Self-selected Resistance Training Intensity in Healthy Women: The Influence of a Personal Trainer

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Abstract

The purpose of the present investigation was to examine the influence of resistance training with a personal trainer versus unsupervised resistance training on the self-selected intensities used by women during resistance exercise. Forty-six resistance-trained women (age = 26.6 ± 6.4 years; body mass = 64.2 ± 10.9 kg) who either trained individually (n = 27; No PT) or with a personal trainer (n = 19; PT) were carefully instructed to select a weight they used in their own resistance training workouts that enabled the completion of 10 repetitions for the chest press (CP), leg press (LP), seated row (SR), and leg extension (LE) exercises. Each participant was subsequently tested for one repetition-maximum (1RM) strength on each exercise, and the self-selected intensity was calculated based on a percent of each 1RM value. For self-selected relative intensity, the PT group selected significantly greater intensities for LP (50% vs. 41%), CP (57.4% vs. 48%), and SR (56% vs. 42%) whereas a trend ($p = 0.10$) was observed for LE (43% vs. 38%) compared with No PT. Overall, the average self-selected intensity for all exercises was ~51.4% in PT group and ~42.3% in the No PT group. 1RM values for LP, LE, and SR were greater in the PT than No PT group. Ratings of perceived exertion values were significantly greater in the PT compared with the No PT group for CP, LE, and SR but not LP. These results indicate that resistance training under the supervision of a personal trainer leads to greater initial 1RM strength values, self-selection of greater workout intensities, and greater ratings of perceived exertion values during resistance exercise.

Key Words muscular strength, ratings of perceived exertion, strength training, fitness

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Introduction

Resistance training has become a popular modality of conditioning for adults of all ages and abilities. In addition to increasing muscular strength, hypertrophy, endurance, and power, regular participation in a resistance training program can enhance bone mineral density, reduce body fat, decrease resting blood pressure, and improve blood lipids, glucose tolerance, and insulin sensitivity (12). Although different combinations of sets, repetitions, and exercises have proven to be effective, research has indicated that a threshold training intensity (e.g., progressive overload) is needed to produce further gains in strength and hypertrophy (1,2,5,11). The relative threshold intensity is very low, that is, ~45% to 50% of an individual's one-repetition maximum (1RM), in untrained individuals to increase muscular strength. However, the intensity requirement increases (at least 60% to 70% of 1RM) as one's level of conditioning increases (11), and greater resistance training intensities are necessary when one resistance trains to maximize muscle fiber recruitment and increase bone mineral density (11,18). Thus, the intensity (and subsequent volume) of resistance training are critical program variables that dictate the magnitude of training-induced neuromuscular adaptations.

In general, intensities less than 60% of 1RM may be considered to be suboptimal for resistance training when a moderate (e.g., 10) number of repetitions are performed (2,11). Considering the importance of training intensity in eliciting increases in muscle strength, hypertrophy, and other fitness components, that is, bone mineral density, the selection of an appropriate intensity is critical. Glass and Stanton (8) compared the self-selected lifting intensities and reported that women self-selected intensities ranging from ~40% to 52% of their 1RM across all exercises assessed. In a recent study, Focht (6) reported that women self-selected a resistance that was, on average, 56% of their 1RM during performance of the leg extension, chest press, pull-down, and overhead press exercises. On the basis of these data, it appears that many women participating in resistance training in health clubs may self-select intensities that are suboptimal or too low for muscle strength and hypertrophy increases.

The positive influence of supervised resistance training is well-documented (5,11,14). For example, Mazzetti et al. (14) compared supervised to unsupervised periodized resistance training over the course of 12 weeks and reported that the supervised training group was able to train with heavier loads, showed a greater rate of increase in training loads, and showed a greater increase in 1RM squat and bench press than the unsupervised group. Thus, individuals appear to train at greater relative intensities and progress at a greater rate when their workouts are supervised by a strength and conditioning professional.

Personal trainers play a critical role in health clubs, especially in relation to women's health and fitness. In addition to teaching and correcting exercise technique, personal trainers design resistance training programs for their clients and prescribe the training intensity, volume, frequency and workout structure, exercise selection and order, rest intervals, and lifting velocity. Thus, the encouragement to train at a greater relative intensity and the direct supervision by a personal trainer may expose clients to a more favorable training stimulus. Because the client becomes accustomed to training at a greater level of perceived exertion, it is possible that these individuals may select greater intensities and train at a greater level of perceived exertion in the absence of a personal trainer. Therefore, the purpose of the present study was to investigate the self-selected resistance training intensities in women who consistently trained unsupervised versus the responses of women who have consistently trained under the supervision of a personal trainer. It was our hypothesis that women who were trained by a personal trainer would self-select greater relative intensities. In addition, a questionnaire was provided to all subjects to ascertain sports/training backgrounds, program characteristics, attitudes, goals, and sources of information regarding resistance training.

