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Online Communication about Genetics and Body Weight: Implications for Health Behavior and Internet-Based Education

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Abstract

Social media, specifically online weight loss message board communities, may become an important conduit for information about genetics and body weight. This information has the capacity to influence individuals as it is naturally encountered online, or could be strategically disseminated for public health purposes. However, little is known about how the public engages with information they encounter related to genetic underpinnings of body weight, or how their interpretation of this information shapes health beliefs. The current study examined discussions about genetics and weight in message board communities devoted to discussion of weight loss. Fifty-four online discussions, comprised of 505 individual posts from three weight loss-themed message boards were coded using a closed-ended procedure. Individuals who discussed genetics and weight in online message board communities initiated these discussions mainly for personal reasons and primarily cited mass media-sourced information. Genetic causes of weight tended to be endorsed alongside behavioral causes. There was no association between cause endorsements and expressed frustration. These findings help elucidate the effects of naturally-encountered information about genetics of weight. They may also have implications for the creation of online evidence-based tools to aid communication about genetic advances in ways that encourage positive dietary and physical activity behavior.

Information about genetics and weight is routinely disseminated to the public via the media and internet (Tambor, Bernhardt, Rodgers, Holtzman, & Geller, 2002). This information has the capacity to influence public beliefs about the causal mechanisms that underlie weight and weight loss. It therefore also has potential to affect individuals' physical activity and dietary behavior. However, little is currently known about how the public engages with information they encounter related to the genetic underpinnings of body weight, and how their interpretation of this information might actually shape health beliefs.

The internet has become a major source of the public's information about health and health behavior (Fox, 2008), and experts expect it to be a primary source for genetics information

(McBride et al., 2010). In addition to more traditional online media formats, interactive, social media are poised to become a major source for information gathering, social interaction, and social support around health and wellness topics (Chou, Hunt, Beckjord, Moser, & Hesse, 2009; Fox & Jones, 2009). Although only a small percentage of internet users report sharing information about their own health-related experiences via social media, more than one third of internet users have read someone else's commentary about their health experiences online (Fox, 2011). In addition, more than a quarter of internet users have used online media tools to track their own weight and health-related indicators (Fox, 2011). At present, use of social media for health-related information exchange may be most relevant to groups that are heavier users of these platforms, such as younger individuals. However, social media use is growing rapidly among older adults and these demographics may further shift over time as cohorts age (Madden, 2010).

Of the various types of social media, online forums and message boards tend to be a key media platform for individuals who seek to exchange information on specific health conditions and wellness topics (Bell, Hu, Orrange, & Kravitz, In Press; Chou, et al., 2009). This makes them a likely platform for the discussion of newsworthy developments related to particular conditions like weight and obesity-related gene discovery. Rates of message board use are not trivial. According to US-based market research data, 15% of individuals who search for health information online report accessing information on forums and message boards (Elkin, 2008). In addition, data from the Pew Internet Project indicate that 5% of all internet users report personally posting comments, questions or information in online forum discussions (Fox, 2011).

While it is too soon to know, it has been suggested that the impact of exposure to weight-related genetic information via online message boards and other social media could be both positive and negative. Encountering this information could be beneficial, prompting increased motivation for performing health promoting diet and physical activity behaviors (Ashida, Wilkinson, & Koehly, In Press; Conradt et al., 2009; Frosch, Mello, & Lerman, 2005; Sanderson, Persky, & Michie, 2010). On the other hand, concerns have been raised that encountering information positing genetic causal mechanisms for complex traits such as weight could result in deterministic beliefs (Frosch, et al., 2005; Marteau & Weinman, 2006), implying that weight is uncontrollable or difficult to control behaviorally. Whether the impact of genetic information on health behavior in online contexts is positive or negative will hinge on several aspects of its communication, for example, where the information comes from, how it is integrated into discussions, and how it shapes people's beliefs and attitudes about weight loss. Examining the sources from which individuals draw information about the genetics of weight they introduce into online communities can elucidate features of the sources individuals view as relevant to the community and worth sharing with their peers. No studies have yet explored specific information sources brought into weight-related online communities. It is therefore unclear whether this information stems from reliable sources. It is also unclear whether there might be benefit in interventions that introduce reliable genetic information into these communities that is framed to specifically encourage positive dietary and physical activity behavior.

Also of importance are the reasons that community members discuss the genetics of weight. In order for health-related information encountered in the media to have behavioral impact, the information must transition from being considered simply a news item, to being an issue with which the individual engages on a personal level (Weinstein, 1988). It is therefore important to investigate whether online community members discuss the genetics of weight in ways that are relevant to their own health and behavior.

