

Let the Pleasure Guide Your Resistance Training Intensity

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Abstract and Introduction

Abstract

Purpose: The purpose of this study was to evaluate the feasibility and reliability of the Feeling Scale (FS) to self-regulate resistance training (RT) intensity.

Methods: Sixteen sedentary men (39.7 ± 7.5 yr) performed 3 familiarization sessions, 2 one-repetition maximum (1RM) testing, and 16 RT sessions (four sessions for each FS descriptor; randomized). The FS descriptors were "very good" (FS + 5), "good" (FS + 3), "fairly good" (FS + 1), and "fairly bad" (FS - 1). Resistance exercises were leg press, chest press, knee extension, and seated biceps curl. Participants were instructed to select a load associated with the verbal/numerical descriptor of the FS to perform three sets of 10 repetitions.

Results: Participants lifted a significantly greater %1RM as the FS level decreased from FS + 5 to FS - 1 ($P < 0.001$). The mean %1RM values for the FS descriptors of +5, +3, +1, and -1, respectively, were as follows: leg press, $42.5\% \pm 9.5\%$, $58.2\% \pm 7.4\%$, $69.9\% \pm 7.0\%$, and $80.7\% \pm 5.4\%$; knee extensor, $37.4\% \pm 9.6\%$, $54.5\% \pm 9.3\%$, $65.3\% \pm 8.7\%$, and $78.2\% \pm 5.9\%$; chest press, $42.4\% \pm 11.3\%$, $54.9\% \pm 11.4\%$, $66.4\% \pm 12.6\%$, and $78.2\% \pm 13.5\%$; and biceps curl, $39.0\% \pm 8.1\%$, $54.0\% \pm 9.7\%$, $68.4\% \pm 5.9\%$, and $83.2\% \pm 3.0\%$. The interclass correlation coefficient over the four experimental sessions ranged from 0.73 to 0.99 for %1RM and from 0.77 to 0.99 for weight lifted, with a coefficient of variation of approximately 7%, 4%, 2%, and 2% for FS descriptors of +5, +3, +1, and -1, respectively.

Conclusion: This study is the first to demonstrate that the FS can be used to self-regulate exercise intensity in RT. The lower the FS descriptor, the higher the weight lifted. In addition, the load self-selected for each FS descriptor was reliable across the four sessions.

Introduction

Resistance training (RT) is an exercise modality that involves manipulation of program variables (e.g., number of sets, repetitions, and exercises; load; movement speed; and resting period) to promote a systematic increase in the overload placed upon the body to improve muscular fitness.^[1,2] The guidelines for exercise prescription recognize the importance of setting an exercise intensity according to a fixed physiological range to achieve health and fitness benefits. Traditionally, this strategy has been accomplished by using a percentage of a load that can be moved through the entire range of movement only once (i.e., %1RM).^[3] Several methodological factors must be considered to make this measure accurate, including choice of initial weight, interval length between attempts, increments in weight, and criteria for acceptable lifting.^[2] Further, several familiarization sessions are needed for an accurate assessment of 1RM load, which may vary from two to three sessions in well-conditioned^[4] and untrained individuals,^[5] or up to 7–10 sessions in elderly.^[6]

The low level of practical application of this methodology has led researchers to look for an easier strategy to regulate exercise intensity.^[7–9] One possibility is linking the magnitude of muscular effort to the RPE measured by a numeric scale.^[8] This method has been shown to be effective to control the intensity of RT given that it is correlated with physiological variables such as electromyographic activity,^[10] blood lactate,^[10] and hormonal variables.^[11] Likewise, several studies have shown that RPE is responsive to alterations in resistance exercise variables such as load, movement speed, number of repetitions, etc..^[7,9,10,12,13] On the basis of these findings, the use of RPE has been suggested in RT to prescribe exercise intensity.^[3] One important limitation of using a %1RM or RPE approach to prescribe resistance exercise is that when the intensity prescribed is fixed at a moderate or vigorous intensity, as recommended by the American College of Sports Medicine (ACSM),^[2,3] there would be some individuals who will experience a positive affective response from the exercise whereas others may report a less positive or even negative affective response.^[14–16] In sum, both types of exercise prescription neglect the influence of exercise intensity on individual perception of pleasure.

