'Lift Big-Get Big': The impact of images of hyper-muscular bodies and training information

Running Head: The 'Lift Big-Get Big' culture

Original Research Article

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Abstract

Purpose: It has been suggested that the media influences beliefs regarding ideal body appearance and drive for muscularity whilst also offering recommendations for achieving this; most commonly heavy load free weight resistance training (RT). However, evidence for media effects are inconsistent in the literature. This study investigated this 'lift big-get big' culture and effects of imagery on males' beliefs regarding RT. **Method**: An online survey was conducted with male participants (N = 110) randomised to different images (hyper-muscular/lean/control) and RT information ('lift big-get big'/'evidence based RT'/control). **Results**: Descriptive data suggested belief in necessity of heavy loads and free weights was pervasive. There was a small significant effect of condition for multivariate analysis of beliefs regarding RT. Univariate analyses showed significant effects of condition regarding the importance of free weights and heavy loads for strength, and free weights for hypertrophy. Small to moderate effects were found comparing 'evidence-based RT' with a hyper-muscular physique to 'lift big-get big' conditions with both hyper-muscular and lean physiques, the latter more likely to agree free weights and heavy loads are necessary for strength. A small effect was found comparing 'lift big-get big' conditions with both hyper-muscular and lean physiques and the control condition, the former more likely to agree free weights are necessary for hypertrophy. **Conclusions**: Although hyper-muscular bodies alone did not influence RT beliefs, new information i.e. 'evidence-based RT' combined with a hyper-muscular physique had a small effect. The 'lift big-get big' culture is perhaps pervasive enough that most conditions merely reinforced existing beliefs.

Key words: Gym, Strength, Hypertrophy, Muscularity, Media, Weightlifting

Introduction

It has been argued that there has been an influential movement since the mid-1980s, of males being exposed to increasingly muscular physiques within the media (Mishkind, Rodin, Silberstein & Striegle-Moore, 1986), with a trend towards male depictions becoming increasingly muscular in both size and definition (Andersen & DiDomenico, 1992; Grogan, 2016; Hatoum & Belle, 2004; Leit, Pope & Gray, 2001; Pope, Phillips & Olivardia, 2000; Thompson & Cafri, 2007). By the 1990s, magazines increasingly focused on male appearance (Boni, 2002) and depicted men as sexual objects (Hall, 2015; Kimmel & Tissier-Desbordes, 1999; Rohlinger, 2002). Further, though attractive male leads have always been part of culture, since the 1980s, top grossing male movie actors' physiques have shown a trend toward increasing muscularity; a characteristic that is often associated with them being more aggressive, romantically successful, and obtaining more positive outcomes (Morrison & Halton, 2009) Thus it is thought as a consequence, men have begun to change their opinion about what is considered the ideal size, to reflect increased muscularity in an effort to conform to portrayed norms (Gattario et al., 2015; Leit et al., 2001; Raevuori, Lesli-Rahkonen, Bulik, Rose, Rissanen, & Kaprio, 2006). Indeed, it has been argued that, over the last twenty years, western cultural standards have shifted towards a muscular ideal for the male body, characterised by an upper body with a well-developed chest, arms and shoulders, and a lower body with a slim waist, hips and buttocks (Leit, Gray & Pope, 2002; McCreary & Sasse, 2000; Pope et al., 1999; Raevuori et al., 2006). Research has suggested that many men want to 'get bigger'; specifically increasing bicep size and shoulder breadth (Grogan & Richards, 2002; Furnham & Greaves, 1994).

Combining the ever increasing hyper muscularity of actors (the dominant paradigm of superhero movies in Hollywood; Morrison & Halton, 2009), with the popularity of magazines such as Men's Health (Boni, 2002; Grogan & Richards, 2002), their online counterparts (e.g.,

Flex, Men's Fitness, Muscle & Fitness, Men's Health, Ironman), and the growth of social media platforms with fitness related content (Fardouly & Vartanian, 2016), some research has suggested that male body image may be vulnerable to media influence (Labre, 2002; McCabe & Ricciardelli, 2004; Tiggermann, 2005) with the preoccupation with enhancing musculature being coined the 'drive for muscularity' (McCreary & Sasse, 2000). Some studies have suggested this as being linked specifically to media imagery (Labre, 2002; Vartanian, Grant & Passino, 2001). Indeed, a number of theories might help elucidate this phenomenon: Social Comparison Theory (Festinger, 1954) suggests that humans compare themselves to others to evaluate characteristics that hold social importance (Blond, 2008); Social Cultural Theory (Vygotsky, 1978) suggests socio-cultural influences, like the media, are potential sources of body image disturbance (Morrison et al., 2003; Posavac, Posavac & Weigel, 2001). Despite this, meta-analytic review including 71 independent effects sizes in males from experimental, cross-sectional, and prospective studies examining the impact of media upon body image suggests that the effect is less than trivial (Ferguson, 2013). Most studies have been limited to college aged heterosexual males and there is limited evidence thus for generalizability of this finding, or whether it might apply to specific subgroups. Though, some recent evidence shows attentional biases towards body types meeting media portrayed ideals, and the potential negative effects of self-comparison to these on body image and negative affect which may be influenced by existing muscle dysmorphia (Waldorf, Vocks, Düsing, Bauer, & Cordes, 2019; Cho & Lee, 2013; Cordes, Vocks, Düsing & Waldorf, 2017). Although the effects on body image specifically may be unclear, there is to our knowledge no research investigating its effects on beliefs regarding approaches to attaining portrayed ideal body types which are desired by many (Grogan & Richards, 2002; Furnham & Greaves, 1994).

