On the Cognitive (In)Efficiency of Social Comparisons with Media Images

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Abstract

When female viewers make upward social comparisons to the appearance of women in thin-ideal media images, the typical results are decreases in self-evaluations of appearance and increases in negative mood. Here we investigated whether such comparisons are efficient mental processes, requiring few cognitive resources, or if they are more cognitively effortful. If social comparisons to media images are efficient, we should find evidence that they occur even when participants are engaged in a separate, simultaneous, cognitive task (i.e. when made *cognitively busy*) during exposure to the images. In two studies (*N* = 116) and (*N* = 177), Canadian female undergraduates from Southern Ontario viewed media images. Cognitive Busyness was induced in one group of participants by asking them to remember a complex 8-digit number (e.g. 78639946) while viewing the images. A second group of participants memorized only a very simple 8-digit number (11111111) and so were not cognitively busy. Self-evaluations of appearance and levels of negative mood were measured via visual-analogue scales both before and after exposure to the images. Despite the images having detrimental effects on the self-evaluations and mood of participants who were *not* cognitively busy, the images had no such effects on participants who were cognitively busy. In Study 2 even participants who scored highly on a measure of thin-ideal internalization did not seem to be affected by exposure to the images when cognitively busy. Thus, we found no evidence that social comparisons are efficient mental processes and instead suggest that social comparisons may require effortful processing.

Keywords: social comparison, media images, body image, efficiency, automaticity, cognitive busyness

Introduction

A great deal of research primarily from the U.S. (Heinberg & Thompson, 1995; Henderson-King, Henderson-King & Hoffman, 2001), Canada (Buote, Wilson, Strahan, Gazzola & Papps, 2011; Want, Vickers & Amos, 2009), the United Kingdom (U.K.) (Brown & Dittmar, 2005; Dittmar & Howard, 2004), and Australia (Tiggemann & Polivy, 2010; Tiggemann, Polivy, & Hargreaves, 2009), has investigated the effect of viewing thin and physically-attractive women from television and fashion magazines on young female viewers. Meta-analyses indicate that for viewers in these countries, the typical result of exposure to these media images is at least temporary dissatisfaction with their own appearance (Grabe, Ward & Hyde, 2008; Groesz, Levine & Murnen, 2002; Want, 2009). This effect is most frequently explained as the result of social comparison processes (Festinger, 1954). Viewers are thought to compare their eyes, hair, skin, body shape, clothes, and especially their weight, with the women in media images (see Posavac, Posavac & Weigel, 2001 for evidence of such comparisons in a U.S. sample). Because the women in such images are usually exceptionally well dressed, thin, attractive, and often exaggerated with professional make-up or digital manipulation (Kingsmill et al., 2007), they represent *upward* comparison targets for the average female viewer. In other words, women in media images are seen as superior in terms of appearance compared to the average viewer. Such upward social comparisons commonly result in lowered self-evaluations and poorer mood. Accordingly, social comparisons with media images typically leave the average female viewer feeling dissatisfied with her own appearance, as well as unhappy, angry, and insecure (see Tiggemann & Polivy, 2010 and Tiggemann et al., 2009 for examples of the effects on mood in Australian samples).

An open question about social comparisons with media images is the extent to which they are *automatic* mental processes. Automaticity can mean several different things but here we investigated whether social comparisons with media images are automatic in the sense of *efficient* mental processes.

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An efficient mental process is one that requires few cognitive and attentional resources (Bargh, 1994) and can therefore be carried out even when information is presented rapidly, or when a person is otherwise mentally preoccupied with another task (*cognitively busy*). Thus, in two studies we investigated the following questions: Are social comparisons consciously effortful, requiring time and mental resources for deliberation and reflection? Alternatively, are social comparisons efficient processes that can still take place even when we are cognitively busy with another task? We investigated these questions by making a subgroup of the participants in our studies cognitively busy during exposure to media images. These participants were engaged in a separate, simultaneous, cognitive task – memorizing a complex 8-digit number – while they viewed the media images. All participants evaluated their own appearance and reported their levels of negative mood (unhappiness, insecurity, and anger) both before and after exposure to the images. We reasoned that if social comparisons are efficient mental processes then we should find that media images increase levels of negative mood and induce lowered self-evaluations of appearance even among participants who are cognitively busy during exposure.

Our participants were Canadian women who were undergraduates from a large metropolitan area of Southern Ontario. Similar to content analyses from the U.S. (Byrd-Bredbenner, Murray & Schlussel, 2005; Silverstein, Perdue, Peterson & Kelly, 1986; Sypeck, Gray & Ahrens, 2004), content analyses of the images of women in lifestyle and fashion magazines, on billboards, and on television in Canada demonstrate that such images are predominantly of young, thin, and highly physically-attractive women (Buote et al., 2011; Fouts & Burggraf, 1999, 2000). Also similar to the U.S. context (Patrick, Neighbors & Knee, 2004), Canadian women frequently report making upward social comparisons to the appearance of these same models, celebrities, and professional athletes (Strahan, Wilson, Cressman & Buote, 2006). The homogeneity in the way in which the media present women no doubt contributes to Canadian undergraduate-aged women's endorsement of the idea that "The standards of appearance for

women are quite specific and inflexible" (Buote et al., 2011, p.324). This may account for why Canadian undergraduate-aged women describe their appearance relatively more negatively than they describe their other attributes, such as their social skills (Strahan et al., 2006). In fact, women in North America generally experience higher levels of body dissatisfaction than women in any other world region, except for South America (Swami et al., 2010).

To date, only a small handful of studies – one each from the U.K. (Brown & Dittmar, 2005), the U.S. (Gilbert, Giesler & Morris, 1995a), and Canada (Joshi, Herman & Polivy, 2004) – have attempted to provide empirical evidence regarding the efficiency of social comparisons. Yet establishing whether or not social comparisons with media images are efficient may tell us a great deal about their likely effect in the day-to-day lives of women in Canada and other cultures with similar media content. By virtue of their minimal demands on cognitive resources efficient mental processes can take place under conditions in which stimuli are seen only briefly or when individuals are otherwise mentally occupied. As Bargh (1994) and Payne (2012) argued, these may be precisely the conditions under which we are exposed to most stimuli in everyday life and this may be true in particular of media images (Buote et al., 2011). Buote et al. (2011) demonstrated that women in metropolitan Canada are exposed to young, thin, and very attractive media images many times a day, not only when they pay sustained attention to television or read magazines, but also while they wait in check-out lines and while engaged in other daily activities such as walking or driving through the city. Thus, on a daily basis in Canada, women view many thin-ideal images only briefly or while otherwise mentally preoccupied – think of the billboard advertisements we are exposed to while walking or driving around the city, or the magazine covers that line check-out aisles at the grocery store. The same is no doubt true in countries that share similar media content, such as the U.S., the U.K., and Australia. If social comparisons are efficient then even these briefly-presented images, viewed while we are mentally preoccupied with the concerns of daily life, may still affect our mood or self-evaluations. In short, if social comparisons are efficient, then we

ought to be concerned about more than just the effect of the magazine and television images to which we pay sustained attention; the opportunities for thin ideal media images to affect our mood and self-evaluations in daily life will be multiplied many-fold.

