

# Exercise dependence, social physique anxiety, and social support in experienced and inexperienced bodybuilders and weightlifters

Richard Hurst, Bruce Hale, David Smith, David Collins

## Abstract

**Objectives**—To investigate psychological correlates of exercise dependence in experienced and inexperienced bodybuilders and weightlifters. Secondary objectives included measuring social physique anxiety, bodybuilding identity, and social support among bodybuilders and weightlifters.

**Methods**—Thirty five experienced bodybuilders, 31 inexperienced bodybuilders, and 23 weightlifters completed the bodybuilding dependence scale, a bodybuilding version of the athletic identity measurement scale, the social physique anxiety scale, and an adapted version of the social support survey—clinical form.

**Results**—A between subjects multivariate analysis of variance was calculated on the scores of the three groups of lifters for the four questionnaires. Univariate *F* tests and follow up tests indicated that experienced bodybuilders scored significantly higher than inexperienced bodybuilders and weightlifters on bodybuilding dependence ( $p < 0.001$ ), social identity and exclusivity subscales of bodybuilding identity ( $p < 0.001$ ), and social support scales ( $p < 0.001$ ), and significantly lower on social physique anxiety ( $p < 0.001$ ).

**Conclusion**—Experienced bodybuilders exhibit more exercise dependence, show greater social support behaviour, and experience less social physique anxiety than inexperienced bodybuilders and weightlifters.

(*Br J Sports Med* 2000;34:431–435)

Keywords: bodybuilding; exercise dependence; social physical anxiety; social support; athletic identity

Numerous studies have shown that exercise can produce both chronic and acute mental health benefits. However, for some people, exercise can become an obsession, known as exercise dependence, defined as “a process that compels an individual to exercise in spite of obstacles, and results in physical and psychological symptoms when exercise is withdrawn”.<sup>1</sup>

Early research<sup>2</sup> on exercise dependence emphasised possible biological antecedents and medical consequences<sup>3–5</sup> for aerobic exercise, but little evidence has been presented on the motivational components of excessive exercise.<sup>4–6–8</sup> To date, most exercise dependence inventories have been aerobically based and

unvalidated,<sup>9</sup> but much anecdotal evidence<sup>10–12</sup> indicates that people can become dependent on bodybuilding.

Noting this gap in the exercise mode literature, Smith *et al*<sup>13</sup> began validation of a bodybuilding dependency scale (BDS) designed to assess exercise dependence in bodybuilders. Exploratory factor analysis disclosed three subscales (social dependence, training dependence, mastery dependence). Results appeared to strongly support the construct validity of the social dependency subscale, but were less supportive in the other two subscales.

Recently, a new psychological phrase, “muscle dysmorphia”, has been coined for the exercise dependence syndrome in weightlifters based on research with anabolic steroid users.<sup>14</sup> Muscle dysmorphics have been characterised as people with a distortion of body image including a preoccupation with gaining muscle size and definition and a fear of being perceived as weak or thin. These authors noted similarities to a “reverse anorexic” state which included disturbed body image, strict nutritional practices, willingness to ingest dangerous anabolic supplements, dependence on a strict exercise regimen, concealment of their physique, and low self esteem.

The exploratory study by Smith *et al*<sup>13</sup> hypothesised that the apparent prevalence of exercise dependence in bodybuilding is related to the fact that weight training can significantly enhance self esteem.<sup>15–19</sup> They predicted that some people begin bodybuilding training because they suffer from poor body image and low self esteem,<sup>11 20 21</sup> and they may become dependent on it to feel good about themselves. Preliminary evidence<sup>20 22</sup> supports a possible relation between bodybuilding experience and personality changes.

This possible relation between exercise dependence and self esteem was supported by the finding of Smith *et al*<sup>13</sup> that bodybuilders scored significantly higher than weightlifters and fitness trainers on the physical self perception profile (PSPP)<sup>23</sup> subscales. Experienced bodybuilders seem to develop high levels of positive perceptions about their bodies after extensive training. Similarly, bodybuilders scored high on an adapted version of the “exclusivity” and “social identity” scales of the athletic identity measurement scale (AIMS),<sup>24 25</sup> which suggests that bodybuilders may also narrowly identify with the bodybuilding role (A Cornelius, annual conference for athletic counseling, Springfield College, Springfield, MA, May 1999).

