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People increasingly micromanage their lives through technology; every moment and action accounted for by electronic devices. People can even micromanage their health by using devices that calculate every calorie consumed and expended. These devices are among a new class of technology called persuasive technology.

Such devices cleverly persuade users to increase their exercise and decrease their caloric intake. These devices are attractive to girls with eating disorders as they struggle with the narrowing mainstream definition of beauty—now synonymous with anorexia. The volatility of the situation is compounded by the pro-ana movement, an Internet based phenomenon where girls seek empowerment through eating disorder.

If society accepts this new persuasive weight loss technology without question, the results are predictable. A weight-obsessed American culture will proclaim weight loss success while the already epidemic number of girls with eating disorders will increase.

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WEIGHT LOSS PERSUASIVE TECHNOLOGY AND EATING DISORDER

by
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Introduction

People increasingly micromanage their lives through technology; every moment and action accounted for by electronic devices. Today, people can even micromanage their health by using devices that calculate every calorie consumed and expended. Such devices cleverly persuade users to increase their exercise and decrease their caloric intake. Like all weight loss products, these devices are attractive to girls with eating disorders as they struggle with the narrowing mainstream definition of beauty—now synonymous with anorexia. If society accepts this new persuasive weight loss technology without question, the results are predictable. A weight-obsessed American culture will proclaim weight loss success thanks to this technology. Meanwhile, the already epidemic number of girls with eating disorders will increase and prove why they have the highest mortality rate among all psychiatric illnesses.

This paper will first introduce the concept of persuasive technology as defined by Stanford's Persuasive Technology Lab. It will then provide two very different examples of persuasive technology to demonstrate some inherent ethical issues. The discussion will then narrow the focus specifically on weight loss persuasive technology and the specific health benefits, risks, and ethical dilemmas associated with this ever-more-common domain of technology. Finally, this research will illuminate an overlooked, real-life possibility: the abuse of this weight loss technology by girls with eating disorders. The research will introduce the "pro-anorexic nation" and explain how this group increases the likelihood that girls will abuse weight loss persuasive technology.

Background

Persuasive technology is the popular term for software and devices designed to provoke change in human thinking or behavior in a prescribed way. Although there are numerous examples of technologies that have changed human behavior, the mindful and deliberate design

of persuasive technology conceptually sets it apart. For instance, the inventors of mobile communication devices understood the value of convenience their product provided to users, but probably did not imagine the numerous ways the device would blur the boundaries between people's private and public lives.

“The point about intentionality may be subtle but is not trivial. Intentionality distinguishes between a technology's side effect and its planned effect” (Fogg, 1999). Using the aforementioned cell phone example, the planned effect was convenient, mobile communication that could be used anywhere. One of the numerous unplanned side effects was that some people found themselves accountable for answering and returning phone calls from friends, family, and employers during all hours of their waking lives. Using Fogg's definition, although mobile communication has certainly changed the way people live, it is not a persuasive technology in and of itself.

B.J. Fogg, director of the Stanford Persuasive Technology Lab, coined the phrase captology to describe the “body of expertise in the design, theory, and analysis of persuasive technologies” (2007). The Stanford Persuasive Technology Lab seeks to understand how current technologies achieve their persuasive goals and to anticipate future persuasive designs and their impacts on society. Fogg asserts “Now is your chance to decide what they will persuade us to do—and how they'll do it” (1999). There is still time to shape the way this nascent technology adds value to our lives, and more importantly, minimize or prevent the possibly disastrous effects of ill-intentioned or poorly designed persuasive technologies.

One better known example of a persuasive technology is a doll called “Baby Think It Over,” a device used widely in American schools. Henceforth referred to as “Baby,” this electronic doll simulates the difficulties of parenthood by requiring frequent attention from a surrogate parent to the extent that it simulates the amount of labor required to care for a real infant (<http://www.realityworks.com>). You may recognize the old version of the doll which cries for food and attention, requiring students to use a key on Baby that when turned, shuts off Baby's crying until the next programmed episode.

If a student were to neglect Baby when it cries, then this action is recorded by Baby's computer, and will be reflected in a report downloaded from Baby by the instructor. The newer version of the doll is much more sophisticated and needs many different kinds of care, beyond using a key to "turn off" Baby when it cries. Baby is now wireless, coming with a computerized wristband worn by the caretaker that records the use of Baby's multiple accessories for feeding, burping, rocking, and changing Baby's diapers. Failure to do these activities properly will be reported in detail by Baby.

There is no question that this persuasive device is capable of changing user behaviors in the manner for which it was designed. Teacher Linda Frary from Crete-Monee High School in Illinois comments on observing behavioral differences after her school implemented the Baby Think It Over program, "Six years ago, I knew of 23 girls who were pregnant at the end of the first semester. Last year that figure had plummeted to just two" (<http://www.realityworks.com/>). One can visit the Realityworks website and read testimonials such as this to find out how Baby is changing adolescent perceptions of parenthood and related health behaviors to meet the purpose of lowering teen birthrates.

Another example of persuasive technology is Onsale.com, an online auction system that utilizes a socially interactive element to enhance the experience of real-time bidding (<http://www.onsale.com>). The website frames the purchase of an item as playing a game. Users do not "buy" items, they "win" items. Dan Frank, a company director of Onsale.com has this to say about the website:

Our objectives are getting people to the site, getting them to register, and, finally, getting them to make a purchase. People have fun at our site, and feel they've gotten incredible deals. But at times we've seen addiction to the auction process, with users getting in trouble with their spouses (King & Tester, 1999).

The previous quote mentions addiction, a different kind of power of persuasive technology, and when compared to the Baby, creates an interesting juxtaposition. Based on these two examples, one can begin to understand that the power to persuade users is inherently controversial. Few can argue against the value being provided to the user if Baby lowers pregnancy rates for under-informed adolescents. Is a similar value apparent for the user of

Onsale.com? In the first situation, the users of Baby are provided with a simulated experience, one that allows the user to test a possible choice without experiencing an irreversible, real-life consequence. Whether or not the user succeeds in properly taking care of Baby, they will learn about the experience of a having a newborn and therefore be able to make a more informed decision about parenthood.

In contrast, the users of Onsale.com make decisions that are by all practical means, permanent. Onsale.com exploits the natural human tendency to be competitive in order to augment the experience of spending money and obtaining an object of desire. Although a user may enjoy the experience of outbidding someone else, and may enjoy the result of owning a new object, the (net) positive or negative outcome of the purchase is entirely dependent on their specific situation over which the designer has no control. Could the user afford the object? Was the user capable of resisting persuasion if they could not afford the object? Was the object something they really wanted, or was it an impulse-buy driven by the persuasive interface? Thinking back to B.J. Fogg's definition of persuasive technology as something that has a prescribed, controlled outcome, Onsale.com does not entirely meet the bill. One can predict a user will spend money, but he cannot assure the outcome will be positive. If not, who is responsible-- the user?

Berdichevsky and Neuenschwander have begun to answer the question by authoring eight ethical principles of persuasive technology that call for designers to take full responsibility for disclosure to the user in regards to the potential effect of a persuasive device. More importantly, they ask designers to "consider, contend with, and assume responsibility for all reasonably predictable outcomes of its use" (1999). The "reasonably predictable outcomes" functionally include both intentional and unintentional effects, like abuse. Likewise, issues such as these have prompted Fogg to call upon practitioners in the human computer interaction (HCI) field to be proactive in shaping "the public policy that influences the design and uses of computers as persuasive technologies" towards safe, ethical, and responsible designs (Fogg, 1999).

So clearly, some leaders within the HCI community believe that users should be accorded a level of protection through the responsible and conscientious decisions made by designers of persuasive technology products. Following this directive, this research would like readers to consider seriously one of the fastest growing domains within persuasive technology: Health persuasive technology. What if one could permanently damage their health by misusing this technology? It was posited in one article that “Most people accept the idea that improving physical and mental well-being is a good thing to do. As a result, persuasive technologies promoting wellness benefit from a large and enthusiastic potential market and are unlikely to raise serious ethical questions” (King & Tester, 1999).

Of all the persuasive technologies available, the ones that directly affect human health are of great ethical concern. Using the pharmaceutical industry as an analogy-- if the Food and Drug Administration does not release new drugs to the market without first testing them to understand their potential effects on the human body, then why not exercise the same level of caution when introducing a technology to the market that would persuade someone to make a decision that affects their health?

Weight Loss Persuasive Technology

The survey of literature performed for this research uncovered more instances of weight loss persuasive technologies than any other type of persuasive technology. In fact, there were more than could be reasonably included in the scope of this analysis. And, since the Center’s for Disease Control and Prevention has reports that over 60 million people suffer from the obesity in the United States, the need for a technology powerful enough to persuade users to exercise more and eat less is immediate (<http://www.cdc.gov/nccdphp/dnpa/obesity/>). This technology’s speedy path to the market might be encouraged by the fact that many weight loss persuasive technologies can use an already pervasive technology, the mobile phone, to support their functionality. Consolvo et al remarks, “We see the investment these [mobile communication] companies are putting into fitness as a sign that mobile technologies to encourage physical activity show real promise...” (2006).

One example of a phone-based weight loss persuasive technology is NEC's 232E Fitness Phone that provides users with around the clock access to a virtual fitness trainer and dietitian, as well as custom workouts and meal plans (<http://www.nechdm.com/232/232.asp>). The phone has a *Calories Burned Calculator*, *Workout Diary*, and a searchable library of healthy recipes from Fitness Magazine. Although the Fitness Phone helps users track and monitor their dieting and fitness activities, it does not include a pedometer which is atypical.

A different example of weight loss persuasive technology is *Bones in Motion*, or BiM; a software application designed for use with a mobile phone that uses the GPS chip in the phone to calculate speed, distance, and elevation. The "location aware" application provides feedback to the user during physical activity about their pace which is an essential measurement for gauging improvement. If a user does not wish to visually monitor their progress while exercising, they can select a feature that will "beep" for every quarter of a mile traveled. If a user inputs their height and weight into the device, then the application can also calculate calories burned. The application archives all this information so that users can track their progress in a private journal or publish the information online which "...allows users to compare and compete in ways that will encourage ongoing use" (<http://www.bonesinmotion.com/>).

Two weight loss persuasive technologies of particular interest to this research are Chick Clique and Houston (Toscos et al, 2006; Consolvo et al, 2006). (See Appendix I.) These two socially interactive prototypes have been featured in pilot studies whose results, including user feedback, have been published. Quotations and descriptions from these studies offer a rare opportunity to glimpse the first hand experiences of users. Such technologies with socially interactive features are especially cutting edge and quite possibly the harbingers of the nature of all future persuasive technologies. This research postulates that the inclusion of socially interactive elements in technologies—similar to the trend observed on the Internet with websites such as MySpace, Friendster, Flickr, and del.icio.us—increases emotional investment and interest in the experience.

