



Using Virtual Human Technology to Examine Weight Bias and the Role of Patient Weight on Student Assessment of Pediatric Pain

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Abstract

The purpose of the study was to investigate the influence of weight bias and demographic characteristics on the assessment of pediatric chronic pain. Weight status, race, and sex were manipulated in a series of virtual human (VH) digital images of children. Using a web-based platform, 96 undergraduate students with health care-related majors (e.g., Health Science, Nursing, Biology, and Pre-Medicine) read a clinical vignette and provided five ratings targeting the assessment of each VH child's pain. Students also answered a weight bias questionnaire. Group-based analyses were conducted to determine the influence of the VH child's weight and demographic cues, as well as greater weight bias on assessment ratings. Male and VH children with obesity were rated as more likely to avoid non-preferred activities due to pain compared to female and healthy weight children, respectively (both $p < .001$). The pain of VH children with obesity was rated as more likely to be influenced by psychological/behavioral issues compared to the pain of healthy weight VH children ($p = .022$). African American VH children were rated as experiencing significantly greater pain than Caucasian VH children ($p = .037$). As child weight increased, low weight bias participants felt more sympathy, while high weight bias participants felt less sympathy ($p = .002$). Also, low weight bias participants showed increased motivation to help, while high weight bias participants showed less motivation to help, as VH patient weight increased ($p = .008$). Child weight and evaluator weight bias may be influential in the assessment of pediatric pain. If supported by future research, results highlight the importance of training in evidence-based practice and education on weight bias for students majoring in health-care fields.

Keywords Children · Bias · Obesity · Pain

Introduction

Even though individuals in helping professions often see themselves as socially conscious and fair, research suggests that they can hold biases that influence their responses to members of lower status groups within the medical setting (Penner, Albrecht, Orom, Coleman, & Underwood, 2010; Smedley, Stith, & Nelson, 2003). It is well established that healthcare providers often unconsciously and automatically

respond to the demographic characteristics of patients, activating stereotypical beliefs, emotional prejudices, and discriminatory tendencies (Dovidio & Fiske, 2012).

Social psychological theory serves as a useful framework for examining how health disparities between social groups emerge and persist in health care settings (Major, Mendes, & Dovidio, 2013). First, associating characteristics with groups permits people to draw rapid inferences about an individual with minimal effort (Dovidio & Gaertner, 2010). This may translate into either explicit or implicit biases. Explicit biases are beliefs and attitudes within awareness that can be controlled deliberately and strategically, while implicit biases involve unintentional activation, often outside of personal awareness (Fazio & Olson, 2003). Many individuals who report low explicit bias are high in implicit bias (Major et al., 2013).

Social psychological theory has primarily been referenced in studies examining racial disparities in health care. The Aversive Racism Theory posits that people who believe

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that they are not prejudice but who hold implicit biases tend to express their bias in subtle, self-perceived rational ways, but avoid acting in openly bigoted ways that violate social standards (Dovidio & Gaertner, 2004). Racial/ethnic disparities in medical treatment seem to be greater when guidelines for treatment are not well defined (Geiger, 2003). Further, disparities in treatment are more likely to occur for “low discretion” procedures, such as making a referral for a procedure or prescribing a drug, rather than “high discretion” procedures, like emergency surgery, in which appropriate action is far less ambiguous (Smedley et al., 2003).

There is less research examining the extent to which demographic or patient characteristics other than race or ethnicity may predict differential treatment. Further, studies of biased treatment among pediatric patient populations are limited. The current study seeks to examine racial, sex, and weight bias in healthcare decision-making for pediatric patients. Pediatric pain presents an ideal condition to examine the potential impact of bias on health care trainee decision-making, given the subjective nature of pain assessment (American Academy of Pediatrics, 2001).

One recent study examining pediatricians’ unconscious attitudes and stereotypes about patient race found that as pediatricians’ pro-White bias increased, prescribing narcotic medication for child post-operative pain decreased for African American patients but not for White patients (Sabin & Greenwald, 2012). In contrast, a retrospective study found no significant differences between racial and ethnic groups for receipt of analgesic or opioid analgesic medication in children presenting to an emergency department with long bone fractures (Yen, Kim, Stremski, & Gorelick, 2003). Similarly, a vignette-based study involving nurse respondents showed modest and non-significant differences on pain treatment outcomes between White and African-American children (Griffin, Polit, & Byrne, 2007).