Going to the gym has become a lifestyle choice that goes beyond simple health requirements or pursuit of leisure activities (Steward, Smith & Moroney, 2013). For example,

a recent study suggested that males engaged in CrossFit style resistance training (RT) using free weight type exercises were less likely to report health-based motivations for exercise compared to a personal training group performing predominantly supervised machine based RT (Fisher, Sales, Carlson & Steele, 2016). Yet, attaining cosmetic or performance outcomes through the approach typified by what could be termed the ‘lift big-get big’ culture (heavy free weight resistance exercises, often argued as more ‘functional’), could represent an increased risk of injury (Fisher, Steele, Brzycki & DeSimone, 2014). Despite this there is an increasing interest worldwide in such RT approaches (Thompson, 2017; Thompson, 2018), and a growing group of male gym users. For example, for UK public leisure centre visits for males there was a rise from 34% of all visits in 2017 to 46% of all visits in 2018 (ukactive Research Institute, 2017; ukactive Research Institute, 2018). Thus it could be argued there is growing need for accurate information regarding RT practices.

Within exercise science, there has been for some time a common misconception that heavy load free weights are required to stimulate such muscular growth and strength. Indeed, the ‘lift big-get big’ culture has dominated mainstream exercise science research, with organisations such as the American College of Sports Medicine (American College of Sports Medicine, 2009) and National Strength and Conditioning Association (Shurley, Todd, & Todd, 2017) suggesting that free weight RT using heavy loads produces significantly greater muscle growth and strength. Naturally, this research has permeated mainstream media alongside the aforementioned imagery and potentially reinforcing the notion of obtaining the ideal body image through these methods. For example, Men’s Health magazine primarily suggests heavy free weight RT, alongside diet and nutritional information as the predominant approaches to obtaining these body ideals (Ricciardelli et al., 2010). Overall 10.28% of the pages of this magazine presented images of moderately muscular men flexing, body-building, and performing RT (Ricciardelli et al., 2010).

Recently, ‘lift big, get big’ philosophy and research have been challenged and heavily criticised. Some researchers have pointed out that this ‘heavier-is-better’ principle (Carpinelli, 2008; Fisher, Steele & Smith, 2017), in addition to assertion that free weights are superior to other forms of resistance such as RT machines (Carpinelli, 2017a), and are largely unsubstantiated by empirical research. Criticisms have included researcher bias, methodological flaws (Carpinelli, 2008; Carpinelli, 2017a; Fisher, Steele & Smith, 2017), and crucially, the demonstration of similar benefits to muscle growth and strength using a variety of RT types (Rossi et al., 2016) and loads (Schoenfeld et al., 2018).

Though evidence is mixed regarding media effects specifically upon body image in males, there is seemingly a growing group of males engaged in gym based exercise including RT, and also a seemingly predominant ‘lift big-get big’ culture and media providing direction regarding how to achieve certain aesthetic and performance outcomes. Considering that evidence from exercise science suggests that similar outcomes are possible with alternative RT approaches with a potentially lower risk of unintended outcome such as injury, it is prudent to understand whether there exists a connection among males between RT beliefs regarding how best to increase muscle mass and strength, and mass media images of the ideal body type combined with information of how to obtain this. Thus, the aim of this research was to examine the effects of the ‘lift big-get big’ culture using short-term exposure to ideal body types taken from the mass media, upon males’ beliefs regarding RT practises. We anticipated that participants would likely have had prior exposure to the ‘lift big-get big’ culture within the media, and thus a further aim was to determine whether simple editing of imagery and text within media would influence their RT beliefs. In addition, we explored whether the degree of muscle mass in the images presented affected the participants’ beliefs. Due to the assumed pervasiveness of the ‘lift big-get big’ culture, we hypothesised that all groups would report high levels of belief that free weights and heavy loads are important for

development of strength and hypertrophy. We also hypothesised that participants would be more likely to report importance of free weight RT and heavy loads as necessary for muscle strength and growth when exposed to mass media images of the ideal body, reinforcing the 'lift big-get big' philosophy. We further hypothesised that the muscle mass proportions of the image would significantly affect participants' RT beliefs independent of information provided with the image.

Materials and methods

Study Design

An online survey-based study with an experimental design was utilized, whereby participants completing questionnaires were randomized to receive one of five conditions exposing them to different images and information regarding RT approaches and the male image in the media. Such study designs have become increasingly common in psychological research (Krantz & Reips, 2017) and further, as many now consume their media through online sources, it was felt more appropriate for the present study to use this medium. Participants were not informed of the true purposes of the study (to examine the effect of these conditions upon their RT beliefs) but instead informed the study was merely a cross-sectional survey of males' attitudes towards different RT methods, increasing muscle mass and strength, the archetype male in the media, and frequency of exposure to mass media. The study was approved by the ethics committee at the first author's institution (ID No. 300).