Chick Clique and Houston are also interesting in that their test groups exemplify the two overlapping target markets for weight loss persuasive technology examined in this research: women and adolescent girls. The pilot study for Houston specified that a part of their homogenous sampling was to select, "Three groups of women from the Seattle area..." but did not elucidate why they chose women versus men. An obvious reason for targeting women would be if women were prone to being overweight or obese, but this apparently not so. Cited from the Centers for Disease Control and Prevention's website: "In 2001, more men than women were classified as overweight...[although] Men and women were approximately equally likely to be classified as obese (<http://www.cdc.gov/women/natstat/overwght.htm>). So, if women are not at particular risk for becoming obese in comparison to men, then perhaps there the weight loss element is not the reason for isolating women in these studies. Perhaps there is something about the interactive social element of these weight loss persuasive technologies, and the social nature of girls or women, that makes them more concordant for this type of research?

The answer to the question may be partially revealed by the "Why teenage girls?" section of Chick Clique's research goals:

We targeted girls, ages 12 to 19 because they are more likely to become less active throughout adolescence when compared to their male counterparts [12]. Teenage girls are also more likely to use unhealthy techniques for losing weight such as skipping meals, extreme calorie reduction and purging [10]. Furthermore, girls were found to be more responsive to health behavior interventions in a two-year study targeting adolescent obesity [7] (Toscos et al, 2006).

Based on the above passage, the answer to "Why girls?" is because they are more responsive to "interventions" and also because they are more likely to use unhealthy techniques for losing weight. Is it possible that these two concepts are related? What if a girl receives an "intervention" from someone who is not a medical professional? Perhaps an overweight girl is told by her best friend that "Eating only celery" will improve her health...would she do it? Although the literature review did not provide enough evidence that this situation would be a problem for adult women, there is plenty of evidence about how and why adolescent girls are extremely susceptible to the health suggestions they receive from their peers.

One piece of evidence that demonstrates the vulnerability of girls to adopting unhealthy behavior is the well documented and massively popular online eating disorder community commonly referred to as the pro-ana nation (<http://www.msnbc.msn.com/id/8045047/print/1/displaymode/1098/>). There is a new “dialog of resistance against medical and professional constructions of EDs [eating disorders]” that discards the old identity of eating disorder as illness (Giles, 2006). People with eating disorders are coming together on the Internet to reject the idea of being victims of a devastating disease, rather they proclaim ownership of the ‘precious’ state-of-being which gives them beauty and meaning. The tools and techniques to lose extreme amounts of weight are transmitted from one person to another, faster than ever thanks to pro-ana and the Internet. This research compares how pro-ana girls achieve extreme weight loss, and compares their techniques with the persuasive elements of weight loss persuasive devices. This research assumes there are enough conceptual similarities between the behaviors promoting both types of weight loss to reasonably predict that sufferers from eating disorders will adopt weight loss persuasive technologies to support their extreme weight loss goals.

This may be especially true since there is nothing yet to prevent these technologies from being used by the underweight, or worse yet, suffering from caloric restrictive eating disorders such as anorexia and bulimia. In fact, one participant in the Houston study was underweight, and yet met the requirement of participation because of their desire to increase their level of exercise (Consolvo et al, 2006). To be fair, it could be supposed that increased exercise would result in building muscle and weight gain for this individual, but the type of exercise being encouraged by Houston was aerobic activity through walking or running, a slow-twitch muscle activity known for reducing fat and limiting overall muscle density.¹

The likelihood and volatility of the pro-ana situation is compounded by the young age at which girls begin to participate in pro-ana activity. The following expository section describes modern anorexic culture and the pro-ana infrastructure that could easily adopt weight loss persuasive technology as yet another weapon in their arsenal against weight gain.

The Pro-ana Nation

Pro-ana is an international youth movement that supports eating disorder (ED) as a lifestyle choice, not a disease. The pro-ana name is a catchy abbreviation for 'pro anorexia', and often acts as an umbrella identity for other pro-EDs such as pro-mia (pro bulimia) or ED-NOS (eating disorder not otherwise specified) (Giles, 2006). Some of the "other" varieties of eating disorder groups purposefully separate themselves from pro-ana feeling unaccepted or uncomfortable with the elitist nature of ana ideology, but the majority of the ED community uses pro-ana as their primary identifier because the "general assumption [is] that ana represents an ED ideal" and is sanctified by the majority as the ultimate achievement of self control (Giles, 2006). The previously mentioned elitism of anorexia stems from the belief that fasting has none of the "ugly" bingeing and purging behaviors, the latter being physically gruesome, the former indicating lack of discipline and self-control.

Pro-ana has its home on the Internet and can be observed in the entire gamut of web-related medias including pro-ED (pro eating disorder) websites, discussion boards, blogs, chat rooms, and social networking or photo tag sites like MySpace, SecondLife, Flickr, and 43things. "In 2003, there were ~500 pro-ED sites in existence, outnumbering pro-recovery sites 5:1 (Wilson et al, 2007; Chelsey et al, 2003). No one knows for sure how many websites there are since the producers of pro-ana content have gone somewhat underground after the National Association of Anorexia Nervosa and Associated Disorders (ANAD) attacked Yahoo! in 2001 for hosting pro-ana content, which was subsequently removed by Yahoo! (Reaves, 2001). Since then, other public hosts have followed suit to protect themselves from public controversy, causing much of the previously observable pro-ana activity to go 'underground' to avoid censorship, while others steeled themselves against the 'witch hunt' by adding legal disclaimers to their websites (Shade, 2003).

Although many anas declare pride in their ideology, proud or not, almost all are on the defense, protecting themselves from disapproval on numerous fronts, whether from the eyes of parents, spouses, doctors, or society at large. Pro-ana has developed a practical secret society, complete with its own symbols, language, poetry, insider knowledge, and last but not least-- a

diety, Ana, (or any subtle variation of Ana such as Anna, Anamadim, etc.) the goddess of anorexia. “The foundation of the pro-ana faith is a series of ten commandments (a.k.a The Thin Commandments). They include such gems as ‘#5: Thou shall not eat food without punishing oneself afterwards’ and ‘#7: What the scale says is the most important thing’ (Bushnell, 2006).” If a girl is feeling weak, and tempted by food, she can recite the Ana Creed:

I believe in Control, the only force mighty enough to bring order to the chaos that is my world.
I believe that I am the most vile, worthless and useless person ever to have existed on this planet,
and that I am totally unworthy of anyone's time and attention...

or Ana Psalm:

Strict is my diet. I must not want. It maketh me to lie down at night hungry. It leadeth me past the confectioners. It trieth my willpower. It leadeth me in the paths of alteration for my figure's sake. Yea, though I walk through the aisles of the pastry department, I will buy no sweet rolls for they are fattening... (*Fading Obsession*, 2006).

For pro-ana, the act of starving is religious devotion, spiritual expression, and an act of resistance against an excessive, contaminated world. The effects, ana believes, are the hard earned blessings of beauty—the sight of her bones.

“Dr. Santucci runs a national organization helping those with eating disorders [and] [s]he’s alarmed by pro-ana sites and the secrets they share...’How to fool your doctor. How to fudge your weight. How to lose more weight. What to eat so you won’t get hungry. How to vomit...all the trade secrets are exchanged” (Murphy, 2005). Girls also teach each other how to obtain pharmaceuticals that facilitate purging and weight management. Fox et al recounts an incident on the *Anagrrl* discussion board where a girl, desperate to buy her favorite drugs she used in the United States offers to send money from New Zealand where the same drugs are not available:

I’m really putting my trust into everyone here, money-wise...What I am asking is this: Is there anyone who would receive a money order from me, big enough to pay for pills + postage + packaging,..I miss them like I would miss my right arm...” (2005).

Fox et al note that the phenomenon of “sensible drug-taking” is practiced by the equally body-centered culture of body building (2005). Both body builder and pro-ana groups have normalized their drug-taking routines as a necessity for maintaining bodies that are beyond the

mainstream and value their drug use as an indicator of membership to an elite group (Fox et al, 2005).

Despite the clear health dangers associated with extreme weight loss practices, pro-ana is convinced that the anorectic condition is manageable and healthy. By the time the conditions of anorexia have damaged a person's life, there is nothing left but the anorexia. Melissa, a 23-year-old patient undergoing treatment for her anorexia talks about what she has missed:

"I've never had a boyfriend. I feel about 14 years old because I've never had any experience that other people my age have had, with boys, and friends and puberty and everything like that. I just feel like since I was 10, my eating disorder kept me from life" (Greenfield, 2006)

Like many anorexic girls, Melissa found out too late that becoming thin did not bring her closer to a life of friends and excitement. Becoming anorexic bleeds away the time and energy that would be normally devoted to other parts of your life. Sufferers of anorexia are often surprised by the eventual epiphany that their lives are bankrupt and that their entire identity is about anorexia. When they find themselves in that place, they often do not want to give up the only thing that defines their existence.

Even if sufferers of anorexia look for help, they have reported that going to eating disorder recovery sites only makes them feel more defeated. Stefanie, a single mother, recounts her experience trying to seek help through a recovery site: "I felt worse about myself...I felt like a freak. I'm not normal. I mean they're lucky because they got over it. They survived it. And that doesn't leave me anything" (Murphy, 2005). Like many others who turned to recovery sites for help, Stefanie found that going back to pro-ana sites was the only way she could find camaraderie and support. This unfortunate circumstance is the self-perpetuating trap that is pro-ana. In the pursuit of solace on a pro-ana site, even a recovery hopeful will be lured by their old triggers, like seeing pictures of thin girls, hearing stories about being teased or objectified, or simply witnessing the "success" stories of other anorexics who declare newfound strength and happiness in their disease. Mulveen & Hepworth observed that the longer girls interact with other mentally ill girls, the longer their eating disorders last, or intensify (2006). Unfortunately, because of the Internet, anorexics can now easily connect with many others internationally, and in the

privacy of their own homes. Fox et al, believes that “The pro-anorexia...movement has been nurtured by two technologies: information and communication technology such as the internet, and the development of effective pharmaceuticals for weight loss” (Fox et al, 2005). If true, then is it socially responsible to add weight loss persuasive technologies to this already dangerous mix?

An initial comparison between the behavior modification techniques used by people suffering from eating disorders and the behavior modification techniques implemented through persuasive technology reveals an uncanny similarity. Stephanie, a 14-year-old anorexic going through residential treatment for her eating disorder describes the following experience:

Leslie used to be my best friend. She went the other way and became bulimic. When school started, it turned into this competition. She would monitor everything I ate and I would monitor everything she ate. She would call me and say, “I ran 5 miles today.” Then I would say “I’ve got to go and run 10 miles.” Or I would see her run up the stairs and then go to class, and then I would use the hall pass so I could run up the stairs and burn those calories also...When I come back [from treatment], she’s gonna be really skinny and I’m gonna be heavier and she wins (Greenfield, 2006).