Although our investigations here focus on the efficiency of social comparisons, we begin by addressing the broader notion of automaticity. Here we distinguish between efficiency and three other related components of automaticity, and discuss claims and evidence regarding their application to social comparisons.

In what ways Might Social Comparisons be Automatic?

To say that a mental process, such as social comparison, is automatic can mean one or all of several different things (Bargh, 1994) including: (1) that a person is *unaware* of at least part of the process, (2) that its initiation is *unintentional*, (3) that once initiated, it proceeds in an *uncontrollable* fashion, and/or (4) that it is *efficient*, demanding few cognitive resources. Many mental processes appear to possess some, but not necessarily all, of these features of automaticity (Bargh, 1994).

Claims that social comparisons are automatic. Social comparisons with media images have been called automatic in all of these senses. Wood (1996) suggested that "People may not be fully aware of the comparisons they make with their neighbors, coworkers, and TV characters" (p.524). One idea that has been suggested many times (Botta, 1999; Frisby, 2004; Richins, 1991; Want et al., 2009) is that people are *unaware* of the comparisons they make with media images because they "may process and react to media imagery on a nonconscious level" (Henderson-King et al., 2001, p. 1414). Social comparisons have also often been described as spontaneous or *unintentional* processes (Clay, Vignoles & Dittmar, 2005; Dalley, Buunk & Umit, 2009; Gilbert et al., 1995a; Goethals, 1986; Richins, 1991; Want, 2009; Want et al., 2009). For instance, Dittmar and Howard (2004) posited that "social comparisons may 'impose' themselves as soon as ideal targets are present" (p. 772). Furthermore, Goethals (1986)

wondered whether "we control the cessation of comparison" (p. 273) or whether they are in fact

uncontrollable once initiated. Finally, Mussweiler and Rüter (2003) argued that social comparison may

"take the form of a fairly automatic and highly efficient process that requires little cognitive capacity and

can easily be carried out under suboptimal conditions" (p. 468) and many others have similarly

suggested that social comparisons are cognitively *efficient*, rather than effortful processes (Brown &

Dittmar, 2005; Dalley et al., 2009; Joshi et al., 2004; Gilbert et al., 1995a; Want, 2009).

The automaticity of social comparisons is assumed to stem from two possible sources. One

suggestion is that the frequent activation of social comparisons leads to a reduction in the cognitive

resources necessary for making them (Joshi et al., 2004; Mussweiler & Rüter, 2003), in much the same

way as other processes, such as reading, become automatized with extensive practice. A second

suggestion is that accurate assessments of whether one is stronger, smarter, or more attractive than a

potential rival were so useful to our evolutionary ancestors in intra-sexual competition as to have led to

the development of specialized, automatic, mental mechanisms for social comparison (Gilbert, Price &

Allan, 1995b). Indeed, given the frequency with which social comparisons are made (Leahey, Crowther &

Mickelson, 2007), some have argued that "their automatic and capacity-saving qualities are *necessary*

[emphasis added] to ensure our psychological functioning" (Mussweiler & Rüter, 2003, p.468).

Despite all these claims, however, the evidence that social comparisons are automatic in any

sense is somewhat sparse.

Evidence that we are unaware of social comparisons. Two articles (Blanton & Stapel, 2008;

Stapel & Blanton, 2004) reported evidence of social comparisons to images of people that were

presented subliminally and therefore outside of conscious awareness. However, both articles have since

been retracted in light of Stapel's admission of data fabrication. Mussweiler, Rüter and Epstude (2004)

reported that German undergraduate students' self-evaluations were affected by 33ms subliminal

presentations of the names of people considered to be extreme standards of aggressiveness (e.g. Arnold Schwarzenegger) or athleticism (e.g. Michael Jordan), suggesting that comparison processes took place outside of awareness. Furthermore, Massar and Buunk (2009; 2010) reported that subliminal presentations of attractive faces and desirable body shapes led to increased jealously among female undergraduate students from the Netherlands, implying that the appearance of other people can be processed, and perhaps compared to the self, non-consciously. However, Jansen and deVries (2002), who also used a Dutch sample, exposed female participants to subliminal images of thin models from women's magazines but found no significant effect of such exposure on participants' mood or self-esteem compared to a control group. Thus far, studies investigating whether social comparisons can take place outside awareness are few, and results mixed.

Evidence that social comparisons are unintentional. If social comparisons are triggered by stimuli of which participants are unaware (e.g. subliminally-presented stimuli) this also suggests that social comparisons can be unintentional; a person cannot intend to compare herself to a stimulus that she is unaware of. Other evidence regarding the unintentional nature of social comparisons comes from a diary record study by Patrick et al. (2004). In monitoring their daily lives for naturally-occurring social comparisons, Patrick et al.'s sample of U.S. undergraduate women reported the most common reason for making a comparison was that "I didn't intend to compare; it just happened" (p. 510). However, there is very little other evidence that speaks to the question of whether or not social comparisons happen unintentionally.

Evidence that social comparisons are uncontrollable. We are not aware of any direct evidence on the question of whether social comparisons are controllable or uncontrollable once they are initiated. However, there are a small handful of studies that suggest that social comparisons may be

cognitively efficient. It is to this aspect of the automaticity of social comparisons with media images – the focus of the present studies – that we now turn.

Evidence that social comparisons are efficient. Recall that an efficient mental process is one that requires little in the way of cognitive resources and can thus be carried out under in conjunction with other tasks (Mussweiler and Rüter, 2003). There are two generally-recognized strategies for investigating the efficiency of a mental process (Bargh, 1994; Payne, 2012): (1) determine whether the process still operates when a person is under high attentional or *cognitive load* (i.e. when a person is cognitively busy with another task), or (2) determine whether the process still operates when information is rapidly presented.

Gilbert et al. (1995a) investigated whether social comparisons could still take place while people were made cognitively busy. Gilbert et al. afforded U.S. university students an opportunity to make a social comparison by exposing them to either the good performance (16 out of a possible 18 correct answers) or poor performance (4 out of 18 correct) of another student on a (bogus) cognitive task that the participants themselves then performed. Participants were given false feedback about their own performance indicating a moderate score on the task (10 out of 18 correct). Afterwards, they were asked to rate their own ability at the task, as well as to rate the ability of the average student. Crucially, half of the participants were made cognitively busy while they received feedback on their own performance and while making the subsequent ability ratings; in other words, they were made cognitively busy at the moment at which they could have made social comparisons to the performance of the other student. Gilbert et al. made these participants cognitively busy by asking them to memorize an 8-digit number. Despite being cognitively busy, the participants still demonstrated the effects of having made social comparisons to the other student. Those who had been exposed to the superior performance of the other student rated their own ability as slightly worse than that of the average

student, while those who had been exposed to the inferior performance of the other student rated themselves as somewhat better than average.