Methods

Experimental Design and Approach to the Problem

To examine the primary hypothesis of the present investigation, a group of adult women who were currently trained by a personal fitness trainer (PT) and a group of adult women who resistance trained on their own (No PT) volunteered to participate in this study. Volunteers were active members of 3 local fitness centers who were training consistently for the past 3 months in a resistance training program. Each subject was carefully instructed to self-select a resistance (for four exercises) they would typically perform 10 repetitions with in their own programs. Each subject was subsequently assessed for one-repetition maximum (1RM) strength for determination of relative self-selected training intensities. Comparisons between both training groups were made, and a questionnaire was given to the participants to examine women's' attitudes towards resistance training. This study design enabled us to directly examine the influence of supervised training with a personal trainer on self-selected resistance training intensities in women, and to compare these responses with women who trained on their own.

Subjects

The subjects consisted of 46 healthy, resistance-trained women (age = 26.6 ± 6.4 years; height = 163.8 ± 6.3 cm; body mass = 64.2 ± 10.9 kg) who were recruited from 3 local health clubs in the Pennsylvania and New Jersey areas with the assistance of several club employees and personal trainers. Criteria for the study included the following: (1) each woman had to be a current member of a health club; (2) each woman had to have engaged in at least 3 months of consistent resistance training experience before initiating the study; and (3) for those women who employed a PT, at least 3 months of supervised personal training with a PT was required. Potential subjects were randomly recruited from each facility via advertisements and through word of mouth. In addition, PTs assisted in recruitment of their clients as potential subjects for this study. Each subject was informed of the risks and benefits of the study and subsequently signed an institutionally approved informed consent form in accordance with the guidelines of the college's Institutional Review Board. The hypotheses and goals of the study were not discussed with the subjects until after testing was completed because we did not want to introduce any bias that could have affected weight selection and performance. No subjects were taking any medications or nutritional supplements known to affect resistance exercise performance. In addition, subjects had no medical or orthopedic problems that compromised their participation or performance in this study. Group subject characteristics are presented in Table 1. No significant differences were observed between groups for these variables.

Self-Selection Resistance Exercise Protocol

After a general warm-up that consisted of 5 minutes of treadmill walking and calisthenics, each subject was carefully instructed to select a resistance that she would typically use in her own workouts for completion of 10 repetitions. Ten repetitions was the selected number because of its popularity in resistance training programs (11). Subjects were specifically asked "how much weight would you select for this exercise if

Table 1. Subject characteristics.

	No PT (n = 27)	PT (n = 19)
Age, years	25.4 ± 6.8	28.4 ± 5.4
Height, cm	164.2 ± 6.8	163.2 ± 5.5
Body mass, kg	62.1 ± 8.4	67.3 ± 13.2
RT experience, yrs	4.5 ± 5.1	3.8 ± 4.0

RT = resistance training; No differences between groups were observed.

you were completing a 10-repetition set in your workout?" The subject then selected a weight and performed a few practice repetitions to gage the loading. Subjects were given multiple opportunities to select the appropriate weight (i.e., if the initial selection appeared to be too light or heavy) and the investigator provided no additional information that could have created bias in the weight selection. The exercises chosen were the chest press (CP), leg press (LP), seated row (SR), and leg extension (LE). Machine-based exercises were chosen because it was determined previously that subjects who did not train with a personal trainer were more familiar with machine-based exercises than free weights. All subjects had experience performing the exercises selected in the present study. Thus, each subject possessed excellent exercise technique, and familiarization sessions were not necessary. Testing was conducted at the subjects' health club on equipment that the subjects customarily used in their workouts. In addition, PTs were not present during testing of the women in the PT group. Therefore, the responses of the women in the PT group were reflective of their own self-selection criteria and were not directly influenced by the presence of their personal trainer.

Once the appropriate weight was selected, each subject was carefully instructed to perform one set of 10 repetitions using a complete range of motion and a cadence of a 1- to 2-second positive phase and a 1- to 2-second negative phase. Upon completion of the set, each subject was asked to provide her ratings of perceived exertion (RPE) using a 10-point scale. Each subject then proceeded to perform the next exercise. Exercise sequencing was randomized; however, the sequence entailed performing a lower-body exercise followed by an upper-body exercise to allow greater recovery in between trials. Rest interval lengths of 1–2 minutes were allowed in between exercise trials.