Perhaps of greatest importance is how information about the genetics of weight shapes people's beliefs about the causal mechanisms underlying weight and their attitudes towards losing weight. In order for dissemination of genetic information to have positive impacts on health behavior, it must not trigger causal belief systems indicating that weight cannot be influenced by diet and physical activity. Previous survey and focus group research suggests that many individuals report beliefs that both genetic and other factors can influence weight or obesity simultaneously (Brogan & Hevey, 2009; Molster, Charles, Samanek, & O'Leary, 2009; Ogden et al., 2001; Parrott, Silk, & Condit, 2003). This research, however, speaks only to the causal models of weight that are evoked in research settings. Because causal understanding can be context-dependent (Condit et al., 2009), it is important to specifically assess these beliefs in online community contexts where individuals interact to discuss and reflect on their personal weight and weight loss efforts with their peers.

Weight-related genetic information has the capacity to influence individuals as it is encountered naturally in the online environment. Such information could also be strategically disseminated for public health purposes. Because of their content focus and interactive nature, online weight loss communities may be a promising conduit for health behavior and obesity education and intervention. However, it is crucial to first understand how introduction of information about the role of genetics in weight and weight management plays out in this context. In the current study, therefore, the overarching aim was to analyze spontaneous discussions about genetics of weight in online message board communities devoted to discussion of weight loss. These analyses addressed 1) the sources from which community members drew information about the genetics of weight; 2) the contexts in which this information was introduced into discussion; 3) indicators of causal belief systems that accompany the discussion of this information.

Methods

Inclusion and Sampling

Weight-loss themed message boards were initially identified employing a search engine (Google). Search terms included: "weight loss forum", "weight loss message board", "weight loss community", "obesity message board", and "obesity forum". We also identified additional message board communities using aggregator web sites that contained links to relevant communities and links pages within the communities themselves. From the resulting list, we excluded any message boards that were not in English, were not fully searchable, and those where board membership was required to read postings. Of the remaining list, we included in our final sample message boards with at least 75,000 members so as to capture the largest of all the weight-loss themed message boards at the time data collection. We chose to focus on the largest communities because message posts

(i.e., individual messages submitted to a message board by a user) were more likely to be seen and read by wider audiences. This resulted in a sample of three message board communities. All were based in the United States, and were part of larger weight loss resource websites rather than being stand-alone message boards.

In order to increase message board users' anonymity, we avoid including any identifying information. Though we take these additional measures, the information contained within these boards is publicly available, and study of the information was ruled to be exempt by the relevant human subjects research office.

Within each message board, we identified threads (i.e., a series of posts, one initiating the series and all posts made in response) pertaining to the genetics of body weight by searching for eight pre-defined key words (gene, genes, genetic, genetics, genome, genomic, genomics, DNA). Due to limits on the retrospective availability of threads on one of the message boards, we limited the search time frame to one year prior to the data collection date. We thus captured threads posted between May 2007–May 2008. To be eligible for inclusion, threads had to contain at least one search term within the first post of the thread. This ensured that all threads were initiated with some intent to discuss genetics. In addition, use of the search term had to pertain to genetics of body weight rather than genetics of another condition (e.g., cancer) or an unrelated meaning (e.g., a person named Gene). Eligible threads were archived prior to analysis.

Coding

Due to the large number of posts contained within the eligible threads, we designated a random sample to be coded by two trained coders. Data were included at the thread level such that once a thread was designated for coding all posts contained in that thread were coded. Coders used a code book containing closed-ended items assessing a number of themes. Inter-rater reliability was calculated for a sub-sample (20%) of the coded material as is accepted practice (Lombard, Snyder-Duch, & Bracken, 2002). Discrepancies were reconciled through subsequent coder discussion. All retained items reached acceptable reliability (Kappa ≥ 0.6), and the remaining threads were coded by a single trained coder.

Coders assessed the main purpose of each *thread*. They indicated whether the thread was initiated for the purpose of sharing expert or media information, sharing the initiating author's own thoughts or opinions, or to ask questions or advice of fellow community members. Within each *post*, coders collected the names of all media and medical professional sources of information about genetics and weight. Each source was tabulated only the first time it appeared in a thread. Each post was also assessed to determine whether it contained endorsement of genetic causes and/or behavioral causes for weight. This was accomplished with a combination of two coding items assessing mention of 'genetics' or 'heredity' (combined to indicate genetic cause endorsement), and two similar items assessing mention of 'diet' or 'physical activity' (combined to indicate behavioral cause endorsement). Finally, coders used a single item to assess whether or not post authors expressed that they were frustrated with their weight or weight loss efforts.