A similar social pressure is experienced by a group of overweight users of the persuasive device, Houston with Omron HJ-112 digital premium pedometer, as they attempted to meet their weight loss goals:

Because participants were sharing activity level and progress toward their goal with buddies, they felt pressure to make their goal, beat a buddy, or not have the lowest step count. One participant explained how she was motivated to meet her goal because her buddies would know if she did not, “I wasn’t gonna let them see that I wasn’t gonna meet my goal.” Yet others were inspired to beat a buddy’s count, “[a buddy] just started contacting me like ‘how many steps do you have?’ And then I would tell her. She’s like, ‘well, I have this many.’ And so we were sort of competing with each other”...Another participant mentioned...“I didn’t want to be the one with the least amount of step count...” (Consolvo et al, 2006).

The initial discovery of competition as a similar element shared by both domains became the seminal motivation to seek behavioral similarities between anorexics and users of weight loss devices.

Research Methods

This research asserts that enough behavioral similarities between the domains of anorexia and weight loss persuasive technology exist to warrant concern of the HCI community. In order to prove this, behavioral similarities between how anorexic girls reach their weight loss

goals and how weight loss persuasive devices support weight loss goals are compared in the following latent content analysis.

Latent Content Analysis

Domain Definition & Literature Selection

Once the two domains of interest were established, an appropriate sample of literature was selected per each domain. The first domain, given the label **Domain 1 (D1)**, refers to how anorexics achieve weight loss goals. The second domain, **Domain 2 (D2)**, refers to how weight loss persuasive devices support weight loss goals. Before going any further, it should be noted that both domains are gender biased towards women. All user testing in the **D2** literature selection was performed on girls and women between the ages of 12-42 and likewise, the research performed for **D1** concerned adolescent and young women.

Literature selection for these domains posed two challenges, the first in **D2**; persuasive technology is a new field with an extremely limited body of literature and the decision to look specifically at weight loss persuasive technology further narrowed the pool of available literature. The small universe from which to sample literature limited the unit of analysis for **D2** to the paragraph. Analyzing units any larger than the paragraph was impossible since the desired information was typically presented in summary overviews of emergent technologies or pilot studies conducted with prototypes. Where user and researcher evaluations of weight loss persuasive devices were not available in the literature, device feature descriptions were used to augment the analysis.

The second challenge was to isolate an appropriate facet of literature for **D1** about anorexia when the body of literature is not only vast in quantity but diverse in scope. The concern that the pro-ana nation will act as a catalyst for the adoption of weight loss persuasive technology among girls suffering from eating disorders guided the literature selection. Enough articles are available on the subject to allow the unit of analysis for this **D1** to be entire journal articles (and in one instance, a book). Also, since the literature selected for this domain was generally about the social structures and social identities of anorexics, two journal articles were chosen to represent

some subjects of peripheral relevance. One paper was about the effects of friendship cliques on eating disorders, and the other about how parents can affect children suffering from eating disorders (Paxton et al, 1999; Martinez-Gonzales et al, 2007). The literature about friendship cliques and anorexia had particular relevance since one of the weight loss devices is named *Chick Clique* and both seek to elucidate the social relationships of girls. Together, the literature chosen for research represents the environment of human interpersonal relationships that drive anorexia for girls.

Activity Definitions & Operationalization

The process of selecting activities for comparison was an intuitive and iterative process. As the literature was read, if types of weight loss phenomena, behaviors, concepts, or technology features presented themselves as effective elements of reaching weight loss goals, then an activity was defined at the highest level possible in order to make it viable across different domains. If certain behaviors were mentioned with specificity and frequency, then they would be broken out into individual activities. If new, but similar behaviors were observed that nearly fit into a pre-existing activity, then sometimes a small adjustment of the wording made it more functionally inclusive. This objective to make activity definitions as inclusive and high-level as possible, they are a bit nebulous and can conceptually overlap each other at times. The overlap is indicative of the inter-connectedness of the concepts and should not be considered as detracting from the results of the research which are at any rate, highly interpretive.

Activity Coding and Passage Selection

The activities in this research were coded based on their existence, not on their frequency. The binary unit “1” reflected the presence of an activity within a unit of analysis, and the binary unit “0” reflected the absence of an activity within a unit of analysis. Noting the frequency of activities within unit of analysis did not appear to reveal any extra richness of meaning, merely redundant information. This research sought to distill the information down to the most cogent passages observed within a unit of analysis. If there was more than one

passage within a unit of analysis that was particularly meaningful or poignant, then it was listed in the comparison, but the total score for the activity remained as a “1”. For instance, the book *Thin* by Greenfield, 2006, was much larger piece of literature than the journal articles and contained a wealth of nuanced information. *Thin* as a unit of analysis was typically paired with two passages per activity to reflect the multi-dimensional quality of the information from that unit (Greenfield, 2006).

Passage Comparison

Activities were coded for both domains of literature for comparison. Passages were compared by grouping them into tables based on their domain and per the type of activity. (See Appendix III.) Grouping the passages in this manner allows the comments to have more impact. So, for instance, the reader can see all of the comments pertaining to *Peer Pressure* from literature about anorexia, and then all the comments pertaining to *Peer Pressure* from literature about weight loss persuasive technology. When the passages are compared in this manner, the effect is raw and visceral.

Activities Defined

Activity 1: Using a mechanized self-monitoring device to heighten self-awareness

The activity *Using a mechanized self-monitoring device to heighten self-awareness* is typical of all the following activity names, long and cumbersome, but made to be highly descriptive. The activity is describing behavior at the highest level of action possible without stripping the action of its essence. The literature for **D2** focused on pedometers combined with persuasive devices that gave quantitative feedback to users concerning their physical status. The general observation is that a machine is allowing a user access to an exact number (e.g. 1500 steps taken) about their physical status. This is in contrast to a machine-free evaluation, such as a retroactive reflection like, “Today I walked from my house to the store,” which lends itself to a subjective estimate of progress towards the weight loss goal.

This research assumed that using a scale to measure weight is a similar experience to using a pedometer in that users are seeking an immediate and exact empirical number from a machine to evaluate their physical status instead of making estimates of physical progress by such as recognizing a noticeable change in the way their clothing fits. For this reason, any mention of using a machine that could give a user immediate and empirical feedback about their physical status was recorded under this activity.

Activity 2: Information exchange, transmission & learning about how to achieve goal

Throughout the literature, people described how they learned about weight loss techniques. Some examples of the ways they shared information included discussion boards on websites, messaging through persuasive devices, or spontaneous conversation face to face.

Activity 3: Feelings of connection, validation & camaraderie

Having camaraderie with others was mentioned as an important element of well-being and motivation by weight losers in both domains. The emotional connection itself appeared to provide something of value distinct from seeking or receiving encouragement specifically towards weight loss goals. Girls could confirm their status towards their goals by comparing themselves to others in a safe environment as well as establish a sense of normalcy and belonging.

Activity 4: Creation of a record about goal oriented activities

Any creation of a record documenting weight loss progress was included in this activity. Some documents were hand made while others were machine produced. Some of the types of journaling observed were records about daily caloric intake and daily weight loss. Others were reflections about the body, self, and related emotional states while struggling to lose weight. Some persuasive weight loss devices would automatically compile biometric data for users or allow them to input data about their caloric intake, weight, and other dieting related concerns. The more sophisticated weight loss persuasive technologies could show trends by using the information in bar charts to give the user a graphical representation of their progress.

Activity 5: Encouragement & support specifically towards goal

This activity sometimes conceptually overlapped activity number 3, *Feelings of connection, validation & camaraderie*, but was made to document specific times that people mentioned being encouraged towards their weight loss goals. Sometimes this happened within the comforting context of being emotionally supported by a group and other times it was more pointed, perhaps a challenge coming from a parent or trainer.

Activity 6: Deliberate seeking & using multi-media inspirational material

This activity was added to reflect the trend among pro-ana groups to use photographs of thin women to motivate their extreme weight loss behaviors. Pro-ana inspirational multi-media also included poetry and prayers written to the “goddess” of anorexia.

Activity 7: Outside recognition or reward for meeting goal

Many weight losers mentioned the desire for recognition for meeting weight loss goals. This longing was often implied in the context of activity 3, *Feelings of connection, validation & camaraderie*, but stood out as a distinct motivator because of its powerful affect on those who sought and achieved it.

Activity 8: Competition against others achieving the same goal

Competition was an ever present element of reaching weight loss goals, whether or not it was explicitly stated. This research strictly identified competition when identified as such, or when competitive situations were described in enough detail to be unmistakable.

Activity 9: Peer pressure

Peer pressure is very difficult to define since it is a highly subjective experience per each individual and exists in many different forms. Sometimes, peer pressure comes in the form of a comment from a friend or schoolmate, and other times it is less tangible and can be experienced as the perception of unspoken rules that exist among social groups. Incidents of peer pressure were recorded if the subjects within papers labeled their experience as such, or if they could point to a specific action or situation they felt had negatively affected their self-esteem. This research

only recorded peer pressure leading to negative outcomes, i.e. unhealthy physical or mental states.

Activity 10: Customization or creation of a plan for action

Weight losers from both the anorexic and weight loss technology domains found it helpful to create a plan for action, customize, or be provided with a customized diet and exercise plan.

Activity 11: Self accomplishment, meeting a set goal

For other weight losers, self recognition for meeting a weight loss goal was satisfying in and of itself. Others simply needed something, anything, they could succeed at, and if weight loss was that thing, then it served the function of providing a sense of accomplishment. The concept of feeling accomplished does sometimes conceptually overlap activity 9, *Outside recognition or reward for meeting goal*, but not all weight losers were able to articulate the relationship between self accomplishment and recognition by others for being accomplished, so this activity was kept separate.

Activity 12: Setting a goal

Although extremely rare, for some, simply having set a goal was motivating. This activity is only a slight variation on the previous categories, but conceptually interesting since not all people respond to goal setting itself. It is possible that if a person has a history of success with reaching goals, the act of setting a goal is compelling; this issue should be explored in future research.

Activity 13: Group goal achievement

Group goal achievement was mentioned as a motivating factor within the literature about Chick Clique, one of the two socially interactive persuasive weight loss technologies. Even though it was a singular incidence, socially interactive persuasive weight loss technologies are of particular interest to this research and thus the activity was added to create the fullest picture possible about the technology.