Participants

An *a priori* sample estimate was calculated using G*Power (v3.1.9.2). The effect size for the *F* statistic in a between factors one-way analysis of variance (ANOVA) model was set as 0.3 as we had no prior data to base an effect size estimate on. Therefore, we opted for what

we considered might be the smallest worthwhile effect. Sample size was thus estimated as a total of 128 participants at an α of 0.05 and β of 0.80. A total of 262 participants responded to the survey.

Participants were males currently engaged in regular RT (defined as at least once per week in the past month). An online questionnaire was created (described below) through *Survey Monkey* and promoted on social media (Facebook and Twitter). Participants were recruited through opportunity sampling. Prior to completing the questionnaire, participants read an information page and provided informed consent, and were assured of the anonymity of the results. For clarification, prior to participation the participants were provided with a definition of RT:

"Training involving exercises using repeated or sustained muscular contractions requiring a high degree of effort towards the end of the exercise and using either/or free weights (dumbbells, barbells etc.), resistance machines, bodyweight/callisthenic exercises, or other similar methods (i.e. resistance bands)"

In addition, we then provided a definition of muscular hypertrophy:

"Hypertrophy; the enlargement of an organ or tissue from the increase in size of its cells e.g. 'the hypertrophy of muscle fibres'"

Further, participants indicated their age and whether they held a university level qualification in an exercise related topic (e.g., exercise science, sport science, kinesiology etc.). Participants were randomized into five different scenarios halfway through the completion of the survey.

Experimental conditions

The scenarios were: 1) 'evidence based RT recommendations' poster with hyper-muscular male physique (EBRT-HM; *n* = 13 – Figure 1A); 2) 'evidence based RT

recommendations' poster with lean male physique (EBRT-L; *n* = 25 – Figure 1B); 3) 'lift big-get big' poster with hyper-muscular male physique (LBGB-HM; *n* = 30 – Figure 1C); 4) 'lift big-get big' poster with lean male physique (LBGB-L; *n* = 22 – Figure 1D); 5) a control condition without imagery or information (CON; *n* = 20).

The 'lift big-get big' text read:

"For the greatest increases in muscular strength and hypertrophy, heavy free weight lifts such as bench press, squats, deadlifts etc. are optimal. Simply put: The more weight on the bar, the bigger and stronger you'll get!"

The 'Evidence based RT recommendations' text read:

"The most recent research suggests that optimal improvement in strength and hypertrophy is achievable through a variety of resistance types including free weights, machines, and bodyweight, and that the load makes little difference as long as a high effort is used"

The four experimental conditions are shown in figure 1 and were designed to look like simple magazine style advertisements. The hyper-muscular male physique was chosen to typify the imagery associated with the 'lift big-get big' culture, while the lean male physique was chosen in order to present a stark contrast with this, yet at the same time not potentially alert participants to be suspicious, which we felt they may have been if confronted with a more normal-looking physique. These images were previously piloted in 40 participants not included in the present study, in addition to a third image which was to represent a 'moderate' degree of muscle mass between the two images used here. In this pilot participants were asked on separate occasions in randomised order whether they would describe the images as having large muscles and rated using a 10-point likert scale from 1 = "Not at all" to 10 = "Very much". The average response to the hyper-muscular male physique

used here was 8.9±1.1, for the moderately muscular image it was 7.4±1.4, and for the lean male physique it was 4.7±1.6. Thus, the two images used here were sufficiently contrasting.

Randomisation was performed by the *Survey Monkey* software using the 'Image A/B Test' function. This function permits the presence of an image on the question page to be manipulated with respect to the probability that it will appear for a participant. For each condition a 20% chance of that condition appearing was set. As such, randomization occurred at the point where each participant reached this part of the survey and thus there were differences in the number of participants per condition as noted above.

Exposure time, however, was not controlled. Further, the *Survey Monkey* software did not provide data regarding the duration that participants spent on each individual page of the questionnaire. However, the total time taken to complete the questionnaire was recorded and from this the average duration per page was calculated from the total duration divided by the number of pages (16 seconds [range 5 seconds to 53 seconds]). It should be noted that this included all pages (i.e. the introduction, participant information, informed consent, questions, and exposure conditions).

INSERT FIGURE 1 AROUND HERE

Questionnaire

The first half of the questionnaire involved questions asking participants to report their demographics and current training practices. Following these questions, participants encountered one of the randomized conditions (i.e. image and information, or nothing for the control) along with the phrase "*Keep going – you're halfway through now!*"

The second half of the questionnaire involved a total of 10 questions all employing 5-point Likert scales (strongly disagree = 1, disagree = 2, don't know = 3, agree = 4, strongly

agree = 5; a higher rating indicated greater agreement). These included questions regarding their agreement with statements relating to their goals (muscular strength and muscular hypertrophy), and agreement with statements relating to specific RT practices (the use of free weights, resistance machines, and heavy loads) and their essentiality for attaining improvements in muscular strength and muscular hypertrophy. Participants were asked to rate their agreement with the statements presented. Upon completion of the questionnaire participants were thanked and prompted to contact the researchers if they had questions or feedback. The full survey questionnaire is available on request from the authors.

