appropriate to explore mediating or moderating relationships between key variables, as the causal direction of such relationships would be unclear [27].

Conclusion

The current study aimed to investigate differences in the beliefs about causes of obesity held by doctors, psychologists, and community members. Additionally, the study investigated differences in obesity stigma between the three groups and examined the extent to which

these variables could predict beliefs about the causes of obesity. Overall, the expected difference in beliefs between groups was not supported. Rather, a consistent pattern of beliefs emerged with all three groups having strong beliefs about behavioural and psychological causes of obesity.

Because obesity stigma from health professionals has been linked to poorer treatment outcomes for obese patients and given the current study did highlight that the groups did not have overly favourable attitudes towards obese people, the implications for engaging with these patients in treatment could be devastating. There is a clear need for education in tertiary teaching programs to emphasize and educate about antifat attitudes, as well as the multidimensional causal model of obesity. This study highlighted stronger antifat attitudes were predictive of beliefs about behavioural and psychological causes, while weaker antifat attitudes were predictive of beliefs about biological causes of obesity. Both contributions to the complex nature of obesity needs to be taught at the tertiary level at a minimum, in order to effect change in obesity stigma and bias amongst health professionals. The findings of the current study highlight stigma and limited understanding of the causes of obesity exists within the health care system and addressing this may remove some of the social and systemic barriers preventing treatment seeking in this population.

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