Activity 14: Fun & gaming

Fun & gaming was added as an activity to accommodate the persuasive devices geared for children and had some cross over with persuasive devices for adults.

Challenges in Operationalization

As demonstrated by the previous descriptions, it is often very difficult to decide how to identify an instance of an activity within text. Please note that the activities related to *Peer Pressure*, *Outside recognition or reward for meeting goal*, and *Self accomplishment*, *Meeting a set goal*, are surely underrepresented as they were notably present throughout Greenfield's *Thin* which conveyed a wider scope of anorexic behavior while the journal articles were more narrow in their scope (2007).

Another notable challenge was operationalizing the activity, *Using a mechanized self monitoring device to heighten self-awareness*. Although pinpointing instances of pedometer use was no problem, defining instances of scale use was unexpectedly difficult since the literature did not always explicitly mention scale use and self-weight monitoring behavior. The act of weighing oneself during the process of weight loss is perhaps an act too common or obvious to mention. For this research, the term "weight" was interpreted as an implicit indicator that a scale was being used. Also, it should be noted that the literature used the colloquial and popular term "weight loss" to generally describe body fat reduction. This is an important distinction to make considering there were no mentions of weight losers calculating their body fat indexes within the literature.

The terminology in the literature reviewed for both overweight and underweight groups indicates a unanimous preference for using the specific words "weight loss," a trend most disturbing among extreme weight losers where weight loss behaviors not only reduced body fat, but depleted muscle mass and bone mass (American doctor helps treat anorexic Australian twins, 2005). Both overweight and underweight groups seemed most concerned with the numbers on the scale, and for the underweight, this meant pushing the number down long after they had obliterated their body fat. It can be surmised that the scale plays a very prominent role in how

users measure their progress towards weight loss goals and how they choose to perceive their bodies.

Research Objectives

The objective of this research was to initiate a preparatory investigation of the elements which make weight loss persuasive technology effective and compare them with the devices promoted by the pro-ana nation for extreme weight loss. This research is not designed to conclusively decide whether or not a dangerous parallel exists, but to begin a discussion about where these two things begin to converge and diverge, and to consider the possibility that weight loss persuasive technology may be used in the future for self-harm. The combination of the limited (but rapidly growing) body of knowledge in the field of persuasive technology combined with the operational challenges which presented themselves in this research are enough to invalidate any of the findings individually, but the larger picture is that there is a need for an approach to discovering how persuasive technology designs may affect different users. If nothing else, this research hopes to generate interest among HCI professionals in becoming more proactive in evaluating persuasive technologies that can affect user's health, and encourage the development of a tool set or range of approaches for such evaluations.

Research Findings

Activity 1: Using Mechanized Self Monitoring Devices to Heighten Self-Awareness

As previously mentioned in the methods section, it was more difficult than expected to find direct quotations about anorexics weighing themselves, but there is clearly an obsession with weight reduction and one can safely assume that scale use is ubiquitous among the ED community. In fact, while girls are in residential treatment for eating disorders at The Renfrew Center, they have their "blind weight" taken. Blind weight refers to how girls are weighed facing backwards on the scale to prevent them from seeing their weight. Even for a girl who is willingly attending treatment and desires recovery, seeing the growing number on the scale can trigger extreme anxiety and a backslide towards purging and caloric restriction. One girl at Renfrew

describes how she evades “blind weight” by jumping on the scale during her daily checkups before the nurses can forcibly turn her around. She defends her actions by saying, “I would die if I didn’t know my weight every day” (Greenfield, 2006). This sentiment is shared by all the girls at Renfrew and illustrates their addiction to monitoring their weight.

Another girl named Stefanie speaks candidly about her obsession with weight in an interview with CBS correspondent Melinda Murphy of *The Early Show* (Murphy, 2005). Murphy observes that “For much of the last 20 years, Stefanie has defined her days in numbers...[and] the number that really concerns her is the number on the scale...” (Murphy, 2005, *The Early Show*). Stefanie counts her calories religiously, keeping a diet of approximately 500 calories per day. Meanwhile, the petite 5’ 7” woman has pushed her weight from 135 pounds down to 105. When asked by Murphy how much she would like to weigh she answers, “I’ll know when I get there” (CBS News, 2005).

Users of weight loss persuasive technologies have more than the scale to judge their relative achievement towards weight loss. Some of the different measurements available to them are caloric expenditure, number of steps taken, and distance traveled. Users of weight loss persuasive technologies reported a greater awareness of their progress towards weight loss related goals. One user of Houston stated, “I’d be constantly checking it [the pedometer] to see where I was as far as meeting the goal for the day” (Consolvo et al, 2006). This passage is most similar to the behaviors mentioned by the patients at Renfrew, reflecting a level of obsessive interest in knowing exactly where one stands in relation to their goal. A user of Chick Clique made a more moderate statement that “[Chick Clique] makes me think more about what I eat and how much exercise I get” (Toscos et al, 2006).

The results of this comparison indicate that knowing about progress towards a goal is valued by both domains. Also, there seems to be something highly motivating about the granularity of feedback and being able to micromanage one’s progress towards a goal. Perhaps using a precise measuring device gives the user a sense of control, either getting instant gratification by seeing their minute progress, or being able to respond quickly when seeing a

trend in the opposite direction. Either way, it could be surmised that there is something highly seductive about having instant and granular feedback about the body, especially for those focused on their physical status. That said, the pro-ana market will find utility in using persuasive weight loss devices.

It should also be pointed out that people are currently couching their goals in terms of the tools available. When people state that they want to “lose weight” they are typically colloquially referring to losing fat, not weight per se. Nowhere in the literature reviewed for this research did anyone say that they wanted to “lose fat” or mention calculating their body fat indices. The language of weight loss simply shows how the scale has shaped the way people talk about their health behavior. It might be concluded that there is a cultural fixation with actual weight that goes beyond body mass associated with fat. This is apparent among anorexics, who even in their most advanced stages of illness, after they have clearly reduced their body fat to almost nothing, continue to fight for weight loss which results in muscle mass and bone destruction.

There are two women who are perfect examples of this heightened weight loss obsession. The 34-year-old twins Clare and Rachel Wallmeyer have devastated their bodies after 20 years of extreme weight loss behavior. Clare has been reported as having the bone density of a 72-year-old, weighing only 58 pounds, while Rachel's bone density is that of a 100-year-old and weighs only 48 pounds (ABC News, 2007). The twins, who look as though they are well into their 80's, are featured as thinspiration on some pro-ana sites, where there appears to be a growing trend to pursue weight loss for the sake of weight loss itself with disregard to the previous concern about reaching media beauty ideals (*Thinspiration for the Proanorexia Community*, 2007).

Activity 2: Information Exchange, Transmission & Learning How to Achieve the Goal

Some girls recollect face-to-face interactions as the seminal moments for learning how to cultivate their eating disorders. One Renfrew patient recalls:

When I was 10, my mom's boyfriend's daughter showed me how to purge. One day, we were at the table and we were eating dinner and she said, 'Cheryl, come here.' We went into the bathroom

and she said, 'You want to lose weight? This is how you do it.' And as she was saying that she stuck her fingers down her throat and threw up the food she had just eaten (Greenfield, 2006).

Upon first glance, the reader may want to label this situation as an outlier since it has several extreme elements. First, the taboo skill of purging is an abnormal human behavior; second, the skill was being shared with someone at 10 years of age; and third, the 10-year-old girl found enough value in the outcome of purging that she adopted the behavior as her own.

One could assume that this was an unfortunate situation of circumstance, but the literature reveals the contrary:

We live in a culture that supports obsessions with the body, food, self-improvement, and personal transformation of a physical nature. Perhaps this is why we are fascinated with eating disorders and why they have been glamorized by a media that highlights the rich and famous celebrities who have fallen in its wake (Greenfield, 2006).

Similar to adults, young girls are not immune to this fascination with ED. They are highly receptive to the suggestion that having an ED will help them achieve a happier life and will seek out information that supports the goal of cultivating an ED.

One participant of a pro-ana discussion board comments in Fox et al about the new girls who visit the board and how they are not yet "real" anorexics, "...especially [the] younger ones (13 or 14 who come onto sites and ask how to 'become' ana, or say they are 'trying', but want tips other than fasting and purging – ones that require no effort or pain" (2005). The passage reflects the young age at which girls will actively seek information to cultivate an ED. The Internet exacerbates this situation by making information easily accessible, which is exactly why "Millennials" (young people between the ages of 13-24) value the Internet. "Millennials vividly expressed excitement, freedom, immediacy, and most of all control over their experience [on the Internet]—where they go, what they learn, what they buy, whom they talk to, and how they live their lives" (Harris Interactive and Teenage Research Unlimited, 2003).

If pro-ana sites are places where girls can share "...large amounts of information, 'tips' and 'advice,' then how different is that situation from the Chick Clique study where "Many of the girls stated they messaged one another discussing health related issues and tips, something they

wouldn't ordinarily do" (Giles, 2006; Toscos et al, 2006)? Both situations demonstrate the value girls find in sharing health information, framed by the common goal of weight loss.

Notably, the participants' comment that messaging each other about health information is, "something they wouldn't ordinarily do" is corroborated by the observation that teens use "...[instant messaging] IM to say something that they would not have said to somebody's face. They report feeling a measure of protection using IM because writers cannot see the first reaction of the recipient. 'It is easier to talk to someone about certain topics online, than to talk about them face-to-face,' reported a 17-year-old girl in the Greenfield Online group discussion" (Toscos et al, 2006; Lenhart et al, 2001). Based on the similarity of information exchange and the findings that sensitive information is more easily exchanged through electronic interfaces, socially interactive weight loss persuasive technology becomes an ideal medium for supporting the goals the anorexic girls.

Activity 3: Feelings of Connection, Validation & Camaraderie

The feeling of being connected to others was frequently mentioned as an important motivator for participating in pro-ana groups. Whether girls were seeking recovery or not, most felt isolated or shunned when interacting with normal people or recovered anorexics, and preferred to visit pro-ana sites for emotional support. As described by Wilson et al, "Pro-ED Web sites are interactive and sustain a community of individuals through message boards and chat rooms. The community acts as a clique, a type of social interaction...[that allows] visitors [to] feel more able to express themselves..." (2007).

Some girls insist that pro-ana sites are not about support for sufferers of EDs, rather they observe that members are simply needy for attention. One disgusted complaint was, "It seems it's full of selfish people thriving on attention and I don't feel like anyone is being supported as they should be" (Fox et al 2005). Another bold remark was made by Sara, a former president of Beta Sigma Kappa, the official Ana sorority, who stated, "I guess I was attention-starved," when she reflected on her involvement with pro-ana culture (Pro-anorexia movement has cult-like appeal, 2005).