Data Analysis

Of the 262 participants who responded to the survey, 110 completed all questions. The independent variable, consisting of five levels, was the condition to which participants were exposed. The dependent variables were participants' responses to the statements regarding their RT goals and beliefs (Q1 to Q10 of the second half of the questionnaire). Participants' demographic data were categorical and thus between group comparisons performed using the Chi-Square Independent test. A Shapiro-Wilk test revealed data violated assumptions of normality of distribution thus data were rank transformed for analysis. Multivariate Analysis of Variance (MANOVA) was used to examine the effects of condition upon the dependent variables. Where significant between groups effects were found for univariate tests of dependent variables, *post-hoc* analyses for pairwise comparisons were performed using Tukey's HSD. Statistical analysis was performed using SPSS (version 24; IBM, Portsmouth, Hampshire, UK). Multivariate analysis was accepted as statistically significant with $p \leq 0.05$. For univariate tests to control for experiment-wise error rates $p \leq 0.005$ (α of 0.05 was corrected [0.05/10 = 0.005] using Bonferroni's procedure to account for the 10 dependent variables [Q1 to Q10]) was accepted as the limit for statistical significance

when comparing *F* statistics for ANOVA. An uncorrected $p \leq 0.05$ accepted for *post-hoc* pairwise comparisons using Tukey's HSD as application of Bonferroni's correction procedure is considered to overcorrect for such comparisons (thus inflating type II error rate). Effect sizes using partial η^2 for main effects, and Hedge's *g* for post-hoc pairwise comparisons, were interpreted based upon Ferguson's (2009) recommendations using the following thresholds for statistically significant effects: partial η^2 recommended minimum effect size (referred to here as 'small') ≤ 0.04 to < 0.25, moderate ≥ 0.25 to < 0.64, and strong ≥ 0.64; Hedges *g* recommended minimum effect size (referred to here as 'small') ≤ 0.41 to < 1.15, moderate ≥ 1.15 to < 2.70, and strong ≥ 2.70.

Results

Demographics

The conditions did not differ significantly in any demographic characteristics when examined using the Chi-Square Independent test. Participant demographics for the entire sample are presented in Table 1.

INSERT TABLE 1 AROUND HERE

Resistance training goals and beliefs

MANOVA revealed a significant but 'small' multivariate effect for the experimental conditions ($F_{(4,105)} = 1.521$, $p = 0.026$; Wilk's $\Lambda = 0.564$, partial $\eta^2 = 0.133$). Univariate tests revealed significant between groups effects for questions 3 ($F_{(4,105)} = 3.975$, $p = 0.005$; partial $\eta^2 = 0.129$) , 6 ($F_{(4,105)} = 3.953$, $p = 0.005$; partial $\eta^2 = 0.129$, and 7 ($F_{(4,105)} = 3.485$, $p = 0.010$; partial $\eta^2 = 0.115$) with all effects considered to be 'small' in size. For question 3 post-hoc Tukey HSD revealed significantly higher agreement in both LBGB-HM and LBGB-L compared with EBRT-HM ($p = 0.049$, $g = 0.95$, and 0.004, $g = 1.29$ respectively). For question 6 post-hoc Tukey HSD revealed significantly higher agreement in both LBGB-HM and LBGB-L compared with CON ($p = 0.029$, $g = 0.91$, and $p = 0.004$, $g = 1.11$ respectively). For question 7 post-hoc Tukey HSD revealed significantly higher agreement in both LBGB-HM and LBGB-L compared with EBRT-HM ($p = 0.020$, $g = 0.84$, and $p = 0.015$, $g = 0.93$ respectively). Post hoc comparison effects were small to moderate. Table 2 shows descriptive data for each group.

INSERT TABLE 2 AROUND HERE

Discussion

This research sought to investigate how pervasive the ‘lift big get big’ culture is by examining males’ attitudes toward gaining strength, muscle, and their RT beliefs in response to differing imagery and information in combination. There was a small effect of condition upon the multivariate dependent variables. However, results did not support the hypothesis predicting that free weights and heavy loads would be considered more important to grow and get stronger when exposed to the ideal body appearance. Further, the hypothesis predicting that the type of imagery presented alone would significantly affect individuals’ RT beliefs was also not supported. The first two hypotheses, based on the concept that simply changing an image would elicit beliefs that one had to ‘lift big, to get big’ do not seem supported. However, there were significant differences between groups for questions relating to strength only that may have been due to the combination of information provided and the image, which were not hypothesised. Participants exposed to the ‘lift big–get big’ information, regardless of the accompanying image (lean or hyper muscular physique) reported higher agreement with the statements that free weights were essential for optimal improvement in muscular strength and muscular hypertrophy, relative to participants exposed to the ‘evidence based RT recommendations’ information combined with the hyper muscular male physique. Or conversely it could be said that those exposed to the EBRT-HM condition (i.e. ‘evidence based RT recommendations’ information combined with the hyper muscular male physique) were less likely to agree that free weights were essential for optimal improvement in muscular strength and muscular hypertrophy compared to either ‘lift big-get big’ condition. Further, those exposed to the ‘lift big-get big’ information also reported higher agreement with the statement that heavy loads are essential for optimal improvement in muscular strength, relative to the control group, who were not exposed to information or imagery. The above findings could be interpreted as follows and being partly supportive of our hypothesis regarding the assumed pervasiveness of the ‘lift big-get big’ culture.