Research regarding sex stereotyping among children experiencing pain is extremely limited. Typically, girls report greater and more frequent pain than boys (Kroner-Herwig, Heinrich, & Morris, 2007). In terms of treatment, a retrospective investigation found that significantly more codeine was prescribed for boys, whereas girls were prescribed more acetaminophen following cardiac surgery (Beyer, DeGood, Ashley, & Russell, 1983). However, another study reported no significant differences in emergency department testing performed for pediatric male and female subgroups presenting with chest pain (Hambrook, Kimball, Khoury, & Cnota, 2010). Thus, findings in this area of research are mixed.

Recent evidence links obesity to increased incidence of certain types of pain in children, including musculoskeletal pains and headache (Bell et al., 2011; Hershey et al., 2009). Children with co-occurring obesity and pain experience limitations in physical activity (Hunfeld et al., 2001; Konijnenberg et al., 2005), reduced global functioning (Podeszwa,

Stanko, Mooney, Cramer, & Mendelow, 2006), and lower quality of life (Lim, Mayer-Brown, Clifford, & Janicke, 2014), making this an important area of study.

Weight bias, which is defined as the inclination to form unreasonable judgments based on an individual’s weight (Washington, 2011), could impact perceptions of pain causality, behavioral functioning, and overall pain assessment. A large majority of research in this area has focused on adults. Previous studies have shown that providers treating a general sample of adult overweight and obese patients exhibit less emotional rapport (Gudzune, Beach, Roter, & Cooper, 2012), spend less time educating patients with obesity about their health (Bertakis & Azari, 2005), and fail to refer the patient for diagnostic testing or to consider treatment options beyond advising the patient to lose weight (e.g., Persky & Eccleston, 2011). One recent study found that the pain of normal and overweight women and obese men was discounted (judged as less intense, less interfering, more exaggerated, and less attributable to medical factors) and judged as less in need of treatment (treated with less opioids and workplace accommodations) by a sample of undergraduate college students (Miller et al., 2018). This study suggests that biases may be present even before health care providers begin clinical practice.

The few studies investigating weight bias against children in the health care setting have found evidence of potential biased interactions. For example, in two separate studies, pediatric healthcare providers used less patient-centered communication when treating children who were overweight or obese (Edmunds, 2005; Mikhailovich & Morrison, 2007). Limited data in this area of research warrant further study, particularly as parents and children may be less likely to present to appointments or follow through with recommendations due to perceived stigmatization (Puhl, Peterson, & Luedicke, 2011). Further, there is no research that directly examines the influence of child patient weight in pain assessment and treatment practices.

Virtual Human (VH) Technology

Given the extreme difficulty of isolating the effect of a single variable, such as weight, some researchers have been utilizing VH technology to assess provider and trainee biases within the context of a potential medical encounter. The primary feature of VH technology is the use of static or mobile computer-generated characters, hereafter referred to as VHS. VH technology has been used to examine differences in pain assessment among providers treating adult patients. Demographic features (e.g., sex, age, and race) as well as pain features (e.g., facial pain expression) have been manipulated to create a number of different stimuli (Hirsh, Alqudah, Stutts, & Robinson, 2008). VH technology enhances both experimental control and ecological validity that is often lacking

in retrospective and vignette-based research, respectively (Hirsh et al., 2008). Moreover, VH technology is advantageous from a research methodology perspective, as it is less likely that the user will be influenced by social desirability bias, given that the patient or other peers/colleagues are not present in the room (Wandner et al., 2010). This is particularly important when measuring a sensitive construct, such as weight bias. Some researchers have attempted to overcome these issues by using measures of implicit attitudes (e.g., Sabin & Greenwald, 2012). However, it is unclear whether questionnaires and lab-based implicit attitudes tasks accurately represent actual biases and attitudes that may manifest in real-world decision-making situations.