Gilbert et al. (1995a) argued that the fact that students still apparently compared their performance to that of the other student despite being cognitively busy fits with a view of social comparisons that suggests they are, at least initially, "natural, *effortless* [emphasis added], or even inevitable reactions" (p.228). In other words, their results suggest that social comparisons do not require a great deal of cognitive effort because the majority of the participants' cognitive effort was assumed to be taken up with memorizing the 8-digit number, and yet social comparisons still appear to have been made.

With regard specifically to media images, Brown and Dittmar (2005) and Joshi et al. (2004) produced evidence suggesting that social comparisons are efficient processes using rapid presentation of stimuli. Both sets of researchers exposed female participants – participants from the U.K. in Brown and Dittmar, and from Canada in Joshi et al. – to a small number of magazine advertisements featuring thin and attractive women for either 150ms per advertisement or for several seconds per advertisement. They argued that the fleeting 150ms exposure left little time for "deep – elaborated and prolonged – processing" (Brown & Dittmar, 2005, p. 1091). In both studies, the authors found that the women who viewed the images for several seconds per advertisement reported more detrimental effects – lower appearance self-esteem in Joshi et al. and more weight-related anxiety in Brown and Dittmar – than women who viewed the images for just 150ms per advertisement. However, in both studies, subsets of participants were still significantly affected by the briefer exposure. Brown and Dittmar found that women who had strongly internalized the thin ideal as a personal standard experienced more weight-related anxiety after the brief exposure, and Joshi et al. found that restrained eaters reported a more positive self-image. Joshi et al. concluded that exposure to a media image "does

not require extended cognitive processing of the image for the image to have a psychological impact"

(p.340) at least for a subset of people. In other words, both studies show that social comparisons to

media images may, for some people, be minimally demanding of cognitive resources, or efficient.

The Present Research

In two studies presented here we attempted to provide converging evidence that social

comparisons to media images can be efficient mental processes. We designed the studies as analogues

to Gilbert et al.'s (1995a) research in that we investigated the effect of cognitive busyness on social

comparisons to media images. In both studies, participants in one condition (the Free View Condition)

were shown a series of images of women from fashion magazines and websites and were free to reflect

on the images however they chose. Participants' mood and appearance self-evaluations were assessed

both before and after exposure with Visual Analogue Scales (VAS; Heinberg & Thompson, 1995). In a

second condition (the Cognitively Busy Condition), participants were shown the same images, but were

asked to memorize an 8-digit number during exposure.

Hypotheses. Given that meta-analyses of prior research in which participants have been

exposed to media images *without* being cognitively busy have indicated that such exposure typically

increases negative mood and results in significantly poorer self-evaluations of appearance (Grabe et al.,

2008; Groesz et al., 2002; Want, 2009) we generated the following pair of hypotheses, that applied to

both studies:

H1a: In the Free View Condition, participants' mood as measured by the mood VAS would be

significantly more negative after exposure to the media images than before, and

H1b: In the Free View Condition, participants' appearance self-evaluations as measured by the

self-evaluation VAS would be significantly lower after exposure to the media images than before.

If social comparisons with media images are efficient mental processes that are "effortless" (Gilbert et al., 1995a, p.228), require "little cognitive capacity and can easily be carried out under suboptimal conditions" (Mussweiler & Rüter, 2003, p.468) and are potentially even non-conscious (Frisby, 2004; Henderson-King et al., 2001; Richins, 1991; Want, 2009; Wood, 1996) we reasoned that their effects should still be detected even when participants are made consciously cognitively busy with the rehearsal of an 8-digit number. As Payne (2012) put it "if an effect occurs as strongly (or more strongly) under cognitive load as compared to full attention, then this provides evidence of efficiency" (p. 14). Given previous suggestions and the work of Gilbert et al. (1995a) we assumed that social comparisons would be efficient. This lead to the second pair of hypotheses, again applied to both studies:

H2a: In the Cognitively Busy Condition, participants' mood as measured by the mood VAS would be significantly more negative after exposure to the media images than before, and

H2b: In the Cognitively Busy Condition, participants' appearance self-evaluations as measured by the self-evaluations VAS would be significantly lower after exposure to the media images than before.

Alternatively, if social comparisons are cognitively effortful processes, we should find little evidence of their effects on participants' mood and appearance evaluation in the Cognitively Busy Condition.

Study 1

Method

Participants. Across two semesters, 130 women signed up through a study participation website run by the Department of Psychology at Ryerson University in Toronto, Canada. All took part in partial

fulfillment of a research participation component of an introductory psychology course. Of the 130, data

from 11 were excluded because they were 30 years old or older, leaving the remaining participants aged

between 17 and 27. Data from three additional participants were excluded because one had problems

understanding instructions in spoken English, one took part twice (once in both semesters; only the

participant's first set of data was used), and one looked at the images for less than 90 seconds (see

Procedure section). This left 58 participants in each of the two conditions. Participants' age, BMI, and

self-identified ethnic background in the two conditions are shown in Table 1.

Table 1 *Characteristics of women in Study 1*

Characteristic	Free View condition (*n* = 58)		Cognitively Busy condition (*n* = 58)	
	M (SD)	95% CI	*M (SD)*	95% CI
Age in years	19.10 (1.65)	[18.66, 19.53]	19.67 (2.04)	[19.14, 20.21]
BMI	21.53 (2.88)	[20.78, 22.29]	21.25 (3.05)	[20.43, 22.06]
RSES (0-30)	17.57 (5.67)	[16.08, 19.06]	19.03 (4.65)	[17.81, 20.26]
Ethnic background	26 White/Caucasian		28 White/Caucasian	
	14 Asian		9 Asian	
	4 Black/African-American		6 Black/African-American	
	4 Middle-Eastern		1 Middle-Eastern	
	6 South Asian		8 South Asian	
	1 First Nations		2 Hispanic/Latina	
	3 Multi-Ethnic		4 Multi-Ethnic	

N.B.   BMI = Body Mass Index, RSES = Rosenberg Self-Esteem Scale (min-max: 0-30). Participants in the two conditions did not differ significantly on any of these variables (all *p* > .05).

Materials and Procedure. Although participants initially signed up for a study timeslot through

the study participation website, the test procedures took place in person, one participant at a time, in a

dedicated research room. After a consent form was completed, the experimenter left the room and all

measures were presented via a computer. The experimenter returned only for the debriefing, after the

completion of all measures. The details and purpose of each of the steps in the procedure are outlined,

in order, below.