In this regard, the affective response to exercise has been shown to influence future exercise behavior.^[17–20] This was confirmed by a systematic review of 24 studies conducted by Rhodes and Kates,^[21] which showed that the affective responses during exercise are linked to future participation in exercise with a small to large effect size. Specifically, regarding the factors associated with participation in RT, Rhodes et al.^[22] demonstrate in another systematic review that intrapersonal factors such as affective judgments, self-efficacy, and self-regulation behaviors were associated with RT participation. Therefore, an appropriate exercise prescription should not only be focused on providing an adequate intensity but also encourage exercise adherence and compliance. Affect is defined as "the most basic or elementary characteristic component of all valenced responses—positive or

negative, pleasant or unpleasant—including, but not limited to, emotions and moods".^[23] Ekkekakis and Petruzzello^[16] suggested that the Feeling Scale (FS)^[24] should be used to measure affective valence within the exercise context and some studies have used the FS to investigate the relationship between exercise intensity and affective responses in RT.^[14,15,25–27]

Rose and Parfitt^[28] proposed a method for regulating the intensity of aerobic exercise based on the individual's affective response using the FS. Participants were asked to set their exercise intensity to feel "good" (+3 on the FS) and "fairly good" (+1 on the FS), and the intensity corresponded to 64% and 68% of HR_{max}, respectively, which is within the recommended range for improving health and fitness.^[3] Similar results were found later using the same procedure with an active female sample^[29] and previously sedentary individuals in a gym environment.^[30] Furthermore, a sample of sedentary women exercising to feel "good" (FS + 3) improved aerobic performance after 8 wk of training with an adherence rate >92%.^[31] These findings indicated that both sedentary and active individuals can use affect to regulate their exercise intensity during aerobic exercise and showed that the intensity performed during the affect-regulated exercise meets the recommendations for improving health and fitness.^[3] Possibly, this approach could be extended to other forms of physical exercise, such as RT.

Several studies have assessed the effect of different exercise variables in RT on the affective responses to RT, such as muscle action,^[32] load,^[14,15] repetitions, exercise order,^[25] rest periods,^[15] and comparing imposed to self-selected intensity.^[26] These studies have shown, for instance, that moderate intensity (i.e., 70% of 10RM) produced more pleasant affective responses compared with both low (40% of 10RM) and high-intensity exercise (100% of 10RM).^[14] In fact, the effects of the load on affective response have been described for almost the full spectrum of RT intensities (e.g., 40%, 60%, 70%, and 80% 1RM).^[26,33] However, whether the affective sensation can be used to guide (affect-regulate) RT intensity, as well as its reliability, has not been tested. It is worth noting that the purpose of an affect-regulated exercise approach is to give the individual the opportunity to choose an intensity to meet an affective response to ensure that in a set/exercise/session he/she will take pleasure from it. This is particularly important considering that imposing the intensity reduces perceived autonomy and control,^[34] which in the long term, research would suggest, will likely reduce adherence. If shown to be reliable, affect-regulated RT intensity could be used to compliment RT training approaches, especially when the goal is to increase adherence.

It is important to highlight that RT is intermittent in nature, which poses a challenge for affect-regulated exercise given that there are different muscular actions (i.e., concentric and eccentric), pauses between these actions, and an accumulative fatigue from repetition of exercise within the same set. This is especially true in comparison to aerobic continuous exercise in which the ongoing nature of the exercise gives the subject the possibility to monitor the interoceptive cues from different body systems (e.g., muscular, thermoregulatory, respiratory, etc.) and immediately regulate the pace. However, the oscillatory affective response during aerobic interval training suggests that individuals have the ability to process and interpret stimulus and recovery periods independently.^[35] This ability supports that RT intensity may be affect-regulated as previously shown in aerobic activity.^[28–31] In addition, in the last ACSM guidelines for prescribing exercise, it was stated that there was insufficient evidence to support the use of the FS as a primary method of exercise prescription, especially for RT.^[3] Thus, the purpose of this study was to evaluate the feasibility and reliability of RT using the FS to self-regulate the exercise intensity. It was hypothesized that less pleasurable ratings on the FS would result in an increased self-selected exercise intensity (higher weight lifted and %1RM).