Staffordshire  
University,  
Stoke-on-Trent,  
United Kingdom  
R Hurst

University of Maine,  
Orono, ME, USA  
B Hale

Chester College,  
Chester, United  
Kingdom  
D Smith

University of  
Edinburgh,  
Edinburgh, Scotland  
D Collins

Correspondence to:  
B D Hale, 109 Memorial  
Gym, University of Maine,  
Orono, ME 04473, USA  
email:  
Bruce\_Hale@umit.maine.edu

Accepted for publication  
1 June 2000

Earlier findings on exercise dependence and self esteem suggest a possible link between social physique anxiety and bodybuilding dependence. Social physique anxiety<sup>26,27</sup> refers to the degree to which people become anxious when others observe or evaluate their physiques. It is possible that, as bodybuilders become more muscular, they may overcome inferiority feelings, becoming dependent on feeling good about their physiques.<sup>28</sup>

Another important social factor that may be related to bodybuilding dependence is social support. This is defined as “the existence or availability of people on whom we can rely, people who let us know that they care about, value and love us”.<sup>29</sup> This sense of social acceptance has been found to lead to a sense of self efficacy, low levels of anxiety, a positive self image, expectations of desirable outcomes of social interactions, and a benign view of others.<sup>30</sup> It appears to take some time (months) to become an accepted part of the social scene in the gymnasium,<sup>10-12,28</sup> so both dependence and strong social support may be more prevalent among experienced bodybuilders.

This study will examine some of the motivational antecedents that may lead to exercise dependence in bodybuilders and examine how the social climate of bodybuilding gyms may encourage exercise dependence. It will use the BDS,<sup>13</sup> the social physique anxiety scale (SPAS),<sup>26</sup> an adapted version of the social support survey-clinical form (SSS-C),<sup>31</sup> and a bodybuilding specific version of AIMS<sup>24</sup> to examine further the phenomenon of exercise dependence. It is hypothesised that significant correlations will occur between the BDS, SSS-C, SPAS, and AIMS scores. It is also hypothesised that experienced bodybuilders will score significantly higher on bodybuilding dependence, bodybuilding identity, and social support, and lower on social physique anxiety than novice body builders and “power lifters”.

## Methods

### SUBJECTS

Thirty five experienced male bodybuilders (more than two years of bodybuilding training) aged 20–47 (mean (SD) 27 (4)), 31 inexperienced male bodybuilders (less than one year of bodybuilding training) aged 16–45 (mean (SD) 25 (4)), and 23 experienced male weightlifters (at least one year of power lifting training) aged 16–55 (mean (SD) 28 (3.5)) volunteered to participate in the study.

### PROCEDURES

Informed consent forms and questionnaires were distributed to and collected from participants at a major bodybuilding championship, at a bodybuilding gymnasium in Manchester, UK, and at a National Sports Centre weightlifting club in the Midlands.

The BDS<sup>13</sup> consists of a nine item, seven point Likert scale designed to determine the degree to which a weightlifter satisfies the four criteria of Veale<sup>2</sup> and J Morrow (personal communication, 1995) for diagnosis of exercise dependence. Exploratory factor analysis showed that three subscales clustered together

as “mastery” over training schedule dependence (items 1 and 2), “social” dependence for the bodybuilding environment (items, 3, 4, and 5), and need for “training” dependence (items 5, 6, 7, 8, and 9). A Chronbach’s alpha indicated that each subscale showed satisfactory internal consistency ( $\alpha = 0.78, 0.76,$  and  $0.75$  respectively). Initial evidence<sup>13</sup> for construct validity has been provided using the known group difference method, and support for concurrent validity of the social dependency and training dependency subscales was generated by significant correlations between the BDS and the social identity and exclusivity subscales of the AIMS<sup>25</sup> and the physical strength and body attractiveness subscales of the PSPP.<sup>23</sup>