Previous studies using VH technology have revealed that health care professionals, trainees, and laypersons are influenced by patient demographic cues and facial expression when making pain assessment and treatment-related decisions for adult VH patients (Hirsh et al., 2008; Hirsh, George, & Robinson, 2009; Wandner et al., 2010). Only two studies have used VH technology to examine differences in pain assessment and treatment recommendations for children (LaFond, Van Hulle Vincent, Corte, et al., 2015; LaFond, Van Hulle Vincent, Lee et al., 2015). Results suggested that despite recommendations to use self-report of pain symptoms, many nurses use patient behavior as the primary indicator to assess and treat pain. Weight and weight bias were not assessed in these studies.

Purpose

The purpose of the current study is to use VH technology to investigate the influence of pediatric weight and student weight bias on assessment impressions using standardized virtual children presenting with pain. Given the pervasiveness of overweight and obesity in our society, weight-related biases are likely formed well in advance of entering the workforce as an independent practicing clinician (Andrade et al., 2012; Magliocca, Jaber, Alto, & Magliocca, 2005). From an intervention perspective, it may be more feasible to target these biases in an academic environment as part of the standard educational curriculum. Specifically, this study aims to determine if multiple assessment variables (i.e., student perceptions of pain, feelings of sympathy and motivation to help the child, and perceptions that the report of pain is related to psychological/behavioral issues or a desire to avoid non-preferred activities) differ by virtual child weight status (obese vs. healthy weight status), sex, and race. We also aim to determine if these same variables differ by level of student self-reported weight bias.

It is hypothesized that students will feel less sympathy for and less motivated to help VH children with obesity versus VH children who are healthy weight. It also is hypothesized that higher student weight bias will predict less sympathy for

and less motivation to help VH children with obesity compared to the healthy weight VH children. Similarly, students will rate that the pain of VH children with obesity as more likely influenced by psychological/behavioral issues as well as a desire to avoid non-preferred activities, compared to the pain of healthy weight VH children.

Method

Participants

Ninety-six undergraduate students participated in this study, with the following majors most represented: Health Science (18.8%), Nursing (14.6%), Biology (23%), and Pre-Medicine (10.4%). Participants were recruited via flyers, advertisements (e.g., student union), and announcements at health-care-oriented student organization meetings. The majority of students self-reported their race as Caucasian (62%) and their sex as female (81%). The average age of the sample was approximately 20 years ($SD = 1.58$). Approximately 71% of participants reported that they were in their third year or higher of undergraduate study. Participant characteristics are detailed in Table 1.

Virtual Children

VH technology was used to assess participant biases within the context of a standardized hypothetical medical encounter. Eight full-body virtual characters were created via the systematic manipulation of sex (male or female), race (Caucasian or African American), and weight status (obese or healthy weight status). Races were selected primarily for methodological reasons, as only a limited number of cues could be manipulated in order to maintain statistical power. Previous studies have examined differences in decision-making using Caucasian and African American VH, and these races permit the most apparent distinction in skin color. Each virtual child was fully dressed in gender-specific clothing. Females were depicted with at least shoulder-length hair. The manipulation of weight for identified “obese” patients was accomplished by adding surface area to the arms, legs, and abdominal area. The VH children were piloted among a group of 11 graduate students to assess perception of child weight (i.e., degree of overweight). Paired samples *t* tests revealed that the weight of VH children (i.e., obese versus healthy weight) was rated by graduate students as significantly different among all four pairs of same-sex, same-race patients. VH children were presented in standing posture, face forward (see Fig. 1 for example virtual children). The exact same vignette was used for each profile, with the exception of changing “he/she,” and was presented as follows:

Table 1 Demographic and background characteristics of participants

	<i>N</i>	% of total	Mean (SD)	Range
Age (years)			20.47 (1.58)	18.00–26.00
Sex				
Female	78	81.3		
Male	18	18.8		
Race				
Caucasian	59	61.5		
Asian	25	26.0		
Black or African American	9	9.4		
Other	3	3.1		
Year of undergraduate study			2.90 (0.97)	1.00–5.00
Freshman	10	10.4		
Sophomore	18	18.8		
Junior	42	43.8		
Senior or above	26	27.1		
Major of study ^a				
Health science	18	18.8		
Nursing	14	14.6		
Microbiology	11	11.5		
Biology	11	11.5		
Pre-medicine	10	10.4		
Psychology	9	9.4		
Biochemistry	7	7.3		
Public health	5	5.2		
Pre-occupational therapy	5	5.2		
Pharmacy	4	4.2		
Nutritional sciences	3	3.1		
Physiology	3	3.1		
Pre-dental	3	3.1		
Pre-physical therapy	2	2.1		
Food science & human nutrition	2	2.1		
Health education & behavior	2	2.1		
Other	8	8.0		