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Cover story. Demand characteristics are a persistent problem in research on the effects of thin-ideal media images (Want, 2014). To help disguise the purpose of the study we described it in all our recruitment materials and on the consent form as one that addressed the question "How do mood, personality and exposure to images affect our short-term memory?" Participants were told that they would be given measures of their personality and mood and asked to memorize either a complex or simple number as an assessment of their short-term memory. They were also told that while they tried to memorize the number, we would show them a series of images. The cover story was designed to provide a plausible reason why participants might be asked to memorize a number while looking at images. In the cover story, the purpose of presenting the images was to distract participants from the number, rather than, as was the case in reality, presenting the number to distract participants from thinking about the images. In other words, in the cover story, the dependent variable was participants' recall of the 8-digit number and the presentation of the images was the independent variable. Mood and personality were described as potential moderators in the study to give a plausible reason for presenting the study's actual dependent variables, the mood and appearance satisfaction measures.

Personality questionnaire. To bolster the cover story, participants first completed a personality questionnaire, the NEO Five-Factor Inventory-3 (Costa & McCrae, 2010). This measure is a 60-question personality inventory designed to assess the Big Five personality traits (Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness to Experience). No data from this measure were analyzed.

Visual Analogue Scale (VAS) items (pre-test). Participants next answered questions about their mood and feelings about their appearance. They were presented with 10 computerized Visual Analogue Scales (VAS; Heinberg & Thompson, 1995). These items asked participants to assess their feelings *right now* on a variety of dimensions by moving a slider on a line between two marked end-points. All VAS

items were scored from 0 to 100. Three of these VAS items asked participants to rate their mood (with

end-points marked as *happy-unhappy*, *confident-insecure*, and *angry-calm*). Participants' responses to

these items were averaged (with the angry-calm item reversed) to create a negative mood score, where

higher scores indicate greater negative mood. Cronbach's α for these three items was .77 at pre-test,

demonstrating good internal consistency. Four further items asked participants to rate their satisfaction

with their facial appearance, weight, and overall appearance (with end-points marked from *very*

dissatisfied to *very satisfied*) and to rate how attractive they felt (with end-points marked *very*

unattractive to *very attractive*). Participants' responses to these four items were averaged to create an

appearance evaluation score, where higher scores indicate greater satisfaction with/evaluation of their

appearance. Cronbach's α for these four items was .87 at pre-test, demonstrating good internal

consistency. In addition, there were three VAS items that asked participants about their levels of

relaxation (*worried-relaxed*), alertness (*alert-drowsy*), and energy (*sluggish-energetic*), which were

included to support the cover story and which are not analyzed here. Simple VAS items were used, as

opposed to longer measures of appearance satisfaction (e.g. the EDI-BD; Garner, 2004) or mood (e.g.

the PANAS-X; Watson & Clark, 1994), to minimize the likelihood that participants would become aware

of the study's focus on their mood and appearance satisfaction.

Cognitive busyness manipulation. Participants were then asked to memorize one of two types

of 8-digit number (a manipulation adapted from Gilbert et al., 1995a). The 8-digit numbers either

consisted of 8 (mostly-) different digits (78639946) in the Cognitively Busy Condition, or 8 of the same

digit (11111111) in the Free View Condition. The number stayed on the computer screen for 30 seconds

while participants attempted to memorize it. Participants were informed that they would be asked to

recall this number after exposure to a series of images, which they were told would be either of fashion

models or of cats. No participants actually saw images of cats; all saw images of fashion models. The

mention of cat images was included to attempt to distract participants from the study's focus on media

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images; cats were chosen as a set of images that undergraduates would believe might be distracting. Note that participants in both conditions were given a number to remember in order to maintain the cover story. However, the number in the free view condition was assumed to be so easy to remember as to impose no constraints on participants' attention to, or thoughts about, the images.

Exposure to media images. Participants were then presented with 12 images taken from fashion magazines and clothing-manufacturers' websites. Each of the images contained a single female model who was young, thin, attractive, and Caucasian, and who thus fit the thin-ideal as presented by mass media in Canada (Buote et al., 2011). All of the images showed the model's face; five of the images were close-ups of models' faces, while the remaining seven were full body shots of models. In two of the body shots the models were wearing bathing suits, while the remaining models were fully clothed. A mixture of types of image (face only, body shots, bathing suit images) was used in an attempt to activate varied kinds of appearance comparison (i.e. comparison of the face and body). These images had been rated for their attractiveness and thinness by a sample of 285 female undergraduates as part of a previous project in our lab (Quigg, 2012). The face images scored a mean of 64.65 on a 0-100 point scale anchored with *not at all attractive* and *extremely attractive*. The body images scored a mean of 62.44 for attractiveness on the same scale and 84.37 on a 0-100 point scale anchored with *not at all thin* and *extremely thin*. Each image was presented for 10 seconds, for a total of 120 seconds of image exposure. Participants were asked to look at the pictures the whole time they were on the screen and not to look away or close their eyes. An experimenter observed participants through a one-way mirror during image exposure and assessed whether or not participants looked at the images for at least 90 of the 120 seconds they were on the screen. Immediately after image exposure, participants were asked to report the number they had been trying to remember.

VAS items (post-test). After attempting to report the number they had been rehearsing,

participants were asked to complete the same 10 VAS items as they had completed before image

exposure. At post-test, the internal consistency of the three-item mood measure was good, Cronbach's

α = .75, and the internal consistency of the appearance evaluation measure was excellent, Cronbach's α

= .91.

Self-esteem and demographics. Once the VAS items had been completed a second time,

participants completed the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965), which is a 10-item

measure in which participants are asked to indicate the extent to which they agree, on a 0-3 scale, with

statements such as "On the whole, I am satisfied with myself". The RSES scores can range from 0 to 30.

The self-esteem measure was included to check for differences in global self-esteem between

participants in the two conditions. In the present sample, excellent internal consistency of the RSES was

observed, Cronbach's α =.90. Finally, participants answered demographic questions, reporting their age,

height, weight and ethnic background, and were then debriefed as to the real purpose of the study.

Results

Demographics. Participants in the Free View and Cognitively Busy Conditions were not

significantly different in terms of their age, $t(114) = 1.68$, $p = .10$, their BMI, $t(112) = -.52$, $p = .61$, or their

self-esteem (RSES) scores, $t(114) = 1.52$, $p = .13$. (See Table 1 for descriptive statistics.) The proportion of

participants whose self-reported ethnicity was Caucasian (the largest single group and the group whose

ethnicity matched that of the models in the thin ideal images) did not differ significantly between the

two conditions, Fisher's exact test, $p = .85$.