Firstly, descriptive data suggest the prevalence of the ‘lift big-get big’ culture suggested that *most* participants, regardless of presented stimuli already believed that free weights and heavy loads are necessary for strength and/or hypertrophy. Indeed, training practice data revealed the majority of respondents performed free weight RT using loads between 70-90%1RM, suggesting that they already ascribed some value to free weight training using heavy loads as an effective training method. There was above average agreement in almost all groups that free weights and heavy loads were important for the development of strength and hypertrophy including the CON group. However, respondents exposed to ‘evidence based RT recommendations’ information accompanied by an image of a hyper muscular physique were less likely to agree with the statement that free weights are essential for optimal development of strength and hypertrophy relative to respondents in the ‘lift big-get big’ conditions. This may suggest that the ‘lift big-get big’ culture is pervasive enough that merely the introduction of new information is insufficient to change beliefs; however, the introduction of new information (‘evidence based RT recommendations’) in addition to images of hyper-muscular male physique may have a stronger, albeit still small, effect. This effects may be explained by Social Comparison Theory (Festinger, 1954), being that as most males evidently follow these practices already, it is likely that many will be exposed to others exhibiting behaviours coinciding with the ‘lift big-get big’ culture and thus conclude that it holds importance. Indeed, this may explain also why, despite our results showing that most participants reported either never or only sporadically reading subcultural literature, the ‘lift big-get big’ culture is still pervasive. However, the combination of new information with imagery showing a hyper-muscular male physique appeared more convincing and able to influence beliefs, supporting the notion that media sources of imagery, as Social Cultural Theory would predict (Vygotsky, 1978), can still have an impact, yet that to change beliefs they need to be accompanied by information and thus are likely ineffective

alone. The notion that combining information with imagery to affect people's attitudes and beliefs is supported by the literature. For example, a study by Mutti and colleagues (2015) showed that a warning label on a packet of cigarettes without a picture is far less effective than a warning label with a picture. It is worth noting that the images in the present study are unlikely to be as emotionally charged or impactful as graphic depictions of the consequences of cigarette smoking. Another study showed that only images that were contextually relevant to the accompanying information about the dangers of smoking had an impact on participants' beliefs about smoking (Shi et al., 2016). This might help explain why, in the present study, 'evidence-based RT recommendations' information associated with hyper-muscularity was more impactful than the same information associated with the lean physique. Despite this, the effects seen were small and so even this combination of information and imagery appears to only have a minimal, and perhaps specific (i.e. regarding strength outcomes and the effects of load) effect on beliefs perhaps questioning the extent to which the predictions of the theories alone are explanative of peoples beliefs in this regard.

Research has shown that images are likely to invoke some attentional bias with respect to attitudes and beliefs towards muscularity and ideal body types, especially among those reporting high levels of body dissatisfaction (Rodgers & DuBois, 2016). This may suggest that, respondents in the present study viewing the 'evidence-based RT recommendations' information in combination with a body type that more closely resembles their ideal musculature, may have been influenced by the presence of this particular image. Indeed, there is some evidence to suggest that those with existing body dissatisfaction may be more susceptible to media effects (Ferguson, 2013; Waldorf, Vocks, Düsing, Bauer, & Cordes, 2019; Cho & Lee, 2013). Further work should consider whether the magnitude of effects might differ specifically in males with existing body dissatisfaction.

Perhaps most importantly our results suggest that regardless of the stimuli presented, most participants believe it is necessary to ‘lift big’, in order to ‘get big’. This suggests that media proposing evidence-based training are unlikely to change this belief in isolation, perhaps due to the prevalence of the ‘lift big-get big’ culture amongst males participating in RT. The inclusion of hyper-muscular male imagery to accompany the information appears more influential in changing beliefs but this requires further research. The idea of engaging in ‘gym work’ (such as resistance training behaviours) to productively enhance one’s self (Maguire, 2008), and that the accumulation of ‘bodily capital’ is a primary motivator for such behaviour (Stewart et al., 2013), suggests participants might have assumed the presentation of imagery meeting that ideal validates the behaviours suggested in the accompanying information to achieve that outcome. Indeed, within the leisure industry there exists evidence suggesting the conflation of a fitness professional’s body appearance (so called ‘bodily capital’) with their perceived level of knowledge or authority (Frew & McGillivray, 2005; Hutson, 2013). Although, it would appear that fitness professionals themselves hold a ‘lean and defined’ body in higher regard than a hyper-muscular body which contrasts with our current findings (Phillips & Drummond, 2001). It may be that a similar phenomenon to the ‘bodily capital’ effect is occurring here, although despite fitness professionals themselves preferring lean and defined physiques, participants in this study appeared to be more influenced by hyper-muscular physiques apparently conflating the image accompanying information as supporting its authority or credence.