The experience had by participants in the Chick Clique pilot study was similar, but less self-absorbed in flavor. “One of the participants said that using Chick Clique ‘brought us all together more. We could talk about being healthy and our issues with being healthy, because no one [normally] wants to talk about that and [we were] more comfortable’” (Toscos et al, 2006). This domain shares similarity with the pro-ana domain in that both groups found value in feeling connected as a source of comfort and support. The power of social validation is not to be overlooked as a force which “drives human behavior” (Cialdini, 2001). If weight loss persuasive technologies continue to leverage social validation in their designs, these technologies will be attractive to pro-ana girls.

Imagine an anorexic girl who feels shunned at her school suddenly able to walk around with a pedometer on her arm through which she can give and receive support with other anorexics throughout the day. The major concern with this level of connectivity is best described in the article *The Psychology of the Internet*, where Wallace states:

Interacting with a small subset of like-minded others our framework for social comparison could become rather warped. We could quickly acquire an exaggerated perception of the rightness of our views because we found others who not only agree with us but who are even further out on the attitudinal limb (1999, pg. 79).

Not only is it likely that anorexics would seek camaraderie through weight loss persuasive devices, they would also be reinforcing their unhealthy behaviors, even if they desired recovery.

Activity 4: Creation of a record about goal oriented activities

Journals are ubiquitous throughout the ED world. In the pursuit of extreme weight loss, girls will record their daily caloric intakes, the amount of exercise they get, their weight, and their feelings about how they perceive their “fatness” on any given day. Journaling can provide positive or negative reinforcement to push down caloric intakes and can add another level of obsessive, micromanagement to one’s life. Page 83 in *Thin* shows a calorie journal in which one patient carefully tracked her calories to maintain a goal between 200-300 calories per day (Greenfield, 2006). Sometimes these journals are kept private, but many girls find it effective to journal online where they have a sense of accountability to the pro-ana community.

Journaling, tracking, and trending are increasingly common features found in persuasive technologies. “Most participants found value in Houston’s trending information....[one] participant explained how the *last 7 days* feature impacted her, ‘*I’d go, oh gosh, I had a really good day Monday because I went out and walked and it’s now Thursday and I haven’t done any exercise...[this is when you know] you had better get your behind out to the park tomorrow.*” (Consolvo et al, 2006). Similar to the experience had by an anorexic using a journal, the user of the weight loss persuasive technology found inspiration to modify her behavior by seeing a visual reminder of her progress.

Although there were fewer instances in the literature about the value of tracking, trending, or journaling in order to meet weight loss goals, this is clearly another behavioral parallel. Devices such as *Bones in Motion* allow users to enter their every calorie consumed and match it against their calories burned (<http://www.bonesinmotion.com/>). This same type of exacting awareness about caloric exchange is replicated by journal keeping for anorexics. A girl with an ED would find the micromanaging quality of a weight loss persuasive technology extremely useful in her struggle to maintain a 200 calorie diet.

Activity 5: Encouragement & support on the way to goal

In addition to desiring general camaraderie, anorexic girls reported that they appreciated encouragement focused on their weight loss goals. This activity conceptually overlaps the activities *Information Exchange* and *Camaraderie*, but was separated out because there was a regular distinction between simply sharing tips or techniques and explicit encouragement. The most abrasive and perhaps unwelcome example of encouragement was found in *Thin* where a girl at Renfrew describes members of her family paying her money to lose weight: “When I was 10 yrs old, my mother and aunt paid me \$100 each to lose 10 pounds” (Greenfield, 2006, pg. 42).

More common in the literature review were examples of how girls with EDs would give and receive support towards their weight loss goals. There is one instance where a girl tries to protect her elite status as an anorexic by cruelly deriding another for seeking encouragement, “if you are truly anorexic you don’t really need someone telling you what to do...” (Giles, 2006). In

response to this coldness, another girl on the discussion board steps in and offers to provide help offline by saying, “hey i feel your pain...im always available whenever needed you can even call me [phone number] im nice:)” (Giles, 2006). Ironically, the girl who tried to chase away the new participant was refusing to offer the exact type of interaction that likely supported the cultivation of her own ED. Direct person to person support is an extremely effective motivator and makes pro-ana websites attractive to girls conquering extreme weight loss goals.

In comparison, weight loss persuasive devices can give encouragement in several different ways that are compelling to different degrees. The first type of encouragement is from other people through the socially interactive device. Participants in the Houston pilot study “enjoyed receiving recognition and encouragement from their buddies. One participant described what it felt like when she received *Wow!* and *Good Job!* messages from her buddies, “*I thought it was great. It made me feel good*” (Consolvo et al, 2006). This situation demonstrates that even a few words of encouragement have a notable effect on the recipient.

The second type of encouragement is demonstrated by the relational agent Laura, who has been programmed to provide pre-defined encouragement to the system user. One user comments, “In the beginning I was extremely motivated to do whatever Laura asked of me, because I thought that every response was a new response” (Bickmore & Picard, 2005). But later, as the user began to recognize repeat phrases, the motivational effect of Laura’s encouragement wore off. This does not mean that this technology is not promising. Research shows that,

Even though computers can’t demonstrate true empathy because they don’t have the capacity for real feelings...Klein et al [2002] demonstrated that as long as a computer appears to be empathetic and is accurate in its feedback, that it can achieve significant behavioral effects on a user, similar to what would be expected from genuine human empathy (Bickmore & Picard, 2005).

If computers will someday have the power to provide accurate feedback, then “...relational agents on mobile devices could provide a particularly powerful combination, both for relationship building (a ‘buddy’ who is always with you) and for behavior change (e.g., providing interventions at the time and place of need...)” (Bickmore & Picard, 2005).

The third type of encouragement is best exemplified by a persuasive weight loss device marketed to children, the Pocket Pikachu. "...Pikachu encourages physical activity by learning new tricks and becoming happier as the step count increases" (Consolvo et al, 2006). In order for this device to be effective, the owner of the device will have to find something inherently valuable or entertaining in watching Pikachu be "happy." The most frightening thing about the Pocket Pikachu is not its effectiveness, but that it's clearly marketed towards young children.

So long as people can socially interact through weight loss persuasive technology, the technology will support the task of weight loss, no matter the user.

Activity 6: Using multi-media inspirational material

A common behavior of anorexics is to use multimedia material as inspiration to meet their weight loss goals. Pro-ana sites use photographs, poems, music, and creeds as "thinspiration" among other forms of media. Thinspiration sites often display pictures of models that are clearly anorexic in addition to Hollywood actresses who are known for having eating disorders or appear thin enough to warrant the diagnosis. For instance, Mary Kate and Ashley Olsen are revered as "goddesses" of anorexia even though Mary Kate is the only one of the two who has been diagnosed. Girls will sometimes do the reverse of looking at images exemplifying thinness, instead they will mark up pictures of themselves with derogatory comments about their own appearances. For instance, Thin features a page of a journal where a girl displays a picture of herself when she weighed 82 pounds. In the picture she is clearly malnourished and has a feeding tube inserted in her nose. The caption reads, "I can't believe I weighed 82 lbs. That's way too fucking much" (Greenfield, 2006).

Interestingly, there were no instances found among the readings about girls using inspirational materials with weight loss persuasive technologies. Although it is quite conceivable that they could have if they wished since cell phones have the capability to store photos or music.

Activity 7: Outside recognition or reward for achieving goal

In order for an anorexic to be recognized as having achieved her goal, she must be recognized by other girls with EDs as being a "real" anorexic.

"[Anorexics share]...the fear of appearing 'phony' or not 'real', suggesting that there is something intrinsically *authentic* about the nature of anorexia. It is a club with stringent entry criteria, which are

not met by... [those who lapse into an occasional binge]...or have failed to 'earn' membership through medical diagnosis (Giles, 2006).

Another way for a girl to be authenticated is to undergo the medical insertion of a feeding tube. "One girl was saying yesterday that getting a tube is a status symbol that you are really anorexic. And that's how I view my PEG tube" (Greenfield, 2006). The implications of being diagnosed with anorexia or having a feeding tube are horrifying, and yet they do act as rewards for anorexic girls seeking status among the ED elite.

Sometimes, a girl can use her beauty to prove her accomplishment as an anorexic. For example:

[A] forum was dedicated to posting photographs, and some were captioned with a comment about the image might be 'disturbing' or even 'crack the screen', because the participant was fat and undesirable. But these photographs appeared to have been selected with care, to present a deliberately staged version of the self, where hair, make-up and clothes had obviously received considerable attention. They received much comment from other users, who would compliment the pictures, noting that the subject was exceptionally thin and beautiful, and a source of *thinspiration* (Fox et al, 2005).

The previous scenarios stand in stark contrast with the following weight loss persuasive technology, in which Houston participants were rewarded for meeting their goals simply by the appearance of a star icon. One participant comments, "...*It was kinda cool to have that* [the '*'] [*It's*] *The little things that count, the star*. And of course, the more stars, the better..." (Consolvo et al, 2006). And surprisingly, although there were examples in the weight loss persuasive device literature where girls encouraged each other to reach their goals, there were no direct congratulations offered.

Activity 8: Competition

Competition is the bane of every anorexic's existence, acting as a catalyst for unhealthy and obsessive behavior. One anorexic at Renfrew described how she and her roommate would affect each other to exercise and diet: "When [my roommate] would see that I came from the gym, she would automatically put on her running shoes. It was something that triggered me, like, Well (sic), if she's on a diet, I should still be on my diet" (Greenfield, 2006, pg. 54). Another patient expressed the shame an anorexic can feel for seeing "better" anorexics come into treatment: "It's funny how competition is such a huge part of the eating disorder. It hurts every

time another person comes into [treatment] and is thinner or more disciplined than you” (Greenfield, 2006, pg. 137).

The women using weight loss persuasive devices were equally driven by competition. One participant using Houston expressed her fear of appearing as a failure among her workout buddies by mentioning, “I didn’t want to be the one with the least amount of step count...” (Consolvo et al, 2006). In contrast, other participants were motivated by the competition itself and “...were inspired to beat a buddy’s count” (Consolvo et al, 2006). Competition becomes even more insidious when combined with weight loss persuasive technology because not only do people trigger each other to physically push themselves, but they can do it on a micromanagement level since they can share the information from their persuasive devices with each other. Combine this scenario with anorexic users and you have a potentially fatal attraction.

Activity 9: Peer pressure

The activity *Peer Pressure* was defined to categorize interactions that the girls themselves labeled as having a negative effect on them which triggered their weight loss. For instance, one girl recalled, “I’ve always been ‘thin’ or so they’ve told me. But what triggered me was my best friend’s boyfriend... He always used to criticize me and make fun of me and call me ugly” (Fox et al, 2005). Being teased was commonly cited as a powerful motivator for becoming anorexic. While in recovery at Renfrew, a patient named Brittany wrote in her journal, “Will I become anorexic again? I will...I hate my life! I weigh a lot! And I can’t stand getting picked on anymore!!!” (Greenfield, 2006, pg. 125).