Mood. A 2 (Condition: Free View vs. Cognitively Busy) x 2 (Time: Pre-test vs. Post-test) mixed-

design ANOVA was conducted on participants' negative mood scores. This analysis revealed a significant

main effect of Time, $F(1, 114) = 13.47$, $p < .001$, partial $\eta^2 = .11$, but no significant main effect of

Condition, $F(1, 114) = 1.77$, $p = .19$, partial $\eta^2 = .02$. The interaction between Time and Condition was statistically significant, $F(1, 114) = 14.90$, $p < .001$, partial $\eta^2 = .12$.

The significant interaction between Time and Condition was followed up with two paired-samples t-tests, one for each condition. In the Free View Condition, participants' mood was significantly more negative at post-test, $M = 40.24$, $SD = 18.91$, than it had been at pre-test, $M = 31.57$, $SD = 18.57$, $t(57) = -4.77$, $p < .001$, 95% CI of the difference [-12.30, -5.03], Cohen's $d_{unb} = .46$. In the Cognitively Busy Condition, participants' mood at post-test, $M = 31.60$, $SD = 17.09$, was not significantly different from their mood at pre-test, $M = 31.82$, $SD = 17.63$, $t(57) = .15$, $p = .88$, 95% CI of the difference [-2.62, 3.05], Cohen's $d_{unb} = -.01$. Thus, hypothesis 1a – that participants' mood would be significantly more negative at post-test than at pre-test in the Free View Condition – was supported. Hypothesis 2a – that participants' mood would be significantly more negative at post-test than at pre-test in the Cognitively Busy Condition –was not.

Appearance evaluations. A 2 (Condition: Free View vs. Cognitively Busy) x 2 (Time: Pre-test vs. Post-test) mixed-design ANOVA was conducted on participants' appearance evaluations. This analysis revealed a significant main effect of Time, $F(1, 114) = 8.62$, $p < .005$, partial $\eta^2 = .07$, but no significant main effect of Condition, $F(1, 114) = 0.70$, $p = .41$, partial $\eta^2 = .01$. The interaction between Time and Condition was statistically significant, $F(1, 114) = 4.10$, $p < .05$, partial $\eta^2 = .04$.

The significant interaction between Time and Condition was followed up with two paired-samples t-tests, one for each condition. In the Free View Condition, participants' appearance evaluations were significantly lower at post-test, $M = 47.79$, $SD = 20.93$, than they had been at pre-test, $M = 50.98$, $SD = 16.04$, $t(57) = 2.84$, $p < .01$, 95% CI of the difference [0.94, 5.44], Cohen's $d_{unb} = -.17$. In the Cognitively Busy Condition, participants' appearance evaluations at post-test, $M = 52.09$, $SD = 20.47$, were not significantly different from their appearance evaluations at pre-test, $M = 52.67$, $SD = 20.63$,

$t(57) = .93$, $p = .36$, 95% CI of the difference [-0.67, 1.85], Cohen's $d_{unb} = -.03$. Thus, hypothesis 1b – that participants' appearance self-evaluations would be significantly lower at post-test than at pre-test in the Free View Condition – was supported. Hypothesis 2b – that participants' appearance self-evaluations would be significantly lower at post-test than at pre-test in the Cognitively Busy Condition –was not.

Discussion

Participants in the Free View Condition, who viewed the media images and were free to reflect on them however they chose, experienced increased negative mood (unhappiness, insecurity, and anger) following exposure to the images. To a lesser extent, they also experienced a slight decrease in their appearance self-evaluations. These results support Hypotheses 1a and 1b. They are consistent with a great deal of prior research that typically demonstrates the detrimental effects experienced by women from Canada, the U.S., the U.K., and Australia, who view media images while experiencing little to no cognitive load (Grabe et al., 2008; Groesz et al., 2002; Want, 2009).

Participants in the Cognitively Busy Condition, who were tasked with remembering a complex 8-digit number, experienced much less change – on average, close to no change – in their levels of negative mood and appearance evaluations. Thus, in Study 1, no support was found for Hypotheses 2a and 2b. No evidence was found in Study 1 to support the idea that social comparisons to media images can take place while viewers are cognitively busy, and thus no evidence to suggest that social comparisons are efficient mental processes was found. These results suggest that social comparisons with media images may rely on mental processes that are at least somewhat elaborated, rather than being effortless or even non-conscious processes.

The results of Study 1 seem to contradict the findings of Gilbert et al., (1995a) who found evidence that participants still made social comparisons (albeit comparisons on a cognitive task, not on appearance) when they were cognitively busy. Given this contradiction, we decided to replicate Study 1.

To enhance the generality of the results, we used a different set of media images in Study 2. We also added a third Control Condition to counter one specific interpretation of the results of Study 1. One interpretation of the results of Study 1 is that the changes in mood and appearance evaluations experienced by participants in the Free View Condition were not actually caused by the exposure to the media images themselves, but occurred simply because participants were asked questions about important dimensions of appearance and then given time to reflect on them. In other words, it may have been that asking participants about their satisfaction with their appearance activated thoughts about their own appearance, and the longer and more deeply they thought about their appearance the worse they felt, regardless of the exposure to the media images (we thank an anonymous reviewer for this suggestion). This interpretation may be plausible because, as previously noted, a degree of dissatisfaction with appearance seems to be normative among samples of North American women (Swami et al., 2010). Thus, reflecting on appearance by itself may make such participants feel bad even if no media images are presented. If this explanation were true, then we would expect that asking participants' questions about their appearance, then giving them time to reflect, would result in poorer mood and appearance evaluations two minutes later, even if they were not exposed to media images in the interval. Thus, in the Control Condition in Study 2, participants followed the same procedure as in the Free View Condition of Study 1, but were not exposed to any media images.

Study 2 was also designed to attempt to discover if evidence of efficiency in social comparisons could be found among a subset of participants. Although there was no evidence that participants in the Cognitively Busy Condition had made social comparisons in Study 1, we could not rule out the possibility that viewing media images while cognitively busy may be detrimental for a subset of people with heightened body image concerns. For instance, although many studies find overall detrimental effects of media exposure, meta-analyses show that these effects are stronger for people with pre-existing body image issues (Groesz et al., 2002; Want, 2009). Most pertinently, in their U.K. sample, Brown and

Dittmar (2005) found that even though the detrimental effects of viewing media images were enhanced when images were presented for longer, very briefly-presented images did have detrimental effects on those high in internalization of the thin ideal. Thus, in Study 2 we included a measure of internalization of the thin-ideal (the Sociocultural Attitudes Towards Appearance Questionnaire or SATAQ-3: Thompson, van den Berg, Roehrig, Cuarda & Heinberg, 2004) People who score highly on the SATAQ think of media images as important sources of information regarding appearance, feel more pressure to emulate the appearance of models, movie stars and TV celebrities, and report making more habitual social comparisons with them. Thus, if anyone is likely to make social comparisons with media images with minimal conscious effort and while mentally preoccupied with other thoughts, it will be these individuals.