Individuals exposed to the ‘lift big-get big’ conditions, regardless of whether the image was a lean or hyper-muscular male physique, tended to report free weight RT as significantly more important for strength and hypertrophy, compared to those experiencing the ‘evidence based RT recommendations’ condition with a hyper-muscular male physique. However, these groups did not differ significantly from the ‘evidence-based RT

recommendations’ poster with a lean male physique. Further, individuals who saw the ‘lift big-get big’ posters, regardless of the image presented (lean or hyper-muscular physique), reported heavy loads as essential to improvement of muscular strength, relative to the control condition, but not relative to those who experienced the ‘evidence based RT recommendations’ condition. Together, these results offer insight into the influence of the ‘lift big-get big’ culture. Just the information regarding the ‘lift big-get big’ culture was sufficient to elicit and/or reinforce the belief that lifting heavy free weights is necessary to increase strength. The implications, thus, are that the ‘lift big-get big’ culture is perhaps sufficiently prevalent, that neither images or information on their own had great influence over participants, though were possibly more influential when combined as seen by the effects of ‘evidence based RT recommendations’ text alongside a hyper-muscular physique.

Why the effects seemed more specific to strength compared with hypertrophy is of interest to consider. That is to say, *both* free weights and heavy loads were considered important for strength. The most recent meta-analysis (Schoenfeld et al., 2018) reports that the load used has little impact upon hypertrophy or strength when measured using methods that do not resemble the training intervention specifically (i.e. training using dynamic exercise but testing using isometric dynamometry). But when strength is considered as the 1RM in a specific exercise evidence does support that using heavy loads optimises this (Schoenfeld et al., 2018). This is thought to be due to the training in essence more closely mimicking the test outcome and so due to a practice effect (Mattocks et al., 2018). Thus, though many may already be aware of the shifting evidence base suggesting load is less important for hypertrophy, many may consider strength to relate specifically to the 1RM in specific exercises such as free weights (which were used most prevalently in our sample) and this may explain why we only saw small effects in these outcomes.

Though an appreciable concern, and a rationale for the present study, is that people might engage in training practices that are unnecessary and/or potentially harmful due to increased injury risks (Fisher et al., 2014), there may be other unintended consequences of using media imagery to change training practices towards the ‘evidence based’ recommendations. Our results suggested that ‘evidence based RT recommendations’ text alongside a hyper-muscular physique might influence beliefs regarding training practices. However, the body image portrayed is likely still unattainable for the majority of individuals irrespective of training practices. Indeed, there is considerable heterogeneity in response to RT much of which is likely influenced by genetic predisposition which is unlikely to be overcome (Carpinelli, 2017b). As such, a concern may be that individuals wishing to attain this ideal realising that this is not possible irrespective of training practices may move to other potentially risky behaviours such as use of performance enhancing drugs. Only 7.7% of our sample reported having used performance enhancing drugs previously, but 26.8% of those who had not reported having considered it. A further worry may be that, considering the potential for greater media effects in those with muscle dysmorphia, there is also considerable use of performance enhancing drugs in this subgroup (González-Marti, Fernández-Bustos, Contreras Jordán, & Sokolova, 2017; Rohman, 2009). However, the relationships between body image ideals, muscle dsymorphia, and use of performance enhancing drugs is complicated, nor is it clear whether there is necessarily positive or negative (Smith, Rutty, Olrich, 2016). Nevertheless, the potential trade-off between shifting training practices through use of media manipulation and other potentially unintended consequences should be explored in future research.

The limitations of the present study should be noted. An online survey was used to gather data, which in itself is limited in the scope of information available to researchers who were absent during completion of the questionnaire. Although online surveys are becoming

commonplace in modern psychological research (Krantz and Reips, 2017), how much time was spent observing, or even whether the participant observed the poster at all in our study is unknown. As noted, we were unable to determine the exact exposure time through the *Survey Monkey* software; though, the average time spent on each page of the questionnaire ranged from 5 seconds to 53 seconds. Had data collection been conducted with both the participant and experimenter being present during completion, attempts could have ensured participants processed the conditions for a fixed time. However, it would have been difficult to recruit the number of participants reported here in such an experiment due to the labour-intensive process of controlling what participants were observing. Further it could be suggested that the uncontrolled nature of the exposures lent a degree of ecological validity to them particularly considering the nature of modern internet browsing habits.

It should also be noted that we fell just below our *a priori* sample estimate (125 participants estimated, 110 who completed all questions and were thus included). There may be issues of responder bias in that, of the 262 original respondents to the survey, only 110 completed all the questions enabling their data to be used in our analysis. Many ended the survey prematurely, though the impact this may have had on the results is not clear. Further, because of the placement of the 'Image A/B Test' function in *Survey Monkey* after the initial demographic and existing training practice questions respondents were not randomised to a condition until they reached that point. Thus, any respondents who ended the survey prior to that were not randomly allocated to a condition by the software and thus it is not possible to identify fully whether there were differences in completion between the conditions. A total of 112 respondents got as far as the 'Image A/B Test' function and only 2 did not complete all questions with 1 each from the EBRT-HM and EBRT-L conditions. Lastly, experimental psychological research has its own validity issues, meaning any technique employed presents pros and cons. We decided that the online survey offered more benefits than limitations in

this circumstance, including that it represented a more ecologically valid environment for exposure considering that many media sources including magazines are now online.