Strength Testing

1RM strength testing was performed 5 minutes after the self-selected resistance exercise protocol (using the same exercise sequence) previously described using standardized methods (10). All 1RMs were obtained within 3–4 sets to avoid excessive fatigue. In addition, 2–3 minutes of rest was allowed in between trials. Proper range of motion and technique were required for all maximal trials as determined by the investigators, who were certified strength and conditioning specialists. The machine settings for strength testing were identical to those used in the self-selected resistance exercise protocol. The 1RM values for each exercise were used to calculate the relative self-selected intensity (%), that is, self-selected weight/1RM weight $\times$ 100.

Resistance Training Questionnaire

Each subject was asked a series of questions so that we could develop a composite of her attitudes/knowledge of resistance training. Table 2 presents the questions asked of each of the subjects in the present study.

Statistical Analyses

Descriptive statistics (means $\pm$ *SD*) were performed for all dependent variables. An independent *t*-test was used to analyze all performance and RPE data. Chi-square analyses were used to analyze distributions regarding selected questionnaire nominal variables and comparisons between the PT and No PT groups were made using a Mann–Whitney *U* test. Significance in this study was set at $P \leq 0.05$.

Results

Performance and RPE results are presented in Figures 1–4. 1RM values (Figure 1) for LP and LE were significantly greater in the PT than the No PT group. There was trend ($P = 0.06$) for greater 1RM for SP in the PT group compared with No PT group. No differences were observed in CP 1RM. For self-selected relative intensity (Figure 2), the PT group selected significantly greater intensities for LP, CP, and SR compared with the No PT group. In addition, a trend ($P = 0.10$) for greater intensity in the PT group was observed for LE. Collectively, relative intensities selected for upper-body exercises were significantly greater than those self-selected for lower-body exercises. For self-selected trial loads (Figure 3), weights selected by PT were significantly greater than the No PT group for all exercises. RPE values (Figure 4) were significantly greater in the PT compared with the No PT group for CP, LE, and SR but not LP. Finally, no significant differences were observed between groups in relative strength for each exercise: LP = 2.2 $\pm$ 0.5 (PT) versus 1.9 $\pm$ 0.4 (No PT); CP = 0.7 $\pm$ 0.2 (PT) versus 0.7 $\pm$ 0.2 (No PT); LE = 1.1 $\pm$ 0.2 (PT) versus 1.0 $\pm$ 0.2 (No PT); and SR = 0.9 $\pm$ 0.2 (PT) versus 0.8 $\pm$ 0.2 (No PT).

The use of chi-square analyses revealed significant variability in response distributions for each question. Questionnaire responses indicated that 85% of the subjects in No PT and 53% in PT groups were former high school athletes ($P = 0.01$). In addition, 38% of the subjects in the No PT group felt the act of resistance training itself would lead to "bulky muscles," whereas only 16% in the PT group felt the same ($P = 0.05$). Women in the PT group reported training with a personal trainer for an average of 15.4 $\pm$ 14.2 months, yielding an average of 136.9 $\pm$ 150.9 resistance training sessions under the supervision of a PT.

The subjects responses to the types of programs used, equipment used, goals of resistance training, and sources of information regarding resistance training are shown in Table 3. In both groups combined, most subjects reported performing 3 sets per exercise for 10–15 repetitions in their own training programs. In comparison, a significantly greater percentage of subjects in the PT group reported performing 15–20 repetitions per set than the No PT group. All subjects reported using machines in their own workouts. However, more subjects in the PT group (14 to 25%) reported using free weights (dumbbells and barbells) in their workouts than No PT. A trend ($P = 0.08$) was observed, indicating a tendency for a greater percentage of the subjects in the PT group who

Table 2. Resistance training questions.

1. How long have you participated in a regular strength training program?
2. Did you ever play a high school or college sport? If yes, did you strength train as part of your conditioning program?
3. During your strength training workouts, what type of equipment do you usually use (for example, weight machines, dumbbells, barbells, elastic cords, medicine balls, stability balls, or other)?
4. How long have you worked with a personal fitness trainer (for those in the PT group)?
5. About how many training sessions have you had with your personal fitness trainer (for those in the PT group)?
6. During a typical strength training workout, how many sets and repetitions of each exercise do you perform?
7. Why do you strength train? What are your goals?
8. Some people believe that strength training will make muscles 'big and bulky'. What do you think?
9. What are your 3 major sources of information about strength training (list in order beginning with most valuable)?

used barbells than the No PT group. In both groups, the most commonly cited goal was increased "muscle tone," with no significant differences observed between groups. For sources of resistance training information, in PT the 3 most common sources cited were PTs (100%), magazines (79%), and friends (32%) and in the No PT group, the most common sources cited were magazines (63%), friends (46%), and classes/education (33%). The only significant difference observed between groups was in PT where all subjects reported consulting their personal trainer for information whereas no subjects had access to a personal trainer in No PT. It is important to note that we were not able to collect question responses from one subject in No PT. Thus, the n size used was 26.