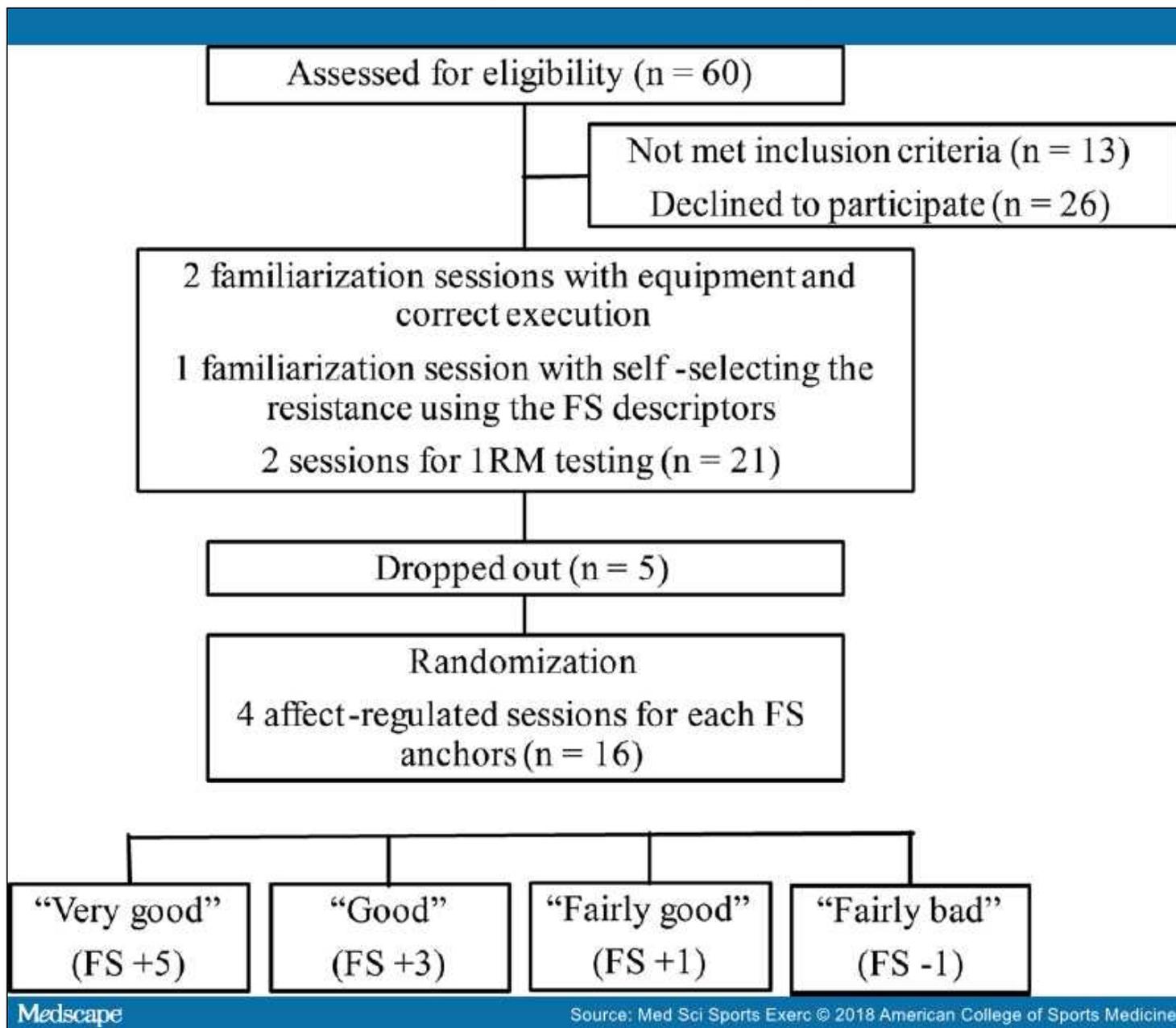
Methods

Participants

Sixteen sedentary men aged between 18 and 45 yr old () volunteered to participate in this study. To be eligible, participants were required to have not participated in RT for at least the previous 6 months. All participants completed a medical history questionnaire, which ensured that they did not have cardiorespiratory or muscular contraindications to participate in physical activity, they were not currently taking any medications for health problems, and were nonsmokers. The Institutional Ethics Committee approved this study (protocol no. 0014.0.091.000–11). Participants gave written informed consent according to the Declaration of Helsinki after a detailed explanation of the experimental procedures, benefits, and possible risks. Figure 1 shows the sequence of procedures used during the study.