Further, a debriefing and post-survey interview could have revealed insight into the results and allowed participants to elaborate on their beliefs about the ‘lift big-get big’ culture. This would have been especially useful to further explore and understand why there were significant differences between some of the aspects of the conditions, but not others. Such a post-survey interview might have allowed the researchers insight into whether the participants were aware of the conditions being examined, and we therefore suggest that future research examine this.

Of course, these results apply only with respect to males currently engaged in RT, though it was the aim of this study to examine this specific group. Whether the ‘lift big-get big’ culture might also predominate within female populations engaged in RT is presently unclear. Considering that males and females alike show little effect of media though it seems likely that there would be a similar lack of effect of imagery specifically, though again beliefs might be more impact by the information provided in combination with certain imagery representing ‘bodily-capital’. Indeed, this is argued to be the case with respect to diet, beauty, or fashion products and behaviours (Want, 2009). Whether this is the case for RT practices and beliefs though is less obvious and requires further research. A number of barriers exist with respect to female participation in RT behaviours, in particular lack of knowledge of RT, along with perceived gender roles, stereotypes, and masculinities (Rohloff, 2013). Indeed, fewer females appear to be engaged in RT compared with males (Loustalot, Carlson, Kruger, Buchner, & Fulton, 2013). However, it should be noted that there is a growing culture of female bodybuilders challenging this (Richardson, 2008) and which could be of interest to study with respect to the prevalence of the ‘lift big-get big’ culture. In addition, we did not collect data regarding sexual orientation, ethnicity, or current anthropometric data (i.e. body

mass index) which may have had implications for participant’s interest in achieving a more muscular physique, nor did we specify an age range due to the use of online methods. The latter may have influenced whether participants saw these images as legitimate comparisons for themselves if they were in older ages groups.

Lastly, we only examined participant’s beliefs regarding RT methods, and only after exposure to our conditions. Thus we did not examine whether any within participant changes in beliefs occurred from pre- to post-exposure, nor did we consider i whether any acute effects upon beliefs seen were likely to be lasting or influence behaviour. As noted, participants were not informed of the true purposes of the study (to examine the effect of these conditions upon their RT beliefs) but instead informed the study was merely a cross-sectional survey of males’ attitudes towards different RT methods, increasing muscle mass and strength, the archetype male in the media, and frequency of exposure to mass media. A concern with the use of a pre-post design would be demand characteristic effects from prompting participants of the nature of the study through questions regarding beliefs prior to an exposure. Thus, we used a single measure between group design to address this concern though this limited us to only having the control group as representative of ‘baseline’ beliefs. That being said, reported training practices prior to exposure did provide some evidence that behaviours were likely in line with belief in the ‘lift big-get big’ approach. Further, though there is perhaps a lack of impact of media imagery on other psychological variables such as body satisfaction (Ferguson, 2013) it may have been of interest to also examine these within this specific population. However, the questionnaire employed would then have been extended which may had had further impact upon our response rates. Future work should certainly look to examine this though independently of beliefs regarding RT practices.

Overall, these results indicate the need for further investigation, particularly regarding the pervasiveness of the ‘lift big-get big’ culture. It appears, similar to prior research, there is

little effect of imagery alone. Further, that a poster promoting merely ‘evidence-based resistance training’ information is insufficient to change beliefs among males currently engaged in RT. However, the combination of this information with an image of a hyper-muscular male physique may have some influence. This suggests that any novel RT recommendations on their own may be insufficient to change people’s beliefs about improving strength and hypertrophy, and thus change behaviour. To investigate this further, we suggest exploring how much exposure (if any) is required to influence participants’ beliefs about the ‘lift big-get big’ culture and its associated philosophy, by testing continuous exposures to information regarding alternative RT approaches, with and without accompanying media images, with different variations of intensity and wording/image configuration.

Conclusion

In summary, this study provides insight into the ‘lift big-get big’ culture. Although images of hyper-muscular bodies alone did not influence resistance training beliefs, the combination of evidence based resistance training information with imagery of a hyper-muscular male physique did have a small effect on respondents’ beliefs towards the importance of heavy load free weights for the improvement of muscular strength and hypertrophy, However, the ‘lift big-get big’ culture is perhaps pervasive enough that exposure to that particular condition either had no effect, or likely reinforced existing beliefs regarding the importance of lifting heavy load free weights to improve strength and hypertrophy.

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Figure Legends:

Figure 1. Conditions shown to participants during completion of the survey. A) EBRT-HM, B) EBRT-L, C) LBGB-HM, and D) LBGB-L.