Discussion

The critical finding of the present investigation was that the majority of healthy women tested in health clubs self-selected resistance training intensities that were considered relatively low, for example, <60%, especially for lower-body exercises.

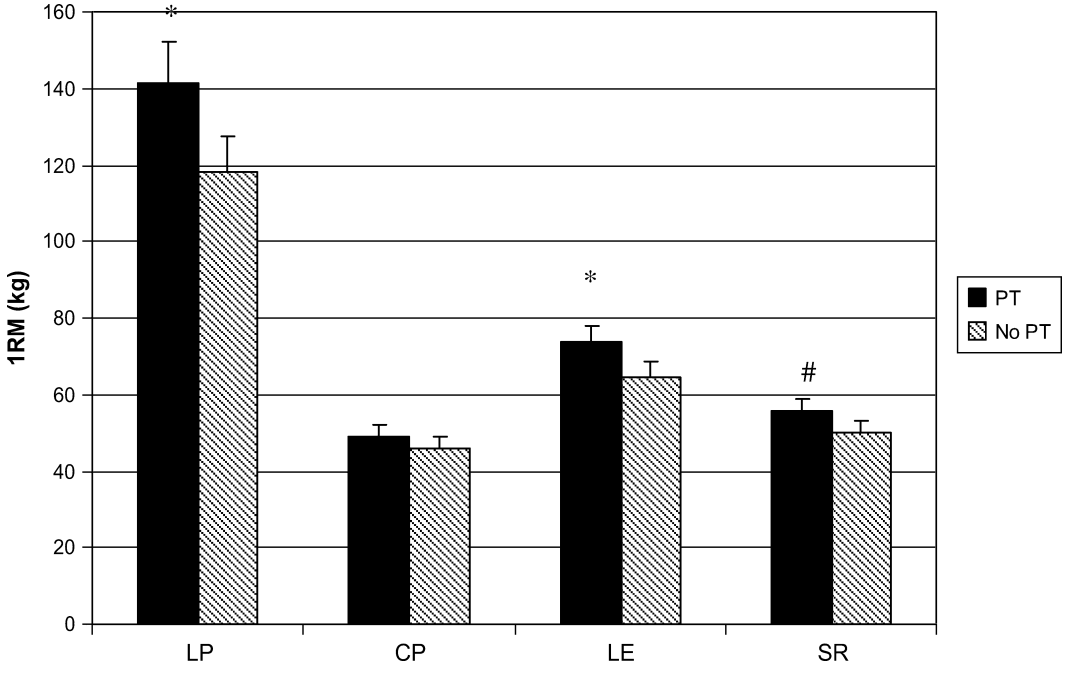

Figure 1. One-Repetition Maximum (1RM) Strength. Differences between the personal trainer (PT) and no personal trainer (No PT) groups. *Indicates a significant difference ($P < 0.05$) between groups. #Indicates a trend ($P = 0.06$) between groups. LP = leg press; CP = chest press; LE = leg extension; SR = seated row. Data presented are the mean ± *SD*.