Table 1. Descriptive characteristics of the sample (n = 16).

	Mean	SD
Age (yr)	39.7	7.5
Height (cm)	168.3	6
Body mass (kg)	75.1	10.9
BMI (kg·m ⁻²)	27.1	3.6
1RM leg press (kg)	117.9	22.6
1RM chest press (kg)	79.3	21.4
1RM seated knee extension (kg)	60.0	7.26
1RM seated biceps (kg)	40.7	11.5



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Figure 1.

Flow chart of participant recruitment, screening, and experimental study design.

Measures

RPE values for the overall body were obtained immediately after each set during the resistance exercise sessions using the OMNI-RES scale.^[8] During the orientation session, standard instructions and anchoring procedures were explained. RPE has been conceptualized as a psychobiological configuration of effort sense, and it has been shown to be valid for use during acute resistance exercise.^[8]

Affective valence was assessed by the FS.^[24] The FS is an 11-point, single-item, bipolar rating scale commonly used for the assessment of affective responses during exercise. The scale ranges from -5 to +5. Descriptors are provided at zero ("neutral") and at all odd integers, ranging from "very good" (+5) to "very bad" (-5). The FS has shown a correlation ranging from 0.51 to 0.88 with the valence scale of the self-assessment manikin and from 0.41 to 0.59 with the valence scale of the affect grid.^[36] In addition, the intraclass correlation coefficient (ICC) of the FS during exercise is 0.83.^[37] Participants were familiarized according to standard instructions.^[24]

Procedures

Familiarization Sessions. The familiarization process was conducted over three nonconsecutive days with an interval of 48 h. During each familiarization session, participants performed a workout similar to the experimental sessions. The first two sessions were planned for the participants to become familiar with the equipment and correct execution (appropriate posture, lifting, and breathing technique, use of a constant range of motion, and movement speed) for resistance exercises. These processes were designed to facilitate the estimation of initial loads and subsequent increments in the 1RM.^[5] Furthermore, two familiarization sessions were used to ensure that all variables involved in RT (i.e., number of sets, repetitions, exercise, execution speed, and interval time) were accounted for the self-selection of the workload corresponding to an FS descriptor.

The last familiarization session was directed to familiarize the participants with the FS and the process of self-selecting the resistance for each exercise using the FS descriptors. Rose and Parfitt^[28] reported that for aerobic training, one familiarization session was necessary for individuals to recognize the exercise intensity that corresponded to an affective response descriptor. Before starting this session, the FS scale was presented and explained to the participant according to standard instructions.^[24] Furthermore, the process of self-selecting the resistance for each exercise using the FS descriptors was explained. They were instructed to select a resistance that was perceived to correspond to a specific FS level: "very good" (FS + 5), "good" (FS + 3), "fairly good" (FS + 1), or "fairly bad" (FS - 1). The order of each condition was randomized and counterbalanced.

1RM Testing

After the familiarization process, 1RM test was conducted for four different exercises in the following order: 1) leg press, 2) chest press, 3) seated knee extension, and 4) seated biceps curl. This order was fixed for all sessions with upper- and lower-body exercises alternated and larger muscle groups and multijoint exercises performed before the smaller muscle groups and single-joint exercise to allow greater recovery between exercises. 1RM was determined using a previously validated testing procedure.^[38] 1RM was defined as the heaviest weight a participant could lift once with a proper lifting technique, without compensatory movements.

First, participants received instructions in proper lifting technique for each exercise before starting the 1RM tests. They were instructed to perform the movement over 2 s (1 s for eccentric and 1 s for concentric phase). Then there was a specific warm-up for each exercise with a constant range of motion and without external load consisting of 10–15 repetitions. After a 5-min passive recovery from the warm-up, the weight was then increased (weight varied according to the exercise performed). Successive attempts with progressive loads were applied until the 1RM value was found for each exercise. No participant required more than five attempts. There was a 5-min recovery period between each trial and between exercises.