Thus, in addition to re-testing the hypotheses from Study 1 (i.e. Hypotheses 1a through 2b), in Study 2 an additional pair of hypotheses were tested. Given that prior research has shown that high-levels of thin-ideal internalization are related to more detrimental effects of viewing media images under conditions akin to our Free View Condition, we predicted:

H3a: In the Free View Condition, the effect of viewing media images – as measured by the pre-to post-test negative mood and appearance self-evaluation scores – would be significantly greater for participants who scored above the median on the SATAQ-3 than for those who scored at or below the median.

Given the results of Brown and Dittmar (2005), who found that participants high in thin-ideal internalization were affected by very brief exposure to media images, we also predicted that:

H3b: In the Cognitively Busy Condition, the effect of viewing media images – as measured by the pre-to post-test negative mood and appearance self-evaluation scores – would be significantly greater

for participants who scored above the median on the SATAQ-3 than for those who scored at or below

the median.

Study 2

Method

  Participants. Across two semesters, 183 women signed up for the study through the same study

participation website as in Study 1. Of the 183, data from six were excluded because they were 30 years

old or older, leaving the remaining participants aged between 17 and 27. This left 59 participants in each

of the three conditions. None of the participants in Study 2 had taken part in Study 1. Participants' age,

BMI, and self-identified ethnic background in the three conditions are shown in Table 2.

Table 2 *Characteristics of women in Study 2*

Characteristic	Free View condition (n = 59)		Cognitively Busy condition (n = 59)		Control condition (n = 59)	
	M (SD)	95% CI	*M (SD)*	95% CI	*M (SD)*	95% CI
Age in years	18.73 (1.81)	[18.26, 19.20]	18.69 (1.70)	[18.25, 19.14]	19.27 (1.96)	[18.76, 19.78]
BMI	22.12 (3.83)	[21.10, 23.13]	21.46 (3.51)	[20.54, 22.38]	21.65 (4.43)	[20.47, 22.82]
RSES (0-30)	17.93 (4.64)	[16.59, 19.27]	18.24 (5.22)	[16.90, 19.58]	16.98 (5.72)	[15.64, 18.32]
SATAQ-3 (30-150)	100.19 (21.14)	[94.69, 105.68]	96.58 (24.21)	[91.08, 102.07]	96.14 (18.42)	[90.64, 101.63]
Ethnic background	23 White/Caucasian		17 White/Caucasian		23 White/Caucasian	
	13 Asian		16 Asian		10 Asian	
	4 Black/African-American		5 Black/African-American		4 Black/African-American	
	3 Middle-Eastern		4 Middle-Eastern		3 Middle-Eastern	
	9 South Asian		11 South Asian		15 South Asian	
	4 Hispanic/Latina		4 Hispanic/Latina		1 Hispanic/Latina	
	3 Multi-Ethnic		2 Multi-Ethnic		3 Multi-Ethnic	

N.B. BMI = Body Mass Index, RSES = Rosenberg Self-Esteem Scale (min-max: 0-30), SATAQ-3 = Sociocultural Attitudes To Appearance Questionnaire (min-max: 30-150). Participants in the three conditions did not differ significantly on any of these variables (all *p* > .05).

Materials and Procedure. All materials and procedures were the same as in Study 1, except where noted below.

Personality questionnaire. The NEO Five-Factor Inventory-3 was omitted for Study 2.

Visual Analogue Scale (VAS) items. In Study 2, Cronbach's α for the VAS measure of negative mood was .79 at pre-test and .85 at post-test, demonstrating good internal consistency. Cronbach's α for the VAS measure of appearance satisfaction was .85 at pre-test and .90 at post-test, demonstrating good to excellent internal consistency.

Cognitive busyness manipulation. The 8-digit number the participants were asked to remember in the Cognitively Busy Condition was changed from 78639946 to 49753170.

Exposure to media images. As in Study 1, participants were presented with 12 images taken from fashion magazines and clothing-manufacturers' websites, each containing a single female model who was young, thin, attractive, and Caucasian. As before, five were close-ups of models' faces and seven were body shots of models. However, in order to ensure that the results of Study 1 were not particular to the images we used, we replaced the images from Study 1 with a new set of images. These new images were rated by a sample of 10 graduate psychology students. The face images scored a mean of 72.57 for attractiveness on the same 100-point scale as in Study 1. The body images scored a mean of 66.35 and 67.14 on the attractiveness and thinness 100-point scales, respectively. The images were presented as in Study 1.

Control condition. This new condition for Study 2 involved the same procedure as the Free View Condition from Study 1, except that participants were not exposed to the media images. Instead, they viewed a series of black-and-white or colored rectangles which were the backgrounds to the media images from the other two conditions with the models from the images digitally erased. Thus, the

participants in this condition were given the pre-test measures, asked to memorize the simple 8-digit

number (11111111) while being exposed to blank images, then given the post-test measures.

Self-esteem scale. Cronbach's α for the Rosenberg Self-Esteem Scale in Study 2 was .87.

Sociocultural Attitudes to Appearance Questionnaire (SATAQ-3). At the end of the study,

participants completed the Sociocultural Attitudes to Appearance Questionnaire (SATAQ-3: Thompson

et al., 2004). This is a 30-question personality inventory designed to measure the extent to which

participants habitually compare themselves to people in the media or wish to look like them, feel

pressure from the media to enhance their appearance, and regard the media as important sources of

information about appearance-related matters. Sample items ask participants to indicate on a 1-5 scale

the extent to which they agree with statements such as "I compare my appearance to the appearance of

people in magazines", "I've felt pressure from TV or magazines to diet" and "Magazine advertisements

are an important source of information about fashion and 'being attractive'". Scores can range between

30 and 150, with higher scores indicating greater internalization of the media-presented thin-ideal. In

the present sample, Cronbach's α was .94, demonstrating excellent consistency. This measure was given

at the end of the procedure, rather than the beginning, to avoid sensitizing participants to the study's

purpose before the DVs were measured.

Results

Demographics. Participants in the three conditions were not significantly different in terms of

their age, $F(2, 174) = 1.85$, $p = .16$, their BMI, $F(2, 169) = .42$, $p = .66$, their self-esteem (RSES) scores, $F(2,$

$174) = .93$, $p = .40$, or their SATAQ-3 scores, $F(2, 174) = .64$, $p = .53$. (See Table 2 for descriptive

statistics.) The proportion of participants whose self-reported ethnicity was Caucasian (the largest single

group and the group whose ethnicity matched that of the models in the thin ideal images) did not differ

significantly between the three conditions, Fisher's exact test, $p = .43$.