The AIMS is a 10 item, seven point Likert scale questionnaire constructed to measure the degree that athletes identify with the athletic role. Although initial factor analysis<sup>24</sup> produced a unidimensional construct with adequate test-retest reliability, internal consistency and some evidence of concurrent validity, more recent confirmatory factor analysis<sup>25</sup> (A Cornelius, annual conference for athletic counseling, Springfield College, Springfield, MA, May 1999) found a three factor solution with four items comprising a “social identity” factor, four items forming an “exclusivity” subscale, and two items creating a “negative effect” subscale. The first two subscales were adapted<sup>13</sup> to make them specific to bodybuilding by changing the word athlete to bodybuilder and the word sport to bodybuilding, and then these eight items were included in the questionnaire. A recent comprehensive analysis of several studies using the multidimensional AIMS (A Cornelius, annual conference for athletic counseling, Springfield College, Springfield, MA, May 1999) has produced internal consistency values of 0.87 for the social identity subscale and 0.88 for the exclusivity subscale.

The SPAS,<sup>26</sup> 12 items on a five point Likert scale, was developed to measure the construct of social physique anxiety. Initially the questionnaire was thought to be a unidimensional measure, but recent confirmatory factor analysis research<sup>27,32</sup> suggests that it is a two factor multidimensional scale composed of five items in factor 1, representing feelings about comfort of presenting one’s physique, and seven items in factor 2, representing expectations of negative evaluation of one’s physique by others. Some evidence<sup>33</sup> for acceptable internal consistency was presented for factor 1 ( $\alpha = 0.76$ ) and factor 2 ( $\alpha = 0.90$ ), and acceptable levels of concurrent validity were shown by significant correlations with the physical self worth (factor 1,  $r = -0.70$ ; factor 2,  $r = -0.73$ ), physical condition (factor 1,  $r = -0.48$ ; factor 2,  $r = -0.43$ ), physical strength (factor 1,  $r = -0.42$ ; factor 2,  $r = -0.42$ ), and sport competence (factor 1,  $r = -0.40$ ; factor 2,  $r = -0.46$ ) subscales of the PSPP.<sup>23</sup>

Finally, an adapted version of the SSS-C,<sup>31</sup> consisting of 32 items on a seven point Likert scale, was included to measure the degree to which a person feels that they are receiving social support in areas of their lives. The eight

Table 1 Correlation coefficients (significance) for bodybuilding dependency, athletic identity, social physique anxiety, and social support behaviours

BDS	AIMS		SPAS		SSS-C								
	SocId	Excl	Factor 1	Factor 2	EmotCh	EmotSp	Listen	PercAss	Reality	TanAss	TasApp	TasChl	Total
SocDp	0.71 (0.000)	0.78 (0.000)	0.34 (0.001)	-0.07 (0.518)	0.25 (0.019)	0.53 (0.000)	0.46 (0.000)	0.52 (0.000)	0.45 (0.000)	0.45 (0.000)	0.57 (0.000)	0.45 (0.000)	0.54 (0.000)
TrnDp	0.53 (0.000)	0.58 (0.000)	0.31 (0.003)	0.06 (0.588)	0.30 (0.004)	0.41 (0.000)	0.43 (0.000)	0.50 (0.000)	0.46 (0.000)	0.38 (0.000)	0.51 (0.000)	0.41 (0.000)	0.51 (0.000)
MstDp	0.76 (0.000)	0.76 (0.000)	0.54 (0.000)	-0.25 (0.018)	0.33 (0.001)	0.61 (0.000)	0.57 (0.000)	0.63 (0.000)	0.55 (0.000)	0.51 (0.000)	0.67 (0.000)	0.57 (0.000)	0.66 (0.000)

BDS, Bodybuilding dependency scale; AIMS, athletic identity measurement scale; SPAS, social physique anxiety scale; SSS-C, social support survey-clinical form; SocDp, TrnDp, MstDp, social, training, and mastery dependence; SocId, social identity; Excl, exclusivity; Listen, listening support; EmotSp, emotional support; EmotChl, emotional challenge; TasApp, task appreciation; TasChl, task challenge; TanAss, tangible assistance; PercAss, perceived assistance.