Participants performed two 1RM test sessions for all four exercises with a 48-h interval between test sessions. The ICC values (r) between tests were 0.91, 0.94, 0.89, and 0.90 for leg press, chest press, seated knee extension, and seated biceps curl, respectively ($P < 0.05$).

Affect-regulated Sessions. All participants performed four affect-regulated resistance exercise sessions for each of the four FS descriptors (16 experimental sessions): "very good" (FS + 5), "good" (FS + 3), "fairly good" (FS + 1), or "fairly bad" (FS - 1). The order of sessions was randomized and counterbalanced with at least 48 h interval between sessions. Before each session, participants were instructed again about the proper lifting technique for each exercise and the process of self-selecting the resistance using FS descriptors.

The affect-regulated exercise sessions were composed of three sets of 10 repetitions for each of four exercises (machines): leg press, chest press, seated knee extension, and seated biceps curl. In addition, the exercise order of alternating upper and lower body exercises was chosen to allow greater recovery between exercises.

Before each experimental session, participants received standard instructions regarding the affect-regulated self-selection process: "Today, you are going to perform four different exercises. Please, select a load associated with a [*verbal descriptor of the FS randomly selected for that day*] feeling, corresponding to [*numeral descriptor of the FS randomly selected for that day*] on this scale for performing three sets of 10 repetitions on the [*name of the exercise*]. If needed, at the end of each set, during the 2-min recovery period, you can adjust the load to maintain the correct feeling associated with the descriptor prescribed during the remainder of the sets." Before each set of each exercise, participants were allowed to perform two sets of up to three repetitions to determine the load associated with the FS descriptor. The investigator did not provide any additional information that could have created bias in the weight selection.

Each exercise session included a 2-min recovery period between sets and 3-min between each exercise. The rationale for these recovery periods was based on previous investigations, which reported that exercise performance may be compromised when the recovery period is short (30 s to 2 min), and longer intervals (3 to 5 min) promote a better performance of muscle strength.^[2] Movement speed during all exercises sessions was controlled by a digital metronome (Qwik Time QT-3 Quartz, 1 x S006p, Qwik TUNE®) providing a standard cadence for the concentric and eccentric phase of 1:1 s, according to traditional RT recommendations.^[2] The absolute resistance (kg), repetitions completed, and RPE were recorded following the completion of each set.

During all sessions, there was an instructor supervising the exercise. Participants were instructed to abstain from vigorous physical activity and to avoid products containing caffeine and alcohol 24 h before their participation in the study sessions. All sessions were conducted with participants wearing appropriate clothing and shoes.

Statistical Analyses

Descriptive statistics (mean \pm SD) were provided for all dependent variables. A three-way repeated-measures ANOVA was used to compare the %1RM, absolute resistance (kg), and repetitions completed for each of resistance exercises (averaged across the sets). The factors used for the comparisons were exercise (leg press, chest press, knee extension, and seated biceps curl), FS condition (FS + 5, FS + 3, FS + 1, and FS - 1), and trial (first, second, third, and fourth exercise sessions). Whenever the sphericity assumption was violated, the Greenhouse–Geisser correction was used. Eta squared (η^2) was used to determine the effects size. Because the number of comparisons increases the risk for type I error, the *P* value for *post hoc* analyses was adjusted according to the Bonferroni correction to 0.01. The ICC and the coefficient of variation (CV) were calculated for %1RM and absolute load to each exercise across trials 1 to 4 to examine the consistency in the mean intensity chosen in the four trials of each condition. All data were analyzed using SPSS 18.0 for Windows (SPSS Inc., Chicago, IL).

Results

There were no significant differences for repetitions completed ($P > 0.05$), confirming that all participants performed a similar number of repetitions for each exercise (9.86 ± 0.23 reps) in all FS conditions (9.86 ± 0.21 reps) and in all trials (9.86 ± 0.20 reps) throughout the study protocol. The results for %1RM showed a significant main effect for condition ($F_{3, 45} = 387.79$, $P < 0.001$, $\eta^2 = 0.98$), with participants lifting a significantly greater %1RM as the FS level decreased from FS + 5 to FS - 1 (). No other significant main effects or interactions were found.

Table 2. Mean and SD of the percentage of %1RM self-selected for each FS condition.