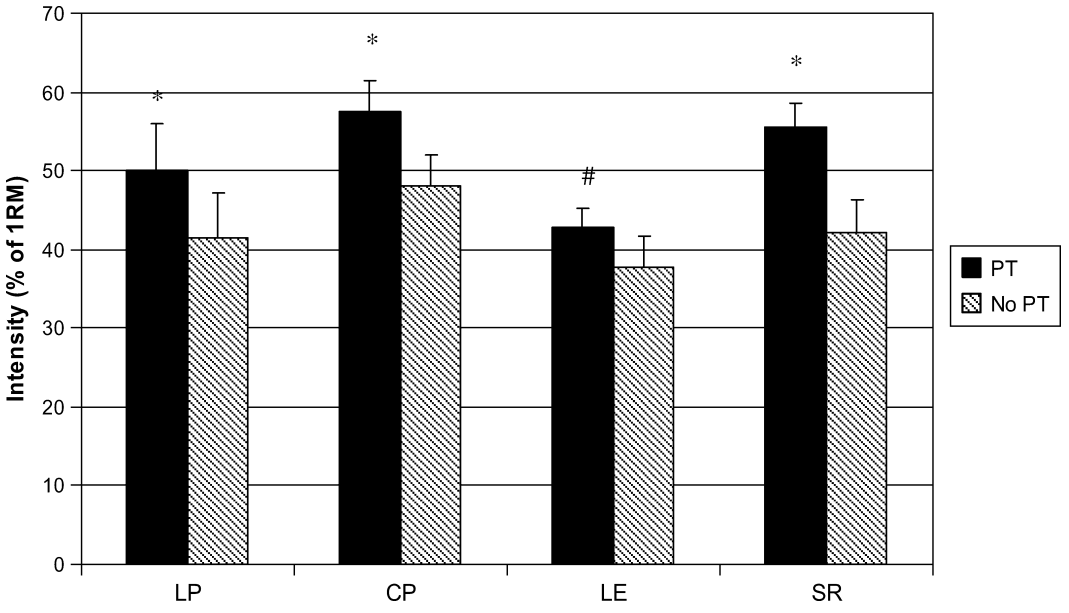

Figure 2. Self-selected intensity. Differences between the personal trainer (PT) and no personal trainer (No PT) groups. *Indicates a significant difference ($P < 0.05$) between groups. #Indicates a trend ($P = 0.10$) between groups. LP = leg press; CP = chest press; LE = leg extension; SR = seated row. Data presented are the mean ± *SD*.

The intensities selected were, on average, lower than what is recommended for progression in muscular fitness by major health organizations (2). In comparison, women who resistance trained under the supervision of a personal trainer self-selected training intensities that were greater than the intensities selected by women who did not train with a personal trainer for the LP (by 9%), CP (by 10%), LE (by 5%), and SR (by 14%) exercises. In addition, self-selected

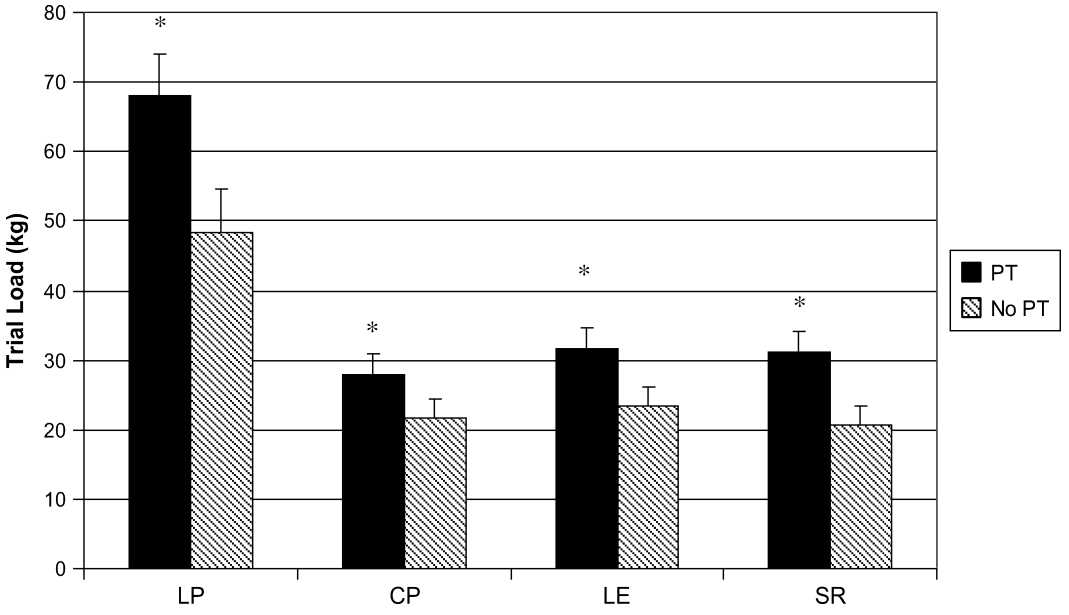

Figure 3. Self-selected trial loads. Differences between the personal trainer (PT) and no personal trainer (No PT) groups. *Indicates a significant difference ($P < 0.05$) between groups. LP = leg press; CP = chest press; LE = leg extension; SR = seated row. Data presented are the mean ± *SD*.