subscales include listening support, emotional support, emotional challenge, task appreciation, task challenge, reality, tangible assistance, and perceived assistance. The eight subscales can be added together to compute a person's overall perception of social support. The SSS-C has been shown to have adequate content and structural validity,<sup>31</sup> moderate to high correlations with the social support questionnaire<sup>29</sup> as evidence of concurrent validity, no sign of social desirability, and substantial evidence of construct validity. Test-retest reliability has been shown by significant correlations ranging from 0.44 to 0.87 across the eight subscales.<sup>31</sup>

## Results

Pearson product-moment correlations were calculated between the three BDS subscales and the two scales of the AIMS, two subscales of the SPAS, and eight subscales of the SSS-C to test for further concurrent validity of the BDS. As the correlations showed moderate to high values (table 1), a multivariate analysis of variance that included all the dependent variables from each questionnaire was calculated to compare the scores of the three groups. If a significant overall multivariate effect occurred, then univariate *F* tests and Tukey's HSD follow up tests using harmonic means of group sizes to control for unequal sample sizes were used to compare the three groups for each dependent variable.

Table 2 Means (SD) for psychological inventories for experienced bodybuilders, inexperienced bodybuilders, and weightlifters

Scale	Experienced bodybuilders	Inexperienced bodybuilders	Weightlifters
BDS-SocDp	24.77 (4.43) <sup>ab</sup>	19.29 (3.68) <sup>ab</sup>	12.91 (4.58) <sup>b</sup>
BDS-TrnDp	16.69 (3.07) <sup>a</sup>	14.13 (2.94) <sup>a</sup>	13.00 (4.83) <sup>a</sup>
BDS-MstDp	12.74 (1.38) <sup>a</sup>	7.29 (2.29) <sup>a</sup>	6.39 (2.50) <sup>a</sup>
AIMS-SocId	21.60 (2.96) <sup>a</sup>	12.97 (3.58) <sup>a</sup>	11.48 (3.12) <sup>a</sup>
AIMS-Excl	21.54 (2.84) <sup>ab</sup>	14.35 (2.93) <sup>ab</sup>	9.96 (4.13) <sup>b</sup>
SPAS-Fac1	18.29 (2.83) <sup>ab</sup>	14.19 (3.33) <sup>b</sup>	16.13 (1.42) <sup>ab</sup>
SPAS-Fac2	14.85 (5.00) <sup>a</sup>	18.58 (5.71) <sup>a</sup>	17.04 (4.41)
EmotChl	18.80 (3.08) <sup>a</sup>	16.48 (1.63) <sup>a</sup>	17.61 (2.98)
EmotSp	23.63 (3.09) <sup>a</sup>	18.68 (4.68) <sup>a</sup>	18.30 (3.95) <sup>a</sup>
Listen	21.46 (2.85) <sup>a</sup>	16.74 (3.02) <sup>a</sup>	17.87 (4.31) <sup>a</sup>
PercAss	24.31 (3.18) <sup>a</sup>	17.29 (4.78) <sup>a</sup>	19.17 (3.92) <sup>a</sup>
Reality	21.60 (3.58) <sup>a</sup>	15.94 (4.49) <sup>a</sup>	17.78 (3.54) <sup>a</sup>
TanAss	21.34 (2.97) <sup>a</sup>	17.48 (1.69) <sup>a</sup>	17.48 (3.50) <sup>a</sup>
TasApp	23.20 (3.24) <sup>a</sup>	17.54 (3.96) <sup>a</sup>	18.48 (3.92) <sup>a</sup>
TasChl	22.83 (2.96) <sup>ab</sup>	16.77 (3.67) <sup>b</sup>	19.22 (3.88) <sup>ab</sup>
SSS-Tot	176.11(18.26) <sup>a</sup>	136.94(22.53) <sup>a</sup>	145.78 (26.43) <sup>a</sup>

<sup>ab</sup>Significantly different at  $p < 0.001$  except for SPAS-Fac2, where  $p < 0.05$ .

BDS, Bodybuilding dependency scale; AIMS, athletic identity measurement scale; SPAS, social physique anxiety scale; SocDp, TrnDp, MstDp, social, training, and mastery dependence; SocId, social identity; Excl, exclusivity; Fac, factor; Listen, listening support; EmotSp, emotional support; EmotChl, emotional challenge; TasApp, task appreciation; TasChl, task challenge; TanAss, tangible assistance; PercAss, perceived assistance; SSS-Tot, total social support.