^aCategories are not mutually exclusive

Patient is a 12-year-old presenting with lower back pain of moderate intensity. The patient is accompanied to her appointment by her mother (not shown). This is her first visit scheduled with her pediatrician to specifically address her back pain, although she has been experiencing pain for over 3 months. She has missed school several times in the past month due to her pain. She has no prescriptions for medications at this time.

To enhance ecological validity, standardized physiological information (temperature, blood pressure, pulse rate, respiration rate, and mental status) was also provided on the same screen as each child. In text that appeared directly beneath this information, participants were informed that all values were within normal limits. The child was static and was not intended to display any pain features. All combinations of the three patient cues (race, sex, and weight

status) were presented to each participant, creating a total of 8 distinct virtual patient profiles. Each profile was repeated one time to create a total of 16 profiles, which allowed for greater reliability of each individual's data due to multiple observations. Each participant viewed the 16 VHs (8 different humans presented twice) in a random order that was generated via an algorithm created by an IT specialist.

Procedures

After contacting the researcher to express interest and to allow for verification of eligibility criteria, each participant was provided with a website link and unique username/password combination via email. Using a personal computer at a location of the participants' choice, participants first provided electronic consent and read an "instructions"



Fig. 1 Male Caucasian healthy weight (shown top left), male Caucasian obese (shown top right), male African American healthy weight (shown bottom left), and male African American obese (shown bottom right) virtual children

document that informed them about how to approach the study. For each VH child profile (i.e., 16 total), participants were asked to provide ratings for the following statements on a computerized Visual Analogue Scale using their mouse or keypad: (1) Level of pain you believe this patient is currently experiencing (*no pain sensation to most intense pain imaginable*), (2) I feel sorry for this patient (*not at all to very much so*), (3) I am motivated to help this patient feel better (*not at all to very much so*), (4) Likelihood that this patient's pain is related to psychological/behavioral issues (*not at all likely to completely likely*), and (5) Likelihood that this patient's report of pain is influenced by a desire to avoid non-preferred activities, e.g., going to school, doing chores, participating in sports (*not at all likely to completely likely*). These ratings were created by the authors for the purpose of this study. The "level of pain" item has been used in existing VH studies (Hirsh et al., 2008, 2009; Wandner et al., 2010).

Following completion of these ratings for all 16 profiles, participants electronically completed a demographic questionnaire that gathered the following background information: age, sex, ethnicity, race, height, weight, academic major/program of study, and current year in school/training. Finally, participants completed the Fat Phobia Scale-Short Form (Bacon, Scheltema, & Robinson, 2001),

which was used to assess explicit weight bias. Participants read the following instructions: "Listed below are 14 pairs of adjectives sometimes used to describe obese or fat people. For each adjective pair, please place an X on the line closest to the adjective that you feel best describes your feelings and beliefs." Each of the 14 items (e.g., lazy-industrious; attractive-unattractive) are measured on a 5-point scale. Select items are reverse-scored to reduce response bias. Total scores range from 1 to 5, with higher scores indicating more negative attitudes toward individuals who are obese (Lippa & Sanderson, 2012). The Fat Phobia Scale-Short Form is strongly correlated with the entire 50-item scale and has demonstrated excellent reliability across two separate samples; Cronbach's $\alpha = 0.87$ in one sample and Cronbach's $\alpha = 0.91$ in a second sample (Bacon et al., 2001). The Fat Phobia Scale has been used as a measure of explicit weight bias in several other studies (e.g., Puhl et al., 2015; Puhl, Wharton, & Heuer, 2009). Cronbach's alpha in the current sample was $\alpha = 0.86$.