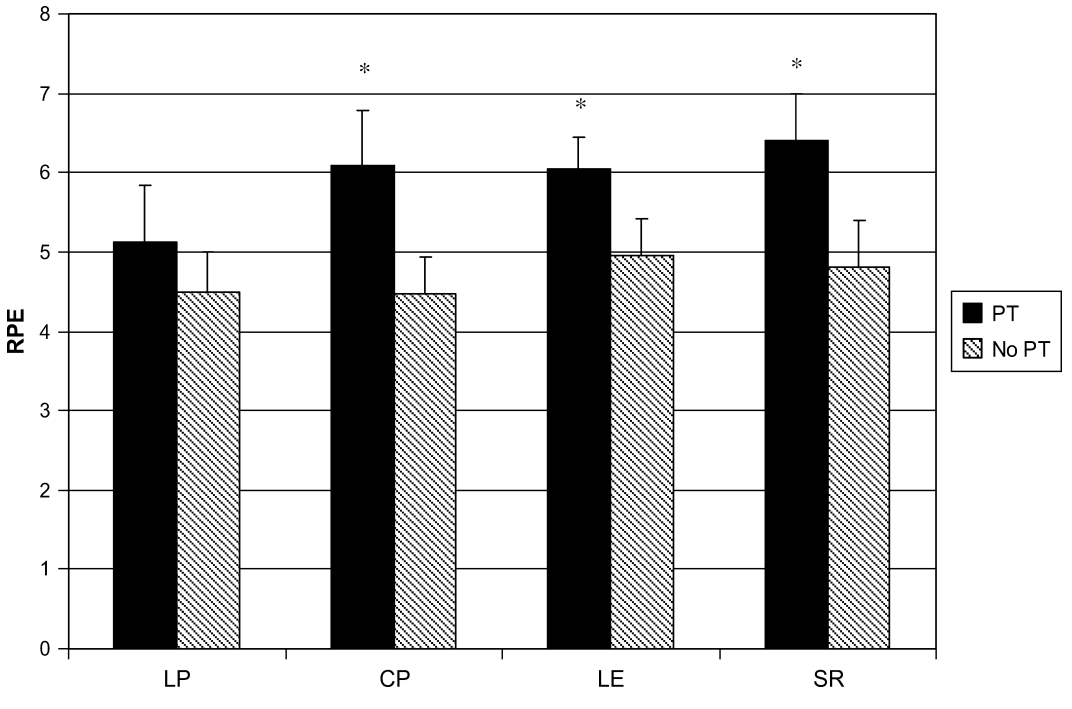

Figure 4. Ratings of perceived exertion (RPE). Differences between the personal trainer (PT) and no personal trainer (No PT) groups. *Indicates a significant difference ($P < 0.05$) between groups. LP = leg press; CP = chest press; LE = leg extension; SR = seated row. Data presented are the mean ± *SD*.

loads and RPE values were significantly greater in PT for 3 of the 4 exercises tested than the No PT group. To our knowledge, this investigation was the first to measure and compare the self-selected training intensities of women who trained on their own to women who trained under the supervision of a PT.

The resistance training intensities self-selected by women in the No PT group ranged from 38% to 48% of their 1RM and from 43% to 57.4% of their 1RM in the PT group for the 4 exercises assessed. Overall, the average self-selected intensity for all exercises was ~51.4% in the PT group and ~42.3% in the No PT group. These intensities may be considered typical for general fitness-type goals; however, they are considered less than optimal for increasing muscular strength and hypertrophy in healthy, resistance-trained women (2,11). Glass and Stanton (8) compared the self-selected lifting intensities of men and women for the chest press, leg press, pulldown, shoulder press, and curl exercises and reported that the women self-selected intensities ranging from ~40% to 52% of their 1RM across all exercises (which did not significantly differ from the intensities self-selected by the men). In a recent study, Focht (6) reported that women self-selected an average of 56% of their 1RM during performance of the leg extension, chest press, pull-down, and overhead press exercises. The results of the present study support these studies (6,8) as similar relative intensities were self-selected. In fact, the intensity range of our women who trained on their own (No PT) was very similar to the range reported by Glass and Stanton (8). Interestingly, the relative percents selected by the women in the Glass and Stanton (8) study for the chest, back, and shoulder exercises were slightly lower than that observed for the leg press. The opposite results were found in the present study. Relative self-selected intensities for the lower-body exercises (LP and LE) were lower than that observed for the upper-body exercises (CP and SR). This discrepancy likely occurred for two reasons. Upon interviewing our subjects after testing was completed, there appeared to be a general concern among some of the women about gaining excessive amounts of muscle mass in the lower body musculature. Although only 38% and 16% of the women in the No PT and PT groups, respectively, believed resistance training would produce excessive bulk, it is possible that the fear, or misconception, of gaining muscle mass in the lower body could have led to the self-selection of lighter loads for lower-body exercises (6). In addition, many of the women were surprised by how much weight they were able to lift during the lower-body 1RM tests. Most of these women did not previously train at a relative intensity close to their 1RM. Thus, the LP and LE 1RM strength tests were educational in the sense that these women discovered they possessed more lower-body strength than they previously thought (ie, underestimation of one's maximal strength could lead to selection of a lower relative training intensity). These results also support the use of periodic strength assessments

Table 3. Questionnaire responses.