A significant overall between subjects multivariate effect was found for all dependent variables (Wilks  $\lambda = 0.072$ ,  $F_{32,142} = 12.05$ ,  $p < 0.001$ ). Univariate *F* tests were significant for all the BDS scales, with BDS social dependency ( $F_{2,86} = 54.97$ ,  $p < 0.001$ ), training dependency ( $F_{2,86} = 8.37$ ,  $p < 0.001$ ), and mastery dependency ( $F_{2,86} = 87.52$ ,  $p < 0.001$ ) showing significant differences between the weight training groups. Follow up tests showed that BDS social dependence scores of experienced bodybuilders were significantly higher than those of inexperienced bodybuilders, whose scores were significantly higher than those of weightlifters (table 2). For BDS training and mastery dependence scores, those of experienced bodybuilders were significantly higher than those of both the inexperienced bodybuilders and weightlifters (table 2).

For the two bodybuilding adapted scales of the AIMS, univariate *F* tests were significant for both the exclusivity subscale ( $F_{2,86} = 94.80$ ,  $p < 0.001$ ) and the social identity subscale ( $F_{2,86} = 88.81$ ,  $p < 0.001$ ). Tukey's HSD tests showed that the exclusivity scores of the experienced bodybuilders were significantly higher than those of the inexperienced bodybuilders, whose scores were also significantly higher than those of the weightlifters; social identity scores of the experienced bodybuilders were significantly higher than those of both the inexperienced bodybuilders and the weightlifters (table 2). For the SPAS, univariate *F* tests were significant for factor 1 ( $F_{2,86} = 18.26$ ,  $p < 0.001$ ) and factor 2 ( $F_{2,86} = 4.40$ ,  $p < 0.05$ ), indicating group differences. Tukey's HSD tests showed that experienced bodybuilders scored significantly higher on factor 1 than weightlifters (table 2), whose scores were significantly higher than those of inexperienced bodybuilders (a higher score indicates lower social physique anxiety). On factor 2, inexperienced bodybuilders scored higher than experienced bodybuilders, indicating more social physique anxiety (table 2).

Finally, for the SSS-C scale, univariate *F* tests were all significant for the overall score and eight subscales: for total SSS ( $F_{2,86} = 28.37$ ,  $p < 0.001$ ), emotional challenge ( $F_{2,86} = 6.35$ ,  $p < 0.01$ ), emotional support ( $F_{2,86} = 18.04$ ,  $p < 0.001$ ), tangible assistance ( $F_{2,86} = 20.84$ ,  $p < 0.001$ ), task appreciation ( $F_{2,86} = 22.03$ ,  $p < 0.001$ ), task challenge ( $F_{2,86} = 25.52$ ,  $p < 0.001$ ), listening support ( $F_{2,86} = 17.83$ ,  $p < 0.001$ ), perceived assistance ( $F_{2,86} = 27.29$ ,  $p < 0.001$ ), and reality ( $F_{2,86} = 17.98$ ,  $p < 0.001$ ). For all the above scales except task challenge

and emotional challenge, follow up tests indicated that experienced bodybuilders scored significantly higher on components of social support than inexperienced bodybuilders and weightlifters (table 2). For the task challenge subscale, experienced bodybuilders scored significantly higher than weight lifters, whose scores were more than inexperienced bodybuilders. For the emotional challenge subscale, experienced bodybuilders scored significantly higher than inexperienced bodybuilders.

### Discussion

The concurrent validity of the BDS was examined by correlating BDS and AIMS scores. The significant positive correlations between all three BDS subscales and the AIMS social identity and exclusivity subscales are a more encouraging finding than the partial support of Smith *et al.*<sup>13</sup>

The between group differences in the BDS subscale scores provide further support for the construct validity of all three BDS subscales. Firstly, the fact that the bodybuilders scored significantly higher than the weightlifters on the BDS social dependence supports an earlier finding,<sup>13</sup> and highlights the importance of the social nature of bodybuilding dependence.