Data Analysis

Data analyses were performed with SPSS for Windows (Version 21). Power analyses were conducted prior to data collection to confirm that a sample size of approximately 100 participants would be adequate to answer study questions. Based on moderate effect sizes (e.g., .26–.34 dz) from a similar study that examined four cues (i.e., age, race, sex, pain expressivity), a target effect size of .30 dz was used (Hirsh et al., 2008). Descriptive analyses were conducted to summarize the demographic and background characteristics of the sample, as well as responses on the Fat Phobia Scale-Short Form. Given that each VH was presented twice, participant responses for the first and second presentations of each VH were averaged for each of the five pain assessment ratings. Average assessment ratings were calculated across VH children at both levels of the weight status cue (i.e., obese and healthy weight). Five separate repeated-measures analysis of variance (RANOVA), under the general linear model, were used to examine pain assessment ratings made by student participants as a function of each virtual child's weight status, race, and sex. Interactions between student self-report of weight bias and VH child weight status were examined on two assessment items, "I feel sorry for this patient" and "I am motivated to help this patient feel better." Total Fat Phobia score was entered as a covariate in two separate repeated-measures ANCOVA analyses. Direction of these interactions was determined via examination of means of each factor (i.e., child weight status and participant weight bias).

Results

Ratings by VH Child Weight Status

Average participant assessment ratings were calculated across VH children at the two levels of the weight status cue (i.e., obese and healthy weight). These averages are presented in Table 2. There was no significant difference in average intensity of pain reported for the obese versus the healthy weight virtual child. Also, ratings for the items “I feel sorry for this patient” and “I am motivated to help this patient feel better” did not significantly differ by VH child weight status.

Results for the item, “Likelihood that the child’s pain is related to psychological/behavioral issues” indicated a significant effect for weight status, $F(1, 95) = 5.42, p = .022$, partial $\eta^2 = .054$. Participants rated that the pain of VH children with obesity was more likely related to psychological or behavioral issues ($M = 31.94, SD = 21.68$) than the pain of healthy weight VH children ($M = 29.07, SD = 20.02$).

Results for the item, “Likelihood that this child’s report of pain is influenced by a desire to avoid non-preferred activities” showed a significant effect for VH child weight status, $F(1, 95) = 29.07, p < .001$, partial $\eta^2 = .234$. Participants rated the pain of VH children with obesity as more influenced by a desire to avoid non-preferred activities ($M = 38.38, SD = 23.67$) than the pain of VH children who were of healthy weight status ($M = 29.66, SD = 21.61$).

Ratings by VH Child Race and Sex

Only one of the five ratings revealed a significant effect for VH child race. Participants assessed African American VH children ($M = 44.20, SD = 18.22$) to be experiencing greater pain than Caucasian VH children ($M = 43.13, SD = 19.09$),

$F(1, 95) = 4.46, p = .037$, partial $\eta^2 = .045$. Also, there was only one significant effect when examining the cue of VH child sex on each rating. Students rated that the pain of male children is more influenced by a desire to avoid non-preferred activities ($M = 35.32, SD = 21.59$) compared to the pain of female children ($M = 32.72, SD = 21.42$), $F(1, 95) = 13.90, p < .001$, partial $\eta^2 = .128$. There were no other significant differences on any of the five ratings by VH child sex or race.

Student Rater Weight Bias

On the Fat Phobia Scale-Short Form, participants averaged a total score of 3.82 ($SD = 0.52$) on a possible range of 1–5, with higher scores indicating higher negative attitudes about individuals who are obese (i.e., weight bias). The total score was not significantly associated with any participant demographic or background characteristics, including BMI. Total Fat Phobia score was entered as a covariate in two separate repeated-measures ANCOVA analyses. Ratings on the items “I feel sorry for this patient” and “I am motivated to help this patient feel better” were examined.

There was an interaction effect between student weight bias and VH child weight status. These results indicated that as child weight increased, low weight bias participants felt more sympathy, while high weight bias participants felt less sympathy, $F(1, 95) = 9.76, p = .002$, partial $\eta^2 = .094$. A median split of Fat Phobia was performed to plot the interaction. These findings are displayed in Fig. 2.

Additionally, low weight bias participants showed increased motivation to help, while high weight bias participants showed less motivation to help, as VH patient weight increased, $F(1, 95) = 7.31, p = .008$, partial $\eta^2 = .072$. A median split of Fat Phobia was performed plot the interaction. These findings are displayed in Fig. 3.