	PT (n = 19), %	No PT (n =26), %
Type of program: number of sets per exercise		
1 set	5.3	3.8
2–3 sets	15.8	7.7
3 sets	47.4	77.0*
3–4 sets	26.3	11.5
5 sets	5.3	0
Type of program: number of repetitions per set		
7–10 reps	0	15.3†
10–15 reps	63.2	77
15–20 reps	36.8	7.7*
>20 reps	0	0
Training equipment used		
Machines	100	100
Dumbbells	95	81
Barbells	79	54†
Elastic bands	21	19
Medicine balls	47	38
Stability balls	47	42
BOSU	5	0
Other	0	8
Resistance training goals		
Increase strength	42	31
Increase tone	74	69
Decrease body fat	26	31
Increase endurance	37	15
Increase muscle hypertrophy	16	4
Improve health	21	23
Increase power	0	4
Increase athleticism	0	15†
Increase metabolism	11	0†
Sources of resistance training information		
PT	100	0*
Relatives	5	21
Magazines	79	63
TV/DVDs	16	17
Coach	11	29
Own experience	5	8
Friends	32	46
Internet	11	21
Books	11	4
Education/schooling	11	33
Journals	0	8
Radio	0	4
News broadcasts	0	4
American College of Sports Medicine	0	4

*$P < 0.05$ between groups.
†trend ($P = 0.06$ to 0.10) between groups.

in the general health and fitness training population to inform health club members of their physical capacity. Taken together, both of these factors could have contributed to the lower self-selected relative intensities observed in the lower-body exercises in our population.

The positive influence of a personal trainer was seen in the present study. Women who consistently trained under the supervision of a personal trainer had greater 1RMs in the LP (16%), LE (12%), and SR (11%) exercises compared with the No PT group. These data indicated that the presence of a personal trainer, who prescribed the amount of weight lifted during each set of every workout, resulted in a better resistance training stimulus yielding greater strength improvements over time. In men, Mazzetti et al. (14) compared supervised with unsupervised periodized resistance training over the course of 12 weeks and reported that the supervised training group was able to train with heavier loads, showed a greater rate of increase in training loads, and showed a greater increase in 1RM squat and bench press than the unsupervised group. Therefore, the results of the present study support previous research demonstrating superior maximal strength increases during supervised resistance training where the intensity and volume were prescribed by a personal trainer.

Although the women in the PT group self-selected higher training intensities across all exercises, the overall mean intensities were still lower than 60% of their 1RM. These results indicate that many women who exercise in health clubs may be resistance training at an intensity that is suboptimal for progression. A threshold of intensity exists for every individual that needs to be exceeded in order for fitness improvements to occur, that is, synonymous with the progressive overload principle of resistance training (2,11). For muscular strength improvements in untrained individuals, intensities as low as 45% of 1RM have been shown to elicit strength increases (3). However, the relative intensity requirement increases as one adapts to resistance training. It has been suggested that at least 60–80% of an individual's 1RM is needed to increase muscular strength and hypertrophy in moderately-trained individuals (5,8,11), and this relative percent may increase to >85% of 1RM in highly-trained individuals (2,9). Upon further review, most of the women in the present study fell short of self-selection of intensity within this prescribed minimal range. In fact, 53% of the women in PT attained at least 60% of their 1RM on one exercise, 6 of 19 (32%) attained 60% of their 1RM in 2 or more of the exercises, 3 of 19 (16%) attained 60% of their 1RM on at least 3 exercises, and only 2 of 19 (11%) attained 60% of their 1RM and greater on all 4 exercises assessed. Two women attained relative intensities of 75% of their 1RM or more. Only 2 of 27 women (7%) in No PT attained 60% on at least 2 of the exercises assessed. In fact, a few women in the No PT group self-selected weights that were <20% of their 1RM on multiple exercises. On the basis of the results of the present study and others (6,8), it appears that many women training unsupervised in health clubs may be training at intensities that are far too low for progression in muscular strength and hypertrophy enhancement. Although only a few women stated that muscle strength and hypertrophy were primary training goals, some of the intensities selected

may have been too low for other goals, e.g. muscle endurance, tone, for the targeted repetition number (e.g., 10 repetitions) used in the present study.

A factor affecting the self-selected intensity in the PT group in the present study was the rest intervals prescribed in between sets. Rest interval length has been shown to affect acute lifting loads and repetitions performed (16) and chronic changes in 1RM strength (15,17). Many of the women in the PT group trained using programs that were 30 minutes in length. Because PTs many times have very busy schedules, it is not uncommon to schedule short workouts with high volume per session to optimize time and workout efficiency. Because >95% of the women in the PT group reported using multiple-set programs, the rest intervals prescribed by their trainers were typically 60 to 90 seconds to complete each workout within the allotted time period. It is possible that lighter loads may have been selected in their own training programs to enable the required number of repetitions to be performed despite the short rest intervals. That is, these women may have been accustomed to training in a fatigued state and that could have affected their self-selected intensities in the present study. In addition, more than 70% of the women tested reported increased muscle tone as their number one training goal. Because increased "muscle tone" does not necessarily imply training for increased strength and hypertrophy, it may be that light-to-moderate intensity selection was perceived as adequate for this type of training goal in this population. Interview responses from subjects reported high satisfaction with their personal training based on their goals and stated that the 30-minutes workouts were very challenging despite the moderate loading. Thus, it is important to note that heavy resistance training was not desired amongst several of the women and their personal training was reflective of their goals.