The fact that the experienced bodybuilders scored significantly higher on the BDS training dependence subscale than the inexperienced bodybuilders and weightlifters indicates that bodybuilders can become dependent on the actual activity of lifting weights, rather than just the social aspects of the activity. The experienced bodybuilders also scored significantly higher on the BDS mastery subscale than the inexperienced bodybuilders and weightlifters. This replicated finding further indicates that experienced bodybuilders feel a greater need to exert control over their training schedules.

The SPAS findings support previous anecdotal research<sup>11</sup> and recent research on muscle dysmorphia,<sup>14</sup> which hypothesised that men begin body building in order to reduce feelings of poor body image. The experienced bodybuilders and weightlifters scored significantly lower on SPAS factor 1 than the inexperienced bodybuilders, indicating that the former two groups feel more comfortable about their bodies. This result is in accord with the views of Ecklund and Crawford,<sup>33</sup> who believe that social physique anxiety is associated with motives for exercise participation.

The findings that social support behaviour can differentiate experienced bodybuilders from other weightlifters further illuminates the powerful supportive social atmosphere that exists among the veteran bodybuilding fraternity. As Fisher<sup>28</sup> notes, bodybuilding is a complex subculture, involving norms with regard to appropriate behaviour within this culture. Becoming a part of this social network may lead to identification more as a bodybuilder. A person may then become dependent on the activity if he/she begins to regard it as more important than other key areas of life, such as work and family.

In conclusion, these results indicate that there is a relation between bodybuilding dependence, bodybuilding identity, social physique anxiety, and social support. The results also provide strong support for the validity of all three BDS subscales. This is in vivid contrast with the findings of Smith *et al.*,<sup>13</sup> which is probably due, at least in part, to the larger sample and the differentiation between experienced and inexperienced bodybuilders.

Despite these positive results, it should be noted that research on the BDS is still exploratory. The processes of exercise dependence, muscle dysmorphia, and bodybuilding dependence have not yet been clearly defined by replicated designs with adequate samples<sup>13 14</sup> (CD Lantz, DJ Rhea, annual meeting of the Association for the Advancement of Applied Sport Psychology, Cape Cod, September 1998). It must be cautioned that, although this sample provided adequate statistical power, the high number of dependent variables analysed could lead to inflated type I error. In addition, the BDS items need to undergo further psychometric and confirmatory factor analyses to test this model of exercise dependence thoroughly.

Future research should examine differences between competitive and non-competitive bodybuilders, aerobic and anaerobic exercisers, and men and women. In addition, recent hypotheses<sup>14</sup> suggesting that muscle dysmorphia is a type of reverse anorexia need to be examined with exercisers at risk for eating disorders and steroid users.

- Pierce EF. Exercise dependence syndrome in runners. *Sports Med* 1994;18:149–55.
- Veale D. Does exercise dependence really exist? In: Annett J, Cripps B, Steinberg H, eds. *Exercise addiction: motivation for participation in sport and exercise*. Leicester: British Psychological Society, 1995:1–5.
- Thaxton, L. Physiological and psychological effects of short-term exercise addiction on habitual runners. *Journal of Sport Psychology* 1982;4:73–80.
- Morgan WP. Negative addiction in runners. *Physician and Sportsmedicine* 1979;7:57–70.
- Yates A, Leehey, K, Shisslak, CM. Running: an analogue of anorexia? *N Engl J Med* 1983;308:251–5.
- Ogles BM, Masters KS, Richardson SA. Obligatory running and gender: an analysis of participative motives and training habits. *International Journal of Sport Psychology* 1992.
- Yates A. Eating disorders and long distance running: the ascetic condition. *Integrated Psychiatry* 1987;5:201–11.
- Barrel G, Chamberlain A, Evans J, et al. Ideology and commitment in family life. *Leisure Statistics* 1989;8:249–62.
- Ogden J, Veale D, Summers Z. The development and validation of the Exercise Dependence Questionnaire. *Addiction Research* 1997;5:343–53.
- Fussell S. *Muscle: confessions of an unlikely bodybuilder*. London: Abacus, 1991.
- Klein AM. *Little big men*. Albany: State University of New York Press, 1993.
- Thompson H (writer and presenter), Mares AK (producer). *Iron maidens*. Manchester: BBC Radio 4, 1993.
- Smith D, Hale BD, Collins DJ. Measurement of exercise dependence in bodybuilders. *J Sports Med Phys Fitness* 1998;38:1–9.
- Pope HG, Gruber AJ, Choi P, et al. Muscle dysmorphia: an unrecognized form of body dysmorphic disorder. *Psychosomatics* 1997;38:548–57.
- Tucker LA. Effect of weight training on self concept: a profile of those influenced most. *Res Q Exerc Sport* 1983;54:389–97.
- Tucker LA. Weight training: a tool for the improvement of self and body concept of males. *Journal of Human Movement Studies* 1983;9:31–7.
- Tucker LA. Effect of weight training on body attitudes: who benefits most? *J Sports Med Phys Fitness* 1987;27:70–8.
- Brown RD, Harrison JM. The effects of a strength training program on the strength and self concept of two female age groups. *Res Q Exerc Sport* 1986;57:315–20.
- Trujillo CM. The effect of weight training and running exercise intervention programs on the self esteem of college women. *International Journal of Sport Psychology*
- Darden E. Sixteen personality factor profiles of competitive bodybuilders and weightlifters. *Res Q* 1972;43:142–7.