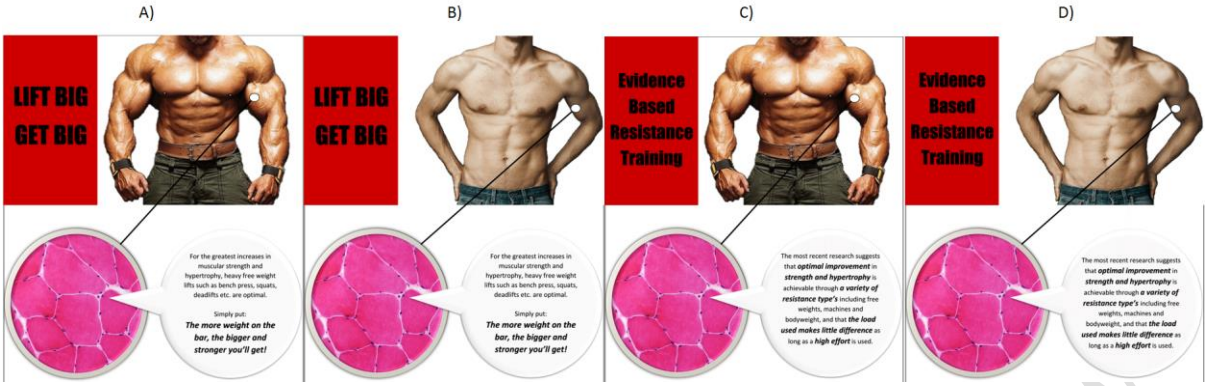

Table 1. Participant Demographics

Age (years)	18-20	21-29	30-39	40-49	50-59
n	13	55	28	18	9
University level qualified in a related topic?	Yes		No	Currently undertaking one	
n	36		56	31	
Training types	Free weights	Resistance machines	Bodyweight exercises	Cardiovascular /aerobic exercises	Other*
n	109	68	87	76	7
Loads	Bodyweight	<50% 1RM	50% to 70% 1RM	70% to 90% 1RM	>90% 1RM
n	57	23	62	96	49
Set volumes	1	2-3		4-5	>5
n	27	65		69	34
Effort (0 to 10[max])	5	6	7	8	9	10
n	1	6	31	41	25	13
Frequency	1x/week	2-3x/week		4-5x/week	>5x/week
n	14	47		46	10
Type of routine	Whole body			Split	
n	57			60	
Ever used nutritional supplementation?	Yes			No	
n	107			10	
Ever considered using nutritional supplementation?	Yes			No	
n	5			5	
Ever used performance enhancing drugs?	Yes			No	
n	9			108	
Ever considered using performance enhancing drugs?	Yes			No	
n	29			79	
How frequently do you read	Never		Sporadically	Often	
Flex	110		6	1	
Men's Fitness	90		26	1	
Muscle & Fitness	99		17	1	
Men's Health	79		35	6	
Ironman	115		2	0	
TNation.com	62		41	14	
Bodybuilding.com	64		48	5	

*Other included bicycle commuting, climbing, explosive strength training, kettlebells, sleds, prowlers, sandbags, speed training; 1RM = One repetition maximum

Table 2. Untransformed means and standard deviations for dependent outcomes.

	EBRT-HM	EBRT-L	LBGB-HM	LBGB-L	CON	*p*
Q1. My goal is muscular strength	4.5±0.5	4.5±0.9	4.5±0.7	4.5±0.6	4.6±0.5	0.998
Q2. My goal is muscular hypertrophy	3.5±1.3	4.1±1.0	4.0±1.0	4.2±0.9	4.3±0.6	0.620
Q3. Free weights are essential for optimal improvement in muscular strength	2.8±1.2	3.6±1.3	4.0±1.1	4.3±1.3	3.5±1.4	0.005
Q4. Resistance machines are essential for optimal improvement in muscular strength	2.2±0.9	2.7±1.1	2.8±1.2	2.5±1.2	2.5±1.0	0.512
Q5. Bodyweight exercises are essential for optimal improvement in muscular strength	2.8±1.6	3.0±1.2	2.8±1.1	2.7±1.4	3.0±1.1	0.922
Q6. Heavy loads (i.e. >65% 1RM) are essential for optimal improvement in muscular strength	4.0±1.1	4.0±1.1	4.4±0.8	4.5±1.0	3.6±1.1	0.005
Q7. Free weights are essential for optimal improvement in muscular hypertrophy	2.8±1.3	3.5±1.2	4.0±1.3	4.1±1.3	3.3±1.2	0.010
Q8. Resistance machines are essential for optimal improvement in muscular hypertrophy	2.5±1.1	3.3±1.2	3.4±1.1	3.2±1.3	3.1±1.1	0.163
Q9. Bodyweight exercises are essential for optimal improvement in muscular hypertrophy	2.0±1.1	2.8±1.1	3.0±1.0	3.0±1.4	2.7±0.9	0.182
Q10. Heavy loads (i.e. >65% 1RM) are essential for optimal improvement in muscular hypertrophy	3.8±1.3	3.4±1.2	3.9±1.2	3.8±1.3	3.3±1.0	0.073

Note: *p* values are for univariate between group effects on rank transformed data; 1RM = One repetition maximum