Weight loss persuasive technology also leveraged peer pressure in a manner that would drive users to meet their goals. Negative reinforcement is just as effective in changing behavior as positive. Because participants were sharing activity level and progress toward their goal with buddies, they felt pressure to make their goal, beat a buddy, or not have the lowest step count. One participant explained how she was motivated to meet her goal because her buddies would know if she did not, “I wasn’t gonna let them see that I wasn’t gonna meet my goal” (Consolvo et al, 2006).

Although there were fewer instances of this activity mentioned in the literature, the dark nature of peer pressure makes the mere appearance of these few instances disturbing. “The quest for perfection inspires some heated competition between these girls,” notes Dr. Vivian Hanson Meehan, President of [ANAD]. “That competition can be very destructive. And it’s that atmosphere of trying to see who is best that lures in people who wouldn’t otherwise be attracted to these behaviors” (Bushnell, 2006). Peer pressure is a ubiquitous stressor that encourages users from either domain to become obsessive when using weight loss persuasive technology—yet another dangerous element for girls who have anorexic tendencies.

Activity 10: Creation of a personal plan for action

Some girls were successful at extreme weight loss by following a highly customized diet or exercise plan. A Renfrew patient supplied the most striking example of this behavior while describing her diet strategy: “At 10:40, I would have a Diet Peach Snapple. Then, at 2:13, I would have a teaspoon and a half of Light and Fit vanilla yogurt. At 5:13, I’d have a glass of wine. And then at 6:17, I would have some lettuce. That was my diet” (Greenfield, 2006, pg. 147). The same Renfrew patient would observe her diet so strictly, her behavior seemed superstitious. She remarked, “If I missed those times, everything was screwed, I didn’t eat till the next day” (Greenfield, 2006). Other girls in the book *Thin* also committed acts of self-punishment or experienced psychological devastation after deviating from their regular diets. A patient at Renfrew named Polly talks about her suicide attempt after unexpectedly eating two pieces of pizza with her friends (Greenfield, 2006, pg. 47).

Some weight loss persuasive devices support this level of customization for diet and exercise plans. Again, the addictive nature of micromanaging the body is apparent in both the features of weight loss persuasive devices and among anorexic behaviors.

Activity 11: Self accomplishment & meeting a set goal

Some anorexics are motivated to reach their goals based on the satisfaction of being self-accomplished. One girl states matter-of-factly, “Well, I’m skinny, I have that much going for me...”, while another reflects, “I was not perfect at anything. And then I found dieting, and I could

be perfect at that.” (Fox et al, 2005, Greenfield, 2006, pg. 42). The most analogous instance to this mindset was found in weight loss persuasive technology literature about Houston: “Most participants were motivated by knowing their performance with respect to their goal,” (Consolvo et al, 2006). But, it could be surmised from the passage that participants were motivated by either good or bad news when discovering their performance statuses.

Notably, the girl who stated unabashedly, “Well, I’m skinny. I have that much going for me...” exhibits a type of self-confidence that is rare for anorexics. As this research has shown, most anorexics define themselves through their peers and therefore need extrinsic reinforcement. This being said, then a persuasive weight loss technology can have a more profound affect on an anorexic user since they seek validation from external sources.

Activity 12: Setting a goal

More rare than instances of *Self Accomplishment* were instances where weight losers were motivated by the simple act of setting a goal. This activity typically requires a pairing with some of the other more cogent activities to make it an effective motivator for weight loss by either domain.

Activity 13: Group goal achievement

Instances of *Group Goal Achievement* were extremely rare, but two instances are worth mentioning. The first is group fasting, a common activity for pro-ana groups online. Typically, group fasts are led by a leader who coaches the members of a discussion board through the fast. The slightly analogous experience had by the Chick Clique test group is that, “A main finding from the post-study questionnaire was that group performance was rated by the girls as being the most powerful method of changing behavior” (Toscos et al, 2006). Why these girls were happier achieving weight loss as a group, instead of individually, is unknown. It can only be observed that this sentiment is highly social.

Activity 14: Fun & gaming

Instances of *Fun & Gaming* features were isolated to persuasive weight loss technologies, and moreso to the technologies designed for children. According to Friestad & Wright, people who lack first-hand experience with persuasion are less prepared to properly mediate the experience (1994). For this reason, children are particularly susceptible to persuasion and should be afforded some level of protection. There was one mention of “fun” in the Chick Clique pilot study where the designers of the prototype, “...used Chick Clique on ourselves for a weekend, [and] we found it fun to use...” (Toscos et al, 2006). Needless to say there were no instances of anorexics having “fun” while participating in caloric restrictive activities. Of all the activities identified, this one is not a cause for concern because it does not support any existing habits of anorexics.

Conclusion

There are many ways in which weight loss persuasive technologies can be potentially abused. The problem cannot be circumvented by simply redesigning the products lest many of the useful features are removed. As found by this research, there are a minimum of 14 behavioral parallels between how girls with EDs lose weight, and how users of weight loss persuasive technology lose weight. The simple truth is, there is not a big enough difference between the acts of regular weight loss and extreme weight loss to specialize the features of weight loss persuasive technology to make them less prone to abuse.

Whether or not girls are at risk for hurting their bodies with persuasive weight loss technologies is up to adults. Parents and teachers should know about the potential interaction between girls, these devices, and the pro-ana nation. They should also know that very common devices such as cell phones or pedometers act as platforms for weight loss persuasive technologies. If we would not approve of finding our children in possession of weight loss pharmaceuticals, then weight loss persuasive devices should be accepted with caution.

Also, we should take special care to notice what types of features are included in weight loss persuasive devices and to what age groups the devices are being marketed. For instance,

Kellogg's is currently promoting their "Get In Step" plan which markets a *Step Counter, Plan Guide, Tracking Forms, and Reward Stickers* specifically for children, while the pedometer alone could be easily used by adults (<http://www.kelloggs.com/promotions/getinstep/kit.shtml>).

Although a basic pedometer is not necessarily a weight loss persuasive technology, it only takes a little imagination to see that a few more years down the road, devices such as those available through a cereal company will contain persuasive features. Are we ready for this level of ubiquity? This study does not purport to have the answers, but hopes to prove that the issue is in need of immediate consideration since persuasive technologies have matured enough to come to market.

Appendix I: Weight Loss Persuasive Devices

The following is a list of weight loss persuasive devices and descriptions of their functionalities. This group was selected for this research to demonstrate the gamut of functionalities currently available in weight loss persuasive devices.

BodyBugg

BodyBugg has physiological sensors that allow it to sense different levels of energy expenditure, whether the user is sleeping, driving, or working out; all data is uploaded to a computer via wireless hardware. BodyBugg can calculate caloric burn, and when coupled with the food journal component of the computer software, it gives superior feedback (Consolvo et al, 2006).

Bones in Motion

"A location-aware mobile phone application that estimates activity level using time and distance traveled. It allows users to record workouts, measure activity, and compare themselves to others using a web-based journal interface" (Consolvo et al, 2006).

Chick Clique

Chick clique is a cell phone application combined with a pedometer, designed for teen girls to compare personal fitness information. The abstract for this device specifically mentions that, "We targeted girls because they are more likely to become less active throughout adolescence and are more likely to use dangerous techniques for losing weight" (Toscos et al, 2006). This device is particularly important to this work since it is one of two fully socially interactive weight loss persuasive technologies meaning that users can communicate with each other through the device itself.

FitTrack system w/ Laura

MIT designed a system called FitTrack, designed for use on a home computer. FitTrack used a relational agent named Laura; a bot which gave users encouragement to increase their daily exercise totals. The participants in the FitTrack study used pedometers to record their activity levels, and then would report them during their interactions with Laura. (Bickmore & Picard, 2005; Consolvo et al, 2007).

Houston with Omron & Nokia

This persuasive weight loss technology is one of two fully socially interactive weight loss persuasive technologies examined in this research. The prototype is complicated since it combines three components. The first two components are the hardware; an Omron HJ-112 Digital Premium Pedometer and a Nokia 6600 mobile phone. The third component is the Houston software which allows users to track their progress through a fitness journal, and on some versions of the software, they can share their progress with friends (Consolvo et al, 2006). This research focused specifically on the user reactions to the sharing software.

iStep X/Sports Brain

The iStep is a pedometer that allows users to upload step counts to a website where they can interact with others, maintain an activity journal, and win prizes.

Nokia 5140

The Nokia 5140 is a pedometer that also allows users to track progress in a journal and customize their training plans.

Pocket Pikachu

This persuasive technology is marketed specifically towards children. It is a virtual pet that is kept healthy when the user exercises. The pet can actually become unhappy and die if the user does not exercise enough. "This can be a powerful means of persuasion, given that children often become emotionally attached to their virtual pets, especially when they start to care for them" (Preece et al, 2007).

TAXC Bike

“The TAXC Fortius training bike is a stationary bike that uses a virtual training course on a screen and generates electricity using heat from the bike’s brakes” (Consolvo et al, 2006). This is one of the few adult persuasive technologies that included a ‘fun’ gaming aspect.