- 21 Thirer J, Greer DL. Personality characteristics associated with beginning, intermediate and competitive bodybuilders. *Journal of Sport Behaviour* 1981;4:3–11.
- 22 Leithwood KA. The personality characteristics of three groups of weightlifters. *Res Q* 1967;43:142–7.
- 23 Fox KR, Corbin CB. The Physical Self-Perception Profile: development and preliminary validation. *Journal of Sport and Exercise Psychology* 1989;11:408–30.
- 24 Brewer BW, Van Raalte JL, Linder DE. Athletic identity: Hercules' muscles or Achilles' heel? *International Journal of Sport Psychology* 1993;25:237–54.
- 25 Hale BD, James B, Stambulova N. Determining the dimensions of the Athletic Identity Measurement Scale: a 'Herculean' cross-cultural effort. *International Journal of Sport Psychology* 1999;30:83–100.
- 26 Hart EA, Leary MR, Rejeski WJ. The measurement of social physique anxiety. *Journal of Sport and Exercise Psychology* 1989;11:94–104.
- 27 Ecklund RC, Much D, Hart E. Factorial validity of the Social Physique Anxiety Scale for females. *Journal of Sport and Exercise Psychology* 1996;8:281–95.
- 28 Fisher LA. Building one's self up: bodybuilding and the construction of identity among professional female bodybuilders. *Proceedings of the Annual Meeting of the Association for the Advancement of Applied Sport Psychology, New Orleans, LA, October, 1995*. Lawrence KS: Allen Press.
- 29 Sarason IG, Levine HM, Basham RB, et al. Assessing social support: The Social Support Questionnaire. *J Pers Soc Psychol* 1983;44:127–39.
- 30 Sarason IG, Sarason BR, Pierce GR. Social support, personality and performance. *Journal of Applied Sport Psychology* 1990;2:117–27.
- 31 Richman JM, Rosenfeld LB, Hardy CJ. The Social Support Survey: an initial evaluation of a clinical measure and practice model of the social support process. *Research in Social Work Practice* 1993;3:288–311.
- 32 Petrie TA, Diehl N, Rogers RL, et al. The Social Physique Anxiety Scale: reliability and construct validity. *Journal of Sport and Exercise Psychology* 1996;18:420–5.
- 33 Ecklund RC, Crawford S. Social physique anxiety: reasons for exercise, and attitudes toward exercise settings. *Journal of Sport and Exercise Psychology* 1994;16:70–82.

## Commentary

This article looks at a fascinating area of sport—exercise dependence—focusing on a group of athletes well known for their devotion to training—bodybuilders. The relation of various areas within exercise dependence (social dependency, training dependency, and mastery) are well demonstrated in this study of experienced and inexperienced bodybuilders and experienced weightlifters. The results may have potential for identifying factors of concern with bodybuilders and potentially addressing these as needed.

MICHAEL L SACHS

Department of Physical Education, Pearson Hall,  
Temple University, Philadelphia, PA 19122, USA