Mood. A 3 (Condition: Free View vs. Cognitively Busy vs. Control) x 2 (Time: Pre-test vs. Post-test) mixed-design ANOVA was conducted on participants' negative mood scores. This analysis revealed no significant main effect of Time, $F(1, 174) = 1.16$, $p = .28$, partial $\eta^2 = .01$, but a significant main effect of Condition, $F(2, 174) = 4.36$, $p < .05$, partial $\eta^2 = .05$. The interaction between Time and Condition was statistically significant, $F(2, 174) = 3.63$, $p < .05$, partial $\eta^2 = .04$.

The significant interaction between Time and Condition was followed up with paired-samples t-tests, one for each condition. In the Free View condition, participants' mood was significantly more negative at post-test, $M = 41.42$, $SD = 18.38$, than it had been at pre-test, $M = 37.37$, $SD = 17.71$, $t(58) = -2.65$, $p < .05$, 95% CI of the difference [-7.11, -0.99], Cohen's $d_{unb} = .22$. In the Cognitively Busy condition, participants' mood at post-test, $M = 34.17$, $SD = 17.34$, was not significantly different from their mood at pre-test, $M = 33.70$, $SD = 18.24$, $t(58) = -.27$, $p = .79$, 95% CI of the difference [-3.90, 2.97], Cohen's $d_{unb} = .03$. In the Control condition, participants' mood at post-test, $M = 29.58$, $SD = 17.76$, was not significantly different from their mood at pre-test, $M = 31.27$, $SD = 16.16$, $t(58) = 1.31$, $p = .20$, 95% CI of the difference [-.89, 4.26], Cohen's $d_{unb} = -.10$. Thus, as in Study 1, the results from Study 2 supported Hypothesis 1a, but did not support Hypothesis 2a.

Appearance Evaluations. A 3 (Condition: Free View vs. Cognitively Busy vs. Control) x 2 (Time: Pre-test vs. Post-test) mixed-design ANOVA was conducted on participants' appearance evaluations. This analysis revealed no significant main effect of Time, $F(1, 174) = .97$, $p = .33$, partial $\eta^2 = .01$, and no significant main effect of Condition, $F(1, 174) = 0.52$, $p = .60$, partial $\eta^2 = .01$. However, the interaction between Time and Condition was statistically significant, $F(2, 174) = 6.92$, $p < .005$, partial $\eta^2 = .07$.

The significant interaction between Time and Condition was followed up with paired-samples t-tests, one for each condition. In the Free View condition, participants' appearance evaluations were significantly lower at post-test, $M = 48.56$, $SD = 19.43$, than they had been at pre-test, $M = 52.58$, $SD =$

17.65, $t(58) = 4.05$, $p < .001$, 95% CI of the difference [2.04, 6.02], Cohen's $d_{unb} = -.21$. In the Cognitively

Busy condition, participants' appearance evaluations at post-test, $M = 53.47$, $SD = 19.97$, were not

significantly different from their appearance evaluations at pre-test, $M = 52.21$, $SD = 19.25$, $t(58) = -.87$,

$p = .39$, 95% CI of the difference [-4.18, 1.66], Cohen's $d_{unb} = .06$. In the Control condition, participants'

appearance evaluations at post-test, $M = 49.68$, $SD = 21.73$, were not significantly different from their

appearance evaluations at pre-test, $M = 48.83$, $SD = 21.08$, $t(58) = -1.07$, $p = .29$, 95% CI of the difference

[-2.46, 0.75], Cohen's $d_{unb} = .04$. Thus, as in Study 1, the results from Study 2 supported Hypothesis 1b,

but did not support Hypothesis 2b.

Moderation of the effects of condition by participants' SATAQ-3 scores. To assess Hypotheses

3a and 3b, namely whether participants who scored highly on the SATAQ-3 were affected by exposure

to the media images to a greater extent, we divided participants in each condition into two groups. One

group consisted of participants whose SATAQ-3 score was at or below the whole sample median (101),

while the second group consisted of participants whose SATAQ-3 score was above the median (i.e.

>101). We then re-ran the paired-samples t-tests comparing participants' pre-test mood and

appearance evaluations with their post-test mood and appearance evaluations. The results are

summarized in Table 3. In these analyses, the only participants to experience significant changes in their

mood, $t(29) = -2.83$, $p < .01$, and appearance evaluations, $t(29) = 4.09$, $p < .001$, were participants from

the Free View Condition who scored above the median on the SATAQ-3. Thus, Hypothesis 3a was

supported but Hypothesis 3b was not. In the Free View Condition, participants who scored above the

median on the SATAQ-3 were more detrimentally affected by the media images than participants who

scored at or below the median; neither set of participants were significantly affected by the images in

the Cognitively Busy Condition.

Table 3 *Participants' pre- and post-test negative mood and appearance evaluation scores by Condition and SATAQ-3 score*

Variable	Free View condition		Cognitively Busy condition		Control condition	
	SATAQ-3 <= 101 (*n* = 29)	SATAQ-3 > 101 (*n* = 30)	SATAQ-3 <= 101 (*n* = 29)	SATAQ-3 > 101 (*n* = 30)	SATAQ-3 <= 101 (*n* = 34)	SATAQ-3 > 101 (*n* = 25)
Pre-test negative mood (0-100)	33.76 (16.94)$_{ab}$	40.86 (18.02)$_b$	27.76 (17.57)$_a$	39.44 (17.26)$_{ab}$	27.57 (13.93)$_a$	36.29 (17.85)$_{ab}$
Post-test negative mood (0-100)	37.41 (17.89)$_{ab}$	45.29 (18.31)$_b$	26.53 (15.95)$_{ac}$	41.56 (15.53)$_b$	24.97 (15.93)$_c$	35.85 (18.50)$_{abc}$
Significance test (pre- to post-test)	*t*(28) = -1.36, *p* = .18	*t*(29) = -2.83, **p < .01**	*t*(28) = .71, *p* = .49	*t*(29) = -.72, *p* = .48	*t*(33) = 1.39, *p* = .17	*t*(24) = .26, *p* = .79
Pre-test appearance evaluation (0-100)	58.72 (16.75)$_a$	46.65 (16.68)$_{abc}$	58.84 (17.80)$_a$	45.80 (18.66)$_{bc}$	55.59 (18.03)$_{ab}$	39.63 (21.77)$_c$
Post-test appearance evaluation (0-100)	56.90 (17.65)$_{ab}$	40.49 (17.83)$_c$	62.28 (18.20)$_b$	44.97 (18.03)$_{ac}$	57.41 (18.73)$_{ab}$	39.17 (21.42)$_c$
Significance test (pre- to post-test)	*t*(28) = 1.55, *p* = .13	*t*(29) = 4.09, **p < .001**	*t*(28) = -1.92, *p* = .07	*t*(29) = .37, *p* = .71	*t*(33) = -1.85, *p* = .07	*t*(24) = .35, *p* = .73

N.B. Statistically significant test results are in bold. SATAQ-3 = Sociocultural Attitudes To Appearance Questionnaire (min-max: 30-150). Within rows, means that are significantly different (*p* < .05) are marked with different subscripts.