Data Analysis

A chi-squared test was conducted to assess whether there were differential patterns in the purpose of introducing genetic information in threads. A chi-squared test, adjusted for the clustering of posts within threads, was conducted to assess the pattern of cause endorsements within posts. A logistic regression model was fitted to evaluate whether posts that endorsed genetic causes alone also involved expressions of frustration with weight loss attempts more so than if behavior was included as a cause. A generalized estimating equation, with an exchangeable correlation among posts, was used to adjust standard errors in order to account for the clustering posts within threads.

Results

A total of 86 threads were identified that were initiated with mention of obesity genetics or weight-related genetics. Of these, coders assessed a random sample of 54 threads which resulted in a total of 505 coded posts. Each thread consisted of a mean of 9.44 posts (SD=10.27). In all, 303 unique users contributed to the 54 threads. Within this sample, each user authored a mean of 1.66 posts (SD=1.67).

Thread Purpose

Of the 54 coded threads, 10 (18%) were created with the purpose of sharing information from an expert or media source. Threads initiated for this purpose tended to do so quite explicitly. For example, in one such thread, the post author stated, *"I found this article very interesting and thought I'd share it"*, and then went on to post a link to an article that described genetic underpinnings of body weight. An additional 14 threads (26%) were created with the purpose of sharing personal advice or opinion. Threads created for this purpose tended to focus on what had previously worked for the author, or what he/she believed to work with regards to weight loss. For example, in one of these threads a post author stated, *"Just wanna share what works for me"* and then went on to describe her diet and exercise regimen. Genetics was incorporated in that she believed that this regimen worked, *"considering my genetics"*. Finally, 30 (56%) threads were created to ask a question or for advice. For example, one post author asked, *"is there something else that I should do that I haven't tried yet?"* after detailing the diet and exercise regimens she had previously tried. Genetics was incorporated in a statement that the author said she knew she was *"fighting genes"*. Threads were most likely to be initiated for the purpose of asking a question or for advice, and least likely to be initiated to share scientific or expert information ($\chi^2 = 12.44$, $p = .002$).

Unique Information Sources Cited in Threads

A total of 34 media or medical professional sources were identified by post authors as being their source of information about genetics and weight. Media sources were cited 27 times, while medical professionals were cited 7 times. Media sources included specific television programs, books, blogs, reference websites, and the radio. Post authors who stated that the genetic information they discussed came from a health professional cited either their own doctor, another doctor (i.e. not the post author's own), or a dietician. The most frequently

cited information sources were the television (*n*=8), news outlets (*n*=6) and books (*n*=6). See Table 1 for further details.

Genetic and Behavioral Cause Endorsement

The majority (71.3%) of posts contained endorsement of a genetic cause for body weight and/or a behavioral cause. Further analyses of causal endorsement include only the 361 posts wherein at least one cause was endorsed. Thirty-five (10%) posts endorsed a genetic cause for weight alone. For example, one individual discussed a friend who eats a lot, does not exercise, and is thin; she stated "*I don't know what the answer is other than genetics*". One hundred eighty posts (50%) endorsed a behavioral cause alone. For example, one post author stated that she was overweight because she "*simply made wrong choices in food*". She did not make any mention of genetic causes in her post. Finally, 146 (40%) posts endorsed both genetics and behavior. For example, a post author stated that if there is "*no lack of food available*," then "*genetics influences weight*". Genetic causes were significantly more likely to be endorsed alongside behavioral causes than alone ($\chi^2 = 77.01$, df = 2, $p < .001$).

Association between Cause Endorsement and Frustration with Weight

Of the 361 posts that contained causal endorsements, 53 (14.7%) contained expressions of frustration about weight loss. For example, one individual stated that she could not seem to lose any weight and that she finds this "*so discouraging*". There were no differences in expressions of frustration based on the nature of cause endorsement ($\chi^2 = 0.65$, df = 2, $p = .724$): frustration was expressed in 14% of posts containing endorsements of genetic causes only (referent), 14% of posts with behavioral causes only (OR=1.06; 95% CI: [0.49; 3.99]), and 16% of posts with genetics and behavior together (OR=1.39; 95% CI: [0.42; 2.67]).

Discussion

This study indicates that individuals who discuss the genetics of weight in online message board communities initiate these discussions for mainly personal reasons, primarily cite mass media-based information, and tend to endorse genetic causes of weight alongside behavioral causes. That the majority of threads were initiated for the purpose of asking questions of other community members or to share personal opinions and ideas suggests that the concept of genetic contributions to weight is most often treated as personally-relevant health information. This implies that it is being considered in such a way that it can impact individuals' health beliefs and behavior.