In the present study, women in the PT group reported RPE values that were significantly greater than the No PT group in 3 of the 4 exercises assessed. This difference may have been attributable to the self-selection of higher relative intensities during the protocol. Other studies have shown greater RPE values with high- versus low-intensity resistance exercise (7,13). Focht (6) measured RPE data in women during 2 conditions, resistance exercise with a self-selected intensity (which tended to be ~56% of 1RM on average) versus an imposed intensity (75% of 1RM) for 4 exercises and reported that RPE values were greater during the imposed intensity protocols. Because the personal trainers prescribed the intensity to the subjects in the PT group, it is likely that these women were accustomed to greater levels of exertion in their workouts than the women in the No PT group and it appeared to carry over to when these subjects were tested during the self-selection protocol in the absence of their personal trainers.

Responses from the questionnaire yielded some interesting findings. More than 95% of the women in both groups reported using multiple-set programs. In addition, 63–77% of the women reported performing 10–15 repetitions for all of their sets. These results support previous investigations suggesting the use of multiple sets for at least 10 repetitions for goals (ie, tone, modest strength improvements, body fat reductions, etc) common to the general fitness populations (2,5,11). Interestingly, 100% of the women reported using machine-based exercises in their programs. However, in response to their use of free weights 54–81% of women in the No PT group reported using barbells and dumbbells, respectively, whereas 79–95% of women in the PT group reported using barbells and dumbbells. These data indicate that the PTs were influential in introducing more extensive free-weight training to this population. In addition, based on subject interviews, some women in the No PT group felt intimidated or feared using free weights because they tended to be perceived as more difficult to perform and some feared excessive muscle mass development with free-weight training. Although these fears are not substantiated by research (4), they appeared to affect the selection of exercises and training equipment used by many women in the health clubs. Finally, more than 38% of the women in both groups reported frequent use of medicine balls and stability balls in their workouts. These data reflect the growing popularity of other modalities of resistance training used to increase core stability, balance, and performance.

We reported that 38% of the women in the No PT group and 16% of the women in the PT group believed that the mere act of resistance training would lead to large, "bulky" muscles. That is, any type of resistance training (independent of intensity, volume, and effort) could lead to excessive muscular hypertrophy. This myth, or misconception, associated with women and resistance training has perpetuated for a number of years despite no scientific data to support it (4). Research shows that progressive overload is needed for improvements to occur; thus, the act of resistance training itself is not enough if it is below one's threshold level of adaptation (11). Interestingly, significantly fewer women in the PT group believed the myth. It is possible that their PTs educated them in many aspects of resistance training. In addition, many of these women trained hard and may have come to the realization that they did not develop excessively large muscles despite performing challenging workouts. In either case it appeared that PTs were effective in dispelling this misconception associated with resistance training in many of our subjects.

The results of the present study indicated that the most common sources of resistance training cited by our subjects were a personal trainer (in the PT group only), magazines, friends, and classes/education. These data demonstrated the importance of a personal trainer, not only for resistance exercise prescription, but also for client education. Most subjects in the No PT group reported magazines and friends as their major sources of information. Although 85% of these women reported playing high school sports and had some exposure to resistance training (with information provided by coaches), sources of their current information were mostly magazines and friends.

In summary, the results of the present study indicated that the majority of women examined who trained in health clubs self-selected training intensities that may be considered too low for progression in muscular fitness (2). In addition to individual training goals, it appeared that the self-selected intensities may have been influenced by subjects' own perceptions or misconceptions about resistance training. Those who consistently trained under the supervision of a personal trainer self-selected higher resistance training intensities, reported higher RPE values, had greater initial 1RM strength, and were less likely to believe the misconception of excessive "muscle bulk" via resistance training than women who trained on their own. These results support previous studies demonstrating the superiority of supervised resistance training. However, the importance of resistance training intensity (and selection of proper intensities based on goals) needs to be emphasized in this population as many of the subjects interviewed were not previously aware of their low training intensities.

Practical Applications

Progressive overload is a critical component to resistance training leading to gains in muscle strength and hypertrophy. Selection of an appropriate intensity is critical to mediating the magnitude of neuromuscular adaptations. Our data demonstrate that women training in health clubs may not select an appropriate resistance training intensity needed for gains in muscular performance. However, women training under the supervision of a personal trainer possessed greater 1RM strength, self-select intensities, and workout at RPE values greater than those women who train unsupervised. Therefore, supervised resistance training via a personal trainer appears to be advantageous.

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