Table 2 Means and standard deviations for ratings within sex, race, and weight status cues

	Sex		Race		Weight status	
	Male	Female	Caucasian	African American	Healthy weight	Obese
Pain intensity	44.01 (18.37)	43.33 (18.95)	43.13 (19.09)*	44.20 (18.22)*	43.65 (19.68)	43.68 (18.52)
Feeling sorry	52.99 (26.66)	52.46 (26.51)	52.29 (26.82)	53.15 (26.53)	52.99 (27.11)	52.46 (26.57)
Motivation to help	73.75 (23.71)	72.92 (24.10)	73.02 (23.94)	73.65 (23.96)	73.69 (24.68)	72.98 (23.45)
Psychological/behavior issues	30.98 (20.25)	30.03 (20.18)	30.48 (20.33)	30.53 (19.98)	29.07 (20.02)*	31.94 (21.68)*
Avoid non-preferred activities	35.32 (21.59)*	32.72 (21.42)*	34.40 (21.32)	33.63 (21.74)	29.66 (21.61)*	38.38 (23.67)*

Rating scale is 0–100

*Indicates significant difference in ratings at $p < .05$ (only main effects denoted)

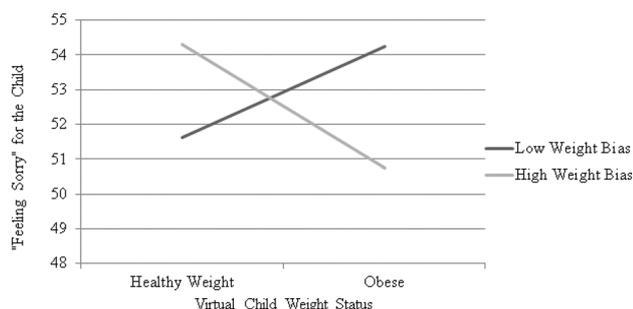


Fig. 2 Interaction showing that low weight bias participants felt more sympathy, while high weight bias participants felt less sympathy as child VH weight increased

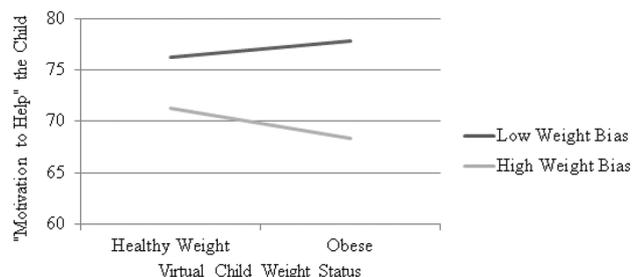


Fig. 3 Interaction showing low weight bias participants showed increased motivation to help, while high weight bias participants showed less motivation to help, as VH patient weight increased

Discussion

Bias among health care providers can systematically influence medical decision-making and exert an independent influence on group health disparities (Penner et al., 2010; Smedley et al., 2003). Existing studies tend to focus on differential treatment among patients of different racial or ethnic groups (see Smedley et al., 2003 for review). Further, there are only a handful of studies examining potential biases among health care professionals treating children.

The current study extends the literature on disparities in healthcare decision-making by examining the influence of child weight status, student weight bias, as well as other demographic characteristics on pain perceptions and assessment decisions for virtual children presenting with chronic pain. Given the subjective nature of pain, providers or those training in health professions may intentionally or unintentionally allow their own stereotyped biases to influence clinical judgments and decision-making.

Individuals who are overweight or obese are often the target of bias in the health care setting (O'Brien, Hunter, & Banks, 2007; Puhl & Heuer, 2009). Unfortunately, the

influence of weight bias in pediatric healthcare represents a significant gap in the literature. Weight bias among health profession trainees, and even professionals, may be even more problematic for youth with pain given recent evidence that obesity is linked to increased incidence of certain types of pain, including musculoskeletal pains and headache (Bell et al., 2011; Hershey et al., 2009). However, the study of weight status as a factor that may elicit negative biases in the assessment of youth with chronic pain has been neglected in the literature. The anonymous, web-based design used in this study sought to reduce social desirability bias often involved in assessing sensitive constructs, such as stereotypes surrounding weight.