Appendix II: Domains

Domain	Reference Number	Citation
Anorexics (1)	1	Anorexia Fight Moves to Web (Murphy, 2005)
	2	Constructing Identities (Giles, 2006)
	3	Friendship Clique (Paxton et al, 1999)
	4	Parental Factors... (Martinez-Gonzalez et al., 2007)
	5	Phenomenological Analysis (Mulveen & Hepworth, 2006)
	6	Pro-anorexia & Internet (Fox et al, 2005)
	7	Surfing for Thinness (Wilson et al, 2007)
	8	Thin (Greenfield, 2006)
	9	Weborexics (Shade, 2003)

Domain	Reference Number	Citation
Weight Loss Persuasive Technology (2)	1	BodyBugg (http://www.bodybugg.com)
	2	Bones In Motion (http://www.bonesinmotion.com)
	3	Chick Clique (Toscos et al, 2006)
	4	FitTrack System w/ Laura (Bickmore & Picard, 2005)
	5	Houston w/ Omron & Nokia (Consolvo et al, 2006)
	6	iStep X/Sports Brain (Consolvo et al, 2006)
	7	Nokia 5140 (Consolvo et al, 2006)
	8	Pocket Pikachu (Consolvo et al, 2006)
	9	TAXC Bike (Consolvo et al, 2006)

Appendix III: Activities

Activity	Title
1	Using a mechanized self-monitoring device to heighten self-awareness
2	Information exchange, transmission & learning about how to achieve goal
3	Feelings of connection, validation & camaraderie
4	Creation of a record about goal oriented activities
5	Encouragement & support specifically towards goal
6	Deliberate seeking & using multi-media inspirational material
7	Outside recognition or reward for meeting goal
8	Competition against others achieving the same goal
9	Peer pressure
10	Customization or creation of a plan for action
11	Self accomplishment, meeting a set goal
12	Setting a Goal
13	Group goal achievement
14	Fun & gaming

Appendix IV: Domain-Activity Matrix

Table 1. A1D1: Anorexics & Self Monitoring

Quote	Ref. No.	Source
"For much of the last 20 years, Stefanie has defined her days in numbers...the number that really concerns her is the number on the scale."	1	Murphy, 2005
"[M]y CW [current weight] is like 195, and im trying to lose like 50lbs in 4 or 5 months or less..." Also, Giles refers to anorexics "forever chasing impossibly low weights..."	2	Giles, 2006
"Girls may model the behaviors of their friends or adopt normative attitudes regarding weight, shape, and dieting."	3	Paxton et al, 1999
"the use of laxatives or vomiting to control weight..."	4	Martinez-Gonzalez et al, 2007
"Motivational images, 'creeds and commandments' known collectively as 'thinspiration', [to] encourage continued weight loss".	5	Mulveen & Hepworth, 2006
pro-ana website users often have a 'signature' which includes their "current and goal statistics and measurements" appearing in "a standard format, incorporating their height, current weight (cw), high weight (hw), low weight (lw) and goal weights (gw)."	6	Fox et al, 2005
"[P]arents and patients differed in their reports of highest weight, with patients reporting weighing an average of 1.1 kg more at highest weight than their parents' report"	7	Wilson, et. al., 2007
Page 26, "I would die if I didn't know my weight every day."	8	Greenfield, 2007
Pro-ana community "supports the lifestyle decision to lose weight, many of the [pro-ana websites] offer advice on weight loss and solicit tips and tricks on how to shed weight".	9	Shade, 2003

Table 2. A1D2: Weight Loss Persuasive Devices & Self-Monitoring

Quote	Ref. No.	Source
BodyBugg “is a device worn on the user’s upper arm that uses physiological sensors and data modeling to monitor health routines. It claims to infer states such as energy expenditure, physical activity, lying down, sleep versus awake, and driving. Data is uploaded to a computer via a wireless interface. BodyBugg tracks caloric expenditure and is coupled with a web interface where users log good intake...[and] raises user awareness of activity level.”	1	Consalvo et al, 2006
Bones in Motion “is a location-aware mobile phone application that estimates activity level using timing and distance traveled.	2	Consalvo et al, 2006
“Chick Clique was also effective in terms of raising the awareness of the relationship of food, exercise and health. One participant stated that “[Chick Clique] makes me think more about what I eat and how much exercise I get.”	3	Toscos et al, 2006
Houston w/ Omron & Nokia, “Overall participants were intrigued to know their real step counts...”You think you’re moving around, but you’re really not getting that many steps. And so you really have to do something extra like go for a walk or go for the run to really get up to that goal.” One user stated, “I’d be constantly checking it [the pedometer] to see where I was as far as meeting the goal for the day.”	5	Consolvo et al, 2006
SportBrain iStep X is a pedometer that records a user’s step count.	6	Consolvo et al, 2006
The Nokia 5140 is a pedometer that records a user’s step count.	7	Consolvo et al, 2006
The Pocket Pikachu is a pedometer that records a user’s step count.	8	Consolvo et al, 2006

Table 3. A2D1: Anorexics & Information Exchange

Quote	Ref. No.	Source
Dr. Pat Santucci is alarmed by the secrets shared on pro-ana websites. She lists them: "How to fool your doctor, how to fudge your weight, how to lose more weight, what to eat so you won't feel hungry, how to vomit. All the trade secrets are exchanged [on pro-ana websites]."	1	Murphy, 2005
"Typically, pro-ana sites contain...large amounts of information, 'tips' and 'advice'..."	2	Giles, 2006
"The cluster of friendship-relation variables indicative of friend communication about dieting and concern about thinness were strong predictors of body image concern and weight-loss behaviors of individual girls."	3	Paxton et al, 1999
"[T]he most common aspect of pro-ana sites being the provision of specific instructions for initiating and maintaining anorexia nervosa and other eating disorders..."	5	Mulveen & Hepworth, 2006
"...especially younger ones [users] (13 or 14 who come onto sites and ask how to 'become' ana, or say they are 'trying', but want tips other than fasting and purging – ones that require no effort or pain."	6	Fox et al, 2005
"These pro-eating disorder (pro-ED) sites are communities of individuals who engage in disordered eating and use the Internet to discuss and reinforce their activities." "Pro-recovery sites also may not be benign: a substantial percentage of pro-recovery site users also reported learning about new weight-loss or purging techniques and diet aids as a result of pro-recovery site visitation..."	7	Wilson et al, 2007
From page 131, "A personal trainer asked me if I wanted to do a fitness competition and I said yes. He had me on a strict diet...one day I just binged and said, 'I don't know what to do,' so he told me to throw up. I've been a bulimic ever since." From page 72, "When I was 10, my mom's boyfriend's daughter showed me how to purge. One day, we were at the table and we were eating dinner and she said...'You want to lose weight? This is how you do it.' And as she was saying that she stuck her fingers down her throat and threw up the food she had just eaten."	8	Greenfield, 2006
"...[M]any of the [pro-ana] sites offer advice on weight loss and solicit tips and tricks on how to shed weight..." The Art of Reduction website asks users, "If you have any information that might be of help to others, we ask that you submit it to us to post and share."	9	Shade, 2003

Table 4. A2D2: Weight Loss Persuasive Technology & Information Exchange

Quote	Ref. No.	Source
"Many of the girls stated they messaged one another discussing health related issues and tips, something they wouldn't ordinarily do."	3	Toscos et al, 2006
"SportsBrain pedometers enable users to...share information with others, however they can only do this while at a computer."	6	Consolvo et al 2006

Table 5. A3D1: Anorexics & Camaraderie

Quote	Ref. No.	Source
"There are also sites aimed at helping anorexics recover. But Stephanie says they didn't help her. 'I felt worse about myself,' she says. 'I felt like a freak.' On pro-ana sites, Stephanie feels she has found a camaraderie, but on that may prove deadly..."	1	Murphy, 2005
"Typically, pro-ana sites contain...emotional support..."	2	Giles, 2006
"This research...is the first study to examine reports regarding body image and eating behaviors of whole friendship clusters of teenage girls rather than individuals."	3	Paxton et al, 1999
"The ability to seek social support on the Internet can provide an invaluable buffer to stresses faced in everyday life."	5	Mulveen & Hepworth, 2006
"I joined a pro-recovery anti pro-ana site and they were all politically correct...but came across this [pro-ana] site and have found on the whole that the support I receive on there is much better than the support I receive on the other..."	6	Fox et. al., 2005
"Pro-ED Web sites are interactive and sustain a community of individuals through message boards and chat rooms. The community acts as a clique, a type of social interaction...visitors feel more able to express themselves online and find these sites more supportive..."	7	Wilson et al, 2007
From page 47, "It is good to be with other girls who are suffering from an eating disorder. For the first time in my life, I don't feel like I am alone."	8	Greenfield, 2006
"Pro-Ana's recognize both the social stigma and the moral censure, and therefore proclaim the positive benefits of creating their own community..."	9	Shade, 2003

Table 6. A3D2: Weight Loss Persuasive Technology & Camaraderie

Quote	Ref. No.	Source
"[Author of <i>The Science of Persuasion</i>] Robert Cialdini describes 'social validation' or peer pressure as one that drives human behavior [3]. He describes 'liking' or the feeling of being connected as a factor in changing behavior....One of the participants said that using Chick Clique 'brought us all together more. We could talk about being healthy and our issues with being healthy, because no one [normally] wants to talk about that and [we were] more comfortable.'"	3	Toscos, et. al., 2006
"Even though computers can't demonstrate true empathy since they don't yet have the capacity for real feelings...Klein et al [2002] demonstrated that as long as a computer appears to be empathetic and is accurate in its feedback, that it can achieve significant behavioral effect on a user, similar to what would be expected from genuine empathy." "A series of studies by Nass and Reeves and their students in the computers as social actors paradigm has demonstrated that people respond in social ways to computers (and other media) when provided with the appropriate social cues, even though they are typically unconscious of this behavior."	4	Bickmore & Picard, 2005

Table 7. A4D1: Anorexics & Records

Quote	Ref. No.	Source
"Typically, pro-ana sites contain archived journals or diaries written by people with eating disorders..."	2	Giles, 2006
In regard to pro-ana websites, "Common features include...diaries..."	5	Mulveen & Hepworth, 2007
From page 83 in <i>Thin</i> , a calorie journal showing how one patient was carefully tracking her calories to maintain a goal between 200-300 calories per day.	8	Greenfield, 2006

Table 8. A4D2: Weight Loss Persuasive Technology & Records

Quote	Ref. No.	Source
"BodyBugg tracks caloric expenditure and is coupled with a web interface where users log food intake."	1	Consolvo et al, 2006
Bones in Motion allows users to record all of their exercise achievements and share them online with other users.	2	www.bonesinmotion.com
"Most participants found value in Houtson's trending information....[one] participant explained how the last 7 days feature impacted her, 'I'd go, oh gosh, I had a really good day Monday because I went out and walked and it's now Thursday and I haven't done any exercise...you had better get your behind out to the park tomorrow.'"	5	Consolvo et al, 2006
"SportBrain pedometers enable users to upload their step counts to a web site where they can view past step counts..."	6	Consolvo et al, 2006
Nokia 5140, "has a journaling feature to track progress."	7	Consolvo et al, 2006

Table 9. A5D1: Anorexics & Encouragement

Quote	Ref. No.	Source
In response to a girl's discussion board request for guidance on how to lose an extreme amount of weight, another girl derides her by saying, "if you are truly anorexic you don't really need someone there telling u what to do..." Another girl steps in and offers to provide help offline: "hey i feel your pain...im always available whenever needed you can even call me [phone number] im nice:)"	2	Giles, 2006
"...friend support was a significant positive predictor of an individual's engagement in extreme weight loss behaviors."	3	Paxton et al, 1999
"Pro-anorexia Internet sites are a genre of website which aspire to promote, support, and discuss anorexia nervosa...where these behaviors are discussed and encouraged as the norm..."	5	Mulveen & Hepworth, 2006
"In pro-ana, the objective was to sustain life in the anorectic condition...whether it be by giving support to start another fast or advice on the 'healthiest' way to handle low calories."	6	Fox et. al., 2005
"These pro-eating disorder (pro-ED) sites are communities of individuals who engage in disordered eating and use the Internet to discuss and reinforce their activities...most users reported visiting these sites to maintain motivation for weight loss."	7	Wilson et al, 2007
From page 42, "When I was 10 yrs old, my mother and aunt paid me \$100 each to lose 10 pounds".	8	Greenfield, 2006
"We started this site to support those who need help with their weight loss goals."	9	Shade, 2003