General Discussion

The results from both studies supported Hypotheses 1a and 1b. In both studies participants in the Free View Conditions, who viewed media images without being made cognitively busy, reported increases in negative mood and lowered evaluations of their appearance from before to after viewing. The results from the Control Condition of Study 2 – in which participants experienced exactly the same procedure as in the Free View Condition but who were not exposed to media images, and who did not experience significant changes in mood and appearance evaluations – demonstrate that the likely cause of this was, in fact, exposure to the media images. In Study 2, the detrimental effects of exposure to media images in the Free View Condition were moderated to some extent by participants' level of internalization of the thin-ideal. Thus Hypothesis 3a was supported; only participants who scored above the median on the SATAQ reported significantly more negative mood and significantly lowered self-evaluations in response to the media images in Study 2. These results are consistent with meta-analyses that demonstrate that when young women view media images while *not* cognitively busy, the result is generally detrimental to their mood and appearance self-evaluations, and these effects are significantly heightened among those individuals who strongly internalize the thin ideal (Groesz et al., 2002; Want, 2009).

In neither study did we find evidence that participants who were made cognitively busy during exposure to the media images were affected by them either in terms of mood or appearance evaluations. In Study 2, we explored whether a subset of participants who scored highly on a measure of internalization of the thin ideal were significantly affected by exposure to media images while cognitively busy, but this was not the case. Thus, in neither study did we find support for Hypotheses 2a and 2b, and in Study 2 there was no support for Hypothesis 3b. In other words, there was no evidence

from the present pair of studies that social comparisons with media images are cognitively efficient processes.

These results may have important implications. The present results speak to the mechanism at work in producing detrimental effects of exposure to thin-ideal media images. Participants in the Cognitively Busy Conditions memorized a complex number and were therefore likely to be at least somewhat mentally preoccupied with rehearsing the digits of that number while they viewed the media images. They thus presumably spent less time consciously reflecting on comparisons between themselves and the women in the media images than participants who were not mentally preoccupied. The end result was that participants who had to memorize the complex number were less detrimentally affected by them. We take this as evidence that social comparisons rely on processes that are at least somewhat effortful and elaborated, rather than efficient and potentially non-conscious.

If we can generalize from the present results to participants' everyday lives (more on this shortly), the present results suggest that media images that we encounter in everyday life while we are mentally preoccupied may have less effect on our mood or self-evaluations than media images to which we devote our full attention. In fact, in the present studies, media images that were viewed while participants were mentally preoccupied did not seem to affect mood or self-evaluations much at all. Perhaps, contrary to the idea of social comparisons as efficient, inevitable, even non-conscious processes, they are actually processes that require cognitive effort. If so, then the covers of the magazines lining the supermarket check-out lines and the billboard images we pass on our commute to work will have little effect on us unless we happen to stop and devote our attention to them.

Limitations and Future Directions

The present results seem to show that exposure to media images has very little detrimental effect on viewers who are cognitively busy. However, we do not regard the present research as

definitive. We cannot conclude from the present study that social comparisons with media images are entirely inefficient and effortful processes. It is still possible that some effects of viewing media images while cognitively busy may occur for some people, some of the time. In particular, in future we aim to assess the effects of exposure to media images while cognitively busy in a larger sample of participants who strongly internalize the thin ideal because the Cognitively Busy Condition in Study 2 contained only 30 such participants. In addition, three other limitations of the present research could be usefully addressed in future research.

Firstly, while the models in the images that we used were homogeneous with regard to their ethnic background (i.e. they were all Caucasian), our sample was relatively heterogeneous in this respect. We chose to focus on images of Caucasian models as these models constitute the mainstream media image in the location of our study; they thus represent the most ecologically valid type of image to use. However, future studies might examine whether or not the effect of cognitive busyness differs depending on the (mis)match between model and participant ethnicity. Perhaps detrimental effects of viewing media images while cognitively busy only occur when the images match the ethnicity of the viewer. In other words, perhaps social comparisons are only efficient when made with individuals who are perceived as in-group members. Unfortunately, the heterogeneity of ethnic background in our sample does not permit us to ascertain whether or not this is the case. Splitting the present sample by ethnicity would result in small numbers of participants in each group, thus reducing the power to detect the effects of the thin-ideal images.

Secondly, it is possible that detrimental effects of social comparisons still occur when participants are cognitively busy, but that these effects will not be evident on self-report measures of mood and appearance satisfaction. In other words, there may be no detectable influence of viewing media images while cognitively busy when *explicit* measures of mood and appearance satisfaction are

used, but effects may be evident on *implicit* measures of the same. Two previous studies found that participants who viewed media images under conditions akin to the Free View Conditions in the present research incurred detrimental effects on such implicit measures. Using an implicit measure, Boyce, Kuijer and Gleaves (2013) found that such images increased negative mood in a sample of female participants from New Zealand, and Gurari, Hetts and Strube (2006) found similarly detrimental effects of such images on an implicit measure of U.S. female undergraduates' appearance satisfaction. Future research might attempt to examine whether or not cognitively busy participants who view media images incur detrimental effects on these measures, or one of the more well-validated measures of implicit self-esteem such as the IAT (Greenwald & Farnham, 2000). If social comparisons can be efficient and non-conscious then perhaps the effects of such comparisons will only be detected at an implicit level.

Finally, both of our studies utilized the same manipulation of cognitive busyness. It seems likely that requiring participants to memorize an 8-digit number imposed a reasonably heavy cognitive load on participants. To that extent, our Cognitively Busy Conditions tested a fairly strong version of the claim that social comparisons are efficient processes. It may still be possible that social comparisons are efficient; just not so efficient as to take place under such heavy cognitive load. Perhaps other manipulations of cognitive busyness will leave social comparisons unaffected, or even increase their effects. On a related note, we do not know to what extent memorizing an 8-digit number induces a level of cognitive busyness that approximates the mental pre-occupation people may experience when exposed to media images in everyday life. This limits the confidence with which we can generalize the present results outside of the laboratory. For these reasons, we are currently investigating the effects of other methods of manipulating cognitive busyness – such as requiring participants to engage in a simultaneous visual task, instead of the memory task used here – while participants view media images.

More research on the effects of engaging in different types of mental activity during exposure to thin-ideal media images is needed. Such research will help to further illuminate both the conditions under which we can expect thin-ideal media images to exert detrimental effects on viewers, as well as the thought processes – whether efficient, unintentional, uncontrollable, and non-conscious, or effortful, deliberate, controllable, and conscious – that mediate those effects.

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