Results from this study revealed significant group-based differences in the assessment of VH children who were presented as obese versus healthy weight. Participants in this study rated the pain of VH children with obesity as more likely influenced by psychological/behavioral issues compared to the pain of VH children of healthy weight status. This finding is consistent with previous literature showing that children with obesity have more general psychosocial difficulties (e.g., lower health-related quality of life, increased behavioral problems, social marginalization, and higher rates of depression) compared to their non-obese counterparts (Csabi, Tenyi, & Molnar, 2000; Schwimmer, Burwinkle, & Varni, 2003; Strauss & Pollock, 2003). Several explanations may be proposed surrounding the contribution of “behavioral issues”; however, interpretation is limited by the fact that there was no operational definition of “psychological/behavioral” issues provided to participants. “Behavioral issues” might refer to resistance surrounding behaviors that could potentially relieve pain for a child who is obese, such as engaging in low-impact physical activity. Related, children with obesity may be perceived to cope with pain in a different manner than children of healthy weight status or may be perceived to express somatic pain complaints in response to social or environmental stressors. Regardless, data suggest that even students with limited clinical training are aware of the myriad of psychosocial issues that impact youth with obesity, and that these issues can impact the experience and presentation of pain.

Similarly, students also rated the pain of VH children with obesity as significantly more likely to be influenced by a desire to avoid non-preferred activities compared to VH healthy weight children. This effect was large (partial $\eta^2 = .234$). This could be the result of a perception that children with obesity may seek to avoid activities (e.g., physical activity) due to weight-based victimization or teasing (Gray, Janicke, Ingerski, & Silverstein, 2008). However, it is important to highlight that the wording of the question does not allow us to determine if participants believed the child with obesity was more likely to exaggerate or “fake” their pain to avoid non-preferred activities, use their pain as an

“excuse” to avoid activities, or if participants simply felt that the child’s pain would actually inhibit participation in non-preferred activities (i.e., via increased loading or biomechanical alterations imposed by additional fat) compared to the pain of healthy weight children. Thus, there is a question of whether participants were considering secondary gain on the part of the child as a possible mechanism underlying their avoidance. Future research can examine this issue further by asking health care trainees and practitioners directly if they feel that a child’s report of pain is influenced by secondary gain and provide specific examples (e.g., to avoid physical activity, to avoid attending school, to avoid being teased by peers in social settings).

Students rated the pain of African American children significantly higher than the pain of Caucasian children. These results are consistent with previous vignette-based VH studies showing that African American adults are perceived to experience greater pain intensity than Caucasian adults (Wandner et al., 2010). The racial discrepancy in pain intensity found in this study is interesting, as all vignettes directly stated that each child was experiencing “moderate pain.” It is unclear why participants rated the African American children, on average, as experiencing higher pain intensity. It is not likely that contextual cues (i.e., facial features or posture) influenced participants’ ratings as these cues were not manipulated in this study, and each patient was intended to display a neutral facial expression.

A main effect was also revealed for sex, as participants rated that the pain of VH male children is significantly more influenced by a desire to avoid non-preferred activities compared to the pain of VH female children. This finding is interesting, given that girls have typically reported more restrictions in daily living due to chronic pain than boys (Roth-Isigkeit, Thyen, Stoven, Schwarzenberger, & Schmucker, 2005). However, an alternative explanation may be that boys in general are more likely to exhibit externalizing behavior than girls and could be more inclined to avoid responsibilities, such as chores and participation in school (Bongers, Koot, van der Ende, & Verhulst, 2004). It is also possible that the make-up of the participant sample (i.e., mostly female) contributed to this finding, although this could not be explored due to low number of male participants.

When student weight bias was examined, results showed that as child weight increased, low weight bias participants felt more sympathy, while high weight bias participants felt less sympathy. Further, as VH patient weight increased, low weight bias participants showed increased motivation to help, while high weight bias participants showed less motivation to help. Given the pervasive ideological belief that body weight is attributable to internal, controllable causes (Crandall, 1994), it may be that some participants may be less sympathetic surrounding secondary health problems

that could be associated with obesity, such as chronic pain. These results have important implications for health care, considering the number of children with obesity that students may encounter as trainees and later on as professionals. Health care utilization could be adversely affected by perceived weight stigma from health care providers, and there is already research suggesting that parents may avoid future medical appointments in response to weight stigmatization of their children by pediatric providers (Puhl et al., 2011). Replication of findings in practicing health care trainees and providers is needed before definitive conclusions can be made regarding how weight and other patient factors influence clinical care.