Table 10. A5D2: Weight Loss Persuasive Technology & Encouragement

Quote	Ref. No.	Source
"In the beginning I was extremely motivated to do whatever Laura asked of me, because I thought that every response was a new response." "...relational agents on mobile devices could provide a particularly powerful combination, both for relationship building (a 'buddy' who is always with you) and for behavior change (e.g., providing interventions at the time and place of need..."	4	Bickmore & Picard, 2005
"...participants enjoyed receiving recognition and encouragement from their buddies. One participant described what it felt like when she received <i>Wow!</i> and <i>Good Job!</i> messages from her buddies."	5	Consolvo et al, 2006
"The web site...offers reward programs where users can win prizes."	6	Consolvo et al, 2006
"Marketed to children, Pikachu encourages physical activity by learning new tricks and becoming happier as the step count increases."	8	Consolvo et al, 2006

Table 11. A6D1: Anorexics & Inspirational Material

Quote	Ref. No.	Source
“...’pro-ana’ sites with their pictures and shared stories promote the eating disorder.”	1	Murphy, 2005
“Typically, pro-ana sites contain...photo galleries, usually of thin models but occasionally of users’ own bodies, poetry and song lyrics reflecting the experience of anorexia and related conditions (significantly though, never obesity).”	2	Giles, 2006
“Motivational images, ‘creeds and commandments’ known collectively as ‘thinspiration’, encourage continued weight loss.”	5	Mulveen & Hepworth, 2006
“...users [of a pro-ana discussion board] might provide a quotation, usually from film or music, which captured their feelings towards their self and towards ana. For example, Marcy used as her signature a lyric from Manic Street Preachers’ song <i>4 stone, 7 pounds</i> : ...i wanna be so skinny that i rot from view...”	6	Fox et al, 2005
“...[M]ost share similar content, including ‘thinspiration’ (images of cachectic women), poetry...”	7	Wilson et al, 2007
From page 25, a journal Shelly [Renfew patient] kept prior to entering treatment. She has a picture of herself (complete with feeding tube in the nose) and a comment below it saying, “I can’t believe I weighed 82 lbs. That’s way too fucking much.”	8	Greenfield, 2006
Many of the Pro-Ana sites have ‘Thinspiration’ sections, usually featuring scanned photos of thin fashion models and actresses. Many of these are popular media figures-Kate Moss and Calista Flockhart are ubiquitous. In some cases Photoshop has been used to make the women in photos even thinner.	9	Shade, 2003

Table 12. A71: Anorexics & Recognition

Quote	Ref. No.	Source
[Taken from a pro-ana discussion], [e]xtracts 12-14 serve to demonstrate the importance of identity in the eating disordered experience. The central concern is the fear of appearing 'phony' or not 'real', suggesting that there is something intrinsically <i>authentic</i> about the nature of anorexia. It is a club with stringent entry criteria, which are not met by... [those who lapse into an occasional binge]...or have failed to 'earn' membership through medical diagnosis.	2	Giles, 2006
"...one forum was dedicated to posting photographs, and some where captioned with a comment about the image might be 'disturbing' or even 'crack the screen', because the participant was fat and undesirable. But these photographs appeared to have been selected with care, to present a deliberately staged version of the self, where hair, make-up and clothes had obviously received considerable attention. They received much comment from other users, who would compliment the pictures, noting that the subject was exceptionally thin and beautiful, and a source of <i>thinspiration</i> .	6	Fox et al, 2005
From page 129, "This year I got voted for best body for senior class...It made me feel good that I had the ideal body that everyone wanted and hardly anyone has." From page 21, "One girl was saying yesterday that getting a tube is a status symbol that you are really anorexic. And that's how I view my PEG tube."	8	Greenfield, 2006

Table 13. A7D2: Weight Loss Persuasive Technology & Recognition

Quote	Ref. No.	Source
"...participants were motivated by the recognition Houston provided when they met their goal (specifically, the congratulations pop-up screen and the '*' following step counts...'It was kinda cool to have that [the '*']. <i>The little things that count, the star</i> . And of course, the more stars, the better..." Also, the users of Houston explained how "...the numbers [pedometer step counts] don't communicate everything. And so if you're sharing information with somebody, you kind of want to share a little bit more about what you did."	5	Consolvo et al, 2006

Table 14. A8D1: Anorexics & Competition

Quote	Ref. No.	Source
"Nichter and Nichter (1991) have described the world of teenage girls as intensely comparative..."	3	Paxton et al, 1999
"...online discussion boards foster competitions..."	5	Mulveen & Hepworth, 2006
From page 54, "When [my roommate] would see that I came from the gym, she would automatically put on her running shoes. It was something that triggered me, like, Well, if she's on a diet, I should still be on my diet." From page 137, "It's funny how competition is such a huge part of the eating disorder. It hurts every time another person comes into [treatment] and is thinner or more disciplined than you."	8	Greenfield, 2006
"[A pro-ana website creator states] [w]e thrive upon challenge, upon competition..."	9	Shade, 2003

Table 15. A8D2: Weight Loss Persuasive Technology & Competition

Quote	Ref. No.	Source
"...the Web service allows users to compare and compete in ways that will encourage ongoing use."	2	www.bonesinmotion.com
"In a pilot study where we used Chick Clique on ourselves for a weekend...[it] made us competitive and walk more."	3	Toscos et al, 2006
"Yet others were inspired to beat a buddy's count, "[a buddy] just started contacting me like 'how many steps do you have?' And then I would tell her. She's like, 'well, I have this many.' And so we were sort of competing with each other"...Another participant mentioned..."I didn't want to be the one with the least amount of step count..."	5	Consolvo et al, 2006

Table 16. A9D1: Anorexics & Peer Pressure

Quote	Ref. No.	Source
Correlational analyses performed on friendship groups indicated that groups displaying higher levels of body image concern and weight loss behaviors...(c) reported receiving more teasing from friends about weight and shape..."	3	Paxton et al, 1999
"I've always been 'thin' or so they've told me. But what triggered me was my best friend's boyfriend... He always used to criticize me and make fun of me and call me ugly."	6	Fox et al, 2005
From page 61, "I started dieting when I was 12 because I had a bad body image and a lot of my peers were thinner than I was." From page 131 "I grew up as an overweight child and was teased, that's about it. I stopped eating when I was in the ninth grade. Once I lost weight, I became popular". From page 125, in Brittany's recovery journal at Renfrew she writes, Will I become anorexic again? I will...I hate my life! I weigh a lot! And I can't stand getting picked on anymore!!!"	8	Greenfield, 2006

Table 17. A9D2: Weight Loss Persuasive Technology & Peer Pressure

Quote	Ref. No.	Source
Because participants were sharing activity level and progress toward their goal with buddies, they felt pressure to make their goal, beat a buddy, or not have the lowest step count. One participant explained how she was motivated to meet her goal because her buddies would know if she did not, "I wasn't gonna let them see that I wasn't gonna meet my goal."	5	Consolvo et al, 2006

Table 18. A10D1: Anorexics & A Personal Plan

Quote	Ref. No.	Source
"One website advocates a total of 185 calories for the day."	1	Murphy, 2005
From page 54, "One of my suitemates used to keep a food journal on her white board. It was say, Breakfast: nothing. Lunch: apple, banana. Dinner: Sandwich. And then she would run 10 miles." From page 147, "At 10:40, I would have a Diet Peach Snapple. Then, at 2:13, I would have a teaspoon and a half of Light and Fit vanilla yogurt. At 5:13, I'd have a glass of wine. And then at 6:17, I would have some lettuce. That was my diet."	8	Greenfield, 2006

Table 19. A10D2: Weight Loss Persuasive Devices & A Personal Plan

Quote	Ref. No.	Source
"...works with the user to customize a training plan."	7	Consolvo et al, 2006

Table 20. A11D1: Anorexics & Self Accomplishment

Quote	Ref. No.	Source
"Well, I'm skinny, I have that much going for me..."	6	Fox et al, 2005
Page 42 Dieting as goal "I was not perfect at anything. And then I found dieting, and I could be perfect at that." Becoming thin as goal pg 54 "I think I got addicted to feeling accomplished. After growing up in a household where I was always told I need to be a certain weight, when I started to actually see results, I went overboard." pg 147. "I don't think I'm good at anything, but I know I'm a good anorexic."	8	Greenfield, 2006

Table 21. A11D2: Persuasive Weight Loss Technology & Self Accomplishment

Quote	Ref. No.	Source
"Most participants were motivated by knowing their performance with respect to their goal."	5	Consolvo et al, 2006

Table 22. A12D1: Anorexics & Goal Setting

Quote	Ref. No.	Source
Participants have goal weights (gw)s listed in their statistics.	6	Fox et al, 2005

Table 23. A12D2: Persuasive Weight Loss Technology & Goal Setting

Quote	Ref. No.	Source
SportsBrain has a goal setting feature.	6	Consolvo et al, 2006

Table 24. A13D1: Anorexics & Group Goals

Quote	Ref. No.	Source
"...whether it be by giving support to start another fast..."	6	Fox et al, 2005

Table 25. A13D2: Persuasive Weight Loss Technology & Group Goals

Quote	Ref. No.	Source
"A main finding from the post-study questionnaire was that group performance was rated by the girls as being the most powerful method of changing behavior."	3	Toscos et al, 2006

Table 26. D14D2: Persuasive Weight Loss Technology & Fun

Quote	Ref. No.	Source
"In a pilot study where we used Chick Clique on ourselves for a weekend, we found it fun to use..."	3	Toscos et al, 2006
"Pikachu encourages physical activity by learning new tricks..."	8	Consolvo et al, 2006
"The <i>TAXC Fortius training bike</i> is a stationary bike that uses a virtual training course on a screen...[and is] designed to encourage physical activity by making exercise fun."	9	Consolvo et al, 2006

Endnotes

1. Aerobic exercise involves long, low levels of exertion in which the muscles are used at well below their maximal contraction strength for long periods of time (the most classic example being the Marathon). Aerobic events, which rely primarily on the aerobic (with oxygen) system, use a higher percentage of Type I (or slow-twitch) muscle fibers, consume a mixture of fat, protein and carbohydrates for energy, consume large amounts of oxygen and produce little lactic acid. Excerpted from http://en.wikipedia.org/wiki/Slow_twitch_muscle.

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