Several threads were also begun with the express purpose of sharing information from expert or media sources. This suggests that some post authors are serving as a "broker" or bridge for the online community, attending to relevant information in the mass media and bringing it to the attention of fellow community members. Though individuals did not always cite the sources from which they gathered and shared weight genetics information, results from this study do shed some light on these sources. Media sources cited in this study varied widely in type and quality and were cited over three times more frequently than medical professional sources. These findings indicate a potential need and opportunity for

the introduction of clear, high quality information into these online health communities, and suggest that medical professionals may need to play a greater role in engaging patients in discussions about genetics than they do currently. Although the internet is reportedly considered a trustworthy source of medical information by many individuals, internet users also report that they trust physicians significantly more than the internet (Hesse et al., 2005).

In this study, when post authors endorsed a genetic cause for weight, they tended to do so in combination with endorsement of a behavioral cause rather than alone. None of the causal endorsement patterns considered here (genes only, behavior only, or both) were linked to increased expressions of frustration about weight. As endorsement of genetic causes did not preclude endorsement of behavioral causes and did not trigger frustration, these findings are inconsistent with the notion that individuals will interpret genetics as an 'all-or-nothing' concept, or that genetic information will elicit deterministic beliefs.

Also of note is that behavioral causes were overwhelmingly endorsed in the discussions included in this study (i.e., ones selected due to their genetic content). This may be due to the fact that weight loss message boards are inherently about diet and physical activity and thus contain a great deal of conversation about behaviors. This finding also fits with previous literature indicating that people tend to endorse behavior above other causes, and sometimes to their exclusion (Condit, et al., 2009; Ogden, et al., 2001).

This study represents an initial attempt to investigate beliefs about and reactions to concepts around genetics and weight in health-related online communities. We targeted message boards because they provide a repository of discourse data that stems from spontaneous interaction between individuals. Therefore, topics of discussion are self-generated and influenced by natural patterns of information seeking and dissemination. Moreover, these online resources could be a promising target for education and dissemination of information about evidence-based weight control and health behavior recommendations.

There are limitations associated with message board analysis methodology. First, there is a lack of available information regarding post authors, which cannot be augmented without initiating contact. Similarly, information about the total number of threads or posts initiated within this study's time frame was not uniformly available and thus cannot be reported. Therefore, the proportion of all discussions that related to genetics is unknown. In addition, there is limited generalizability to the general population, as individuals who post on weight loss-themed message boards are more likely to be engaged in these topics and more likely to have the resources to participate in these communities. It should be noted, however, that this is the same population toward whom initial efforts in e-health and online health education are likely to be directed. Finally, some computer-mediated-communication theory calls into question the notion that discussions in online settings elucidate individuals' true beliefs and attitudes (Walther, 1996). Other assessments, however, indicate that contemporary internet users do incorporate elements of the self in online interactions (Robinson, 2007). Furthermore, the burgeoning use and documented success of online, socially-oriented health promotion tools (Harvey-Berino, Pintauro, Buzzell, & Gold, 2004; Krukowski, Harvey-Berino, Ashikaga, Thomas, & Micco, 2008) suggest that users are engaging in online

interpersonal interactions around health information in ways that are self-relevant and are applied to actual behavior.

Findings from this study may also have some implications for internet-based public education and intervention campaigns. The current findings demonstrate that the sources of information about the genetics of body weight discussed in these communities are infrequently cited, and that when they are cited they are primarily mass media sources. There is therefore reason for concern that such information may be less credible or of inferior quality. This suggests an opening and perhaps a potential need for the introduction of high quality information into online health communities and engagement of medical professionals around this issue. In addition, the community members in this study appeared to consider and discuss information about genetics and weight in ways that were relevant to the self. This suggests that information introduced along these lines could potentially influence individuals' health beliefs and behavior rather than being simply regarded as a scientific news item. Finally, the causal understandings evidenced by the community members in this study, taken together with previous laboratory-based assessments of individuals' causal beliefs about genetics and weight, indicate that introduction of high quality genetic causal information may not have the feared negative effects on beliefs about the efficacy of health behavior.

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TABLE 1

UNIQUE SOURCES OF INFORMATION ABOUT GENETICS OF WEIGHT CITED IN THREADS ON WEIGHT LOSS MESSAGE BOARDS

	Citation Frequency	Sources Cited (number of times cited if mentioned in more than one thread)
Media Sources		
Television	8	Dr. Phil (4); Dr. Oz (2); 20/20; unspecified TV program
News outlets	6	MSNBC (3); USA Today; BBC News; unspecified news article
Books	6	*Rethinking Thin* by Gina Kolata (3); *Fat Land* by Greg Critser; *Japanese Women Don't Get Old or Fat* by Naomi Moriyama ; unspecified book
Magazines	2	"A fitness magazine"; unspecified magazine
Blogs	2	Junkfood Science; The Skinny Daily Post
Reference websites	2	WebMD; Mayo Clinic website
Radio	1	unspecified satellite radio broadcast
Medical Professional Sources		
A doctor (not post author's own doctor)	3	
Post author's own doctor	2	
A dietician	2	