This study is limited by the inclusion of only undergraduate students training in health-related fields. Given the academic focus of undergraduate programs, most of these students likely have limited clinical experience. Thus, results are not generalizable to practicing health care professionals. Despite this, there are likely participants in this sample who represent members of the next generation of health care providers, a critical target for intervention efforts. Another obvious limitation is the analogue nature of the study. While the use of VH technology allowed for increased experimental control of stimuli, a number of other factors that may potentially influence perceptions of youth experiencing pain were excluded. It is also possible that the VH did not appear “realistic” enough to trainees, as the children did not display any facial or other physical expression of pain. Future pediatric VH studies could integrate the use of a child-friendly pain coding system to more accurately represent pain expression. The use of audio, inclusion of parents in the simulation, and opportunities for patient-participant interaction could enhance ecological validity. Also, the VH pictures were not validated against a measure of child weight status. However, they were piloted among a group of 11 graduate students whose ratings about weight status verified a distinction between obese and healthy weight status. Also, participants were not asked to identify the race of each virtual child to reduce transparency of the study. However, this may have resulted in some participants providing ratings based on the cue of skin tone, rather than race. Finally, the aggregation of individual participants’ data does not permit identification of specific individuals who may provide differential treatment based on patient sex, race, or weight status. Thus, analyzing idiographic data can assist training intervention efforts by identifying specific individuals that produced discrepant ratings.

It has been recommended that medical education curricula focus on education in cultural competency, which can translate to improved awareness and management of bias (Teal et al., 2010). These results suggest that interventions targeting weight bias among students and health care trainees may be warranted. Basic education on appropriate

terminology to use when interacting with patients and their caregivers about weight-related issues is essential and can help non-experienced clinicians deliver more compassionate and effective care to children and their families (Puhl et al., 2011). Also, pre-existing stereotypes of current or former practicing clinicians could potentially be transmitted during education activities or clinical training experiences, making it important to address the topic of weight and other biases as part of continuing education curricula.

Future research should begin by examining whether or not participants are actually aware of their own bias. Also, measuring bias implicitly in future research could potentially yield different findings. However, it is unclear whether questionnaires and lab-based implicit attitudes tasks, as well as measures of explicit bias, accurately represent actual biases and attitudes that may manifest in real-world decision-making situations.

A pilot study showed that a brief educational intervention targeting weight bias among second and third-year medical students was effective in improving their beliefs and stereotypes regarding patients with obesity. This intervention, which consisted of a video and group discussion, helped to increase medical students' beliefs that genetic and environmental factors play an important role in the cause of obesity as opposed to lack of personal control. Students' negative stereotypes regarding patients who are obese as measured on the Fat Phobia Scale significantly decreased from a mean of 3.65 to a mean of 3.45 post-intervention (Poustchi, Saks, Piasecki, Hahn, & Ferrante, 2013). A similar study implemented a pilot randomized control trial to test the efficacy of brief "anti-stigma" films in reducing weight bias among trainee dietitians and doctors. Results showed a decrease in explicit attitudes and beliefs toward people with obesity but no changes in implicit anti-fat bias (Swift et al., 2013). These studies were both developed based on the attribution theory, which suggests that an individual's strong beliefs that obesity is due to a lack of personal control (and is therefore controllable) may result in weight bias (Crandall & Reser, 2005). Future research should examine whether or not changes in weight-related attitudes and beliefs are sustainable, and if these interventions predict actual behavior change in the clinical setting.

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Compliance with Ethical Standards

Conflict of interest Shana L. Boyle, David M. Janicke, Michael E. Robinson, and Laura D. Wandner declare that they have no conflict of interest.

Human and Animal Rights All procedures followed were in accordance with the ethical standards of the responsible committee on human

experimentation (institutional and national) and with the Helsinki declaration of 1975, as revised in 2000.

Informed Consent Informed consent was obtained from every participant before engaging in the study procedures.

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