	Leg Press	Knee Extensor	Chest Press	Biceps Curl
FS + 5	42.5 \pm 9.5	37.4 \pm 9.6	42.4 \pm 11.3	39.0 \pm 8.1
FS + 3	58.2 \pm 7.4 ^a	54.5 \pm 9.3 ^a	54.9 \pm 11.4 ^a	54.0 \pm 9.7 ^a
FS + 1	69.9 \pm 7.0 ^{a,b}	65.3 \pm 8.7 ^{a,b}	66.4 \pm 12.6 ^{a,b}	68.4 \pm 5.9 ^{a,b}
FS - 1	80.7 \pm 5.4 ^{a,b,c}	78.2 \pm 5.9 ^{a,b,c}	78.2 \pm 13.5 ^{a,b,c}	83.2 \pm 3.0 ^{a,b,c}

^aDifferent from FS + 5.

^bDifferent from FS + 3.

^cDifferent from FS + 1 (all $P < 0.01$).

The results for absolute resistance showed significant main effects for exercise ($F_{1,61, 24,20} = 121.74$, $P < 0.001$, $\eta^2 = 0.73$) and condition ($F_{1,36, 20,50} = 156.638$, $P < 0.001$, $\eta^2 = 0.24$). Participants selected a higher resistance at each FS level from FS + 5 to FS - 1, and, as expected, the leg press exercise showed the highest resistance ().

Table 3. Self-selected absolute resistance (kg) across exercise sessions for each FS condition.

	Leg Press	Knee Extensor	Chest Press	Biceps Curl
FS + 5	50.7 \pm 16.7	23.0 \pm 6.8	29.5 \pm 11.8	17.4 \pm 10.0
FS + 3	68.9 \pm 16.0 ^a	32.9 \pm 6.9 ^a	38.2 \pm 15.0 ^a	23.2 \pm 10.9 ^a
FS + 1	81.3 \pm 16.4 ^{a,b}	39.8 \pm 8.1 ^{a,b}	46.6 \pm 20.2 ^{a,b}	28.7 \pm 11.8 ^{a,b}
FS - 1	93.9 \pm 17.5 ^{a,b,c}	47.4 \pm 7.7 ^{a,b,c}	55.8 \pm 24.2 ^{a,b,c}	34.3 \pm 13.2 ^{a,b,c}

^aDifferent from FS + 5.

^bDifferent from FS + 3.

^cDifferent from FS + 1 (all $P < 0.01$).

The ICC for %1RM and load lifted within trials were high for all FS conditions (FS + 5, FS + 3, FS + 1, and FS - 1), indicating that the pattern of responses achieved during the FS conditions was consistent over the four resistance exercise sessions. The ICC ranged from 0.73 to 0.99 for %1RM, and from 0.77 to 0.99 for load lifted (). In addition, the mean CV across the four trials for %1RM showed a small variation in exercise intensity selected by the same participant across the four sessions for each FS condition (FS + 5, ~7%; FS + 3, ~4%; FS + 1, ~2%; and FS - 1, ~2%) ().

Table 3. Self-selected absolute resistance (kg) across exercise sessions for each FS condition.

	Leg Press	Knee Extensor	Chest Press	Biceps Curl
FS + 5	50.7 \pm 16.7	23.0 \pm 6.8	29.5 \pm 11.8	17.4 \pm 10.0
FS + 3	68.9 \pm 16.0 ^a	32.9 \pm 6.9 ^a	38.2 \pm 15.0 ^a	23.2 \pm 10.9 ^a

FS + 1	81.3 ± 16.4 ^{a,b}	39.8 ± 8.1 ^{a,b}	46.6 ± 20.2 ^{a,b}	28.7 ± 11.8 ^{a,b}
FS - 1	93.9 ± 17.5 ^{a,b,c}	47.4 ± 7.7 ^{a,b,c}	55.8 ± 24.2 ^{a,b,c}	34.3 ± 13.2 ^{a,b,c}

^aDifferent from FS + 5.

^bDifferent from FS + 3.

^cDifferent from FS + 1 (all $P < 0.01$).

Table 4. ICC, mean CV for the relative (%1RM), and absolute load (kg) for each exercise across sessions 1 to 4.

	Exercises	ICC (95%)		CV (%)	
		%1RM	Load (kg)	%1RM	Load (kg)
FS + 5	Biceps curl	0.94 (0.86–0.97)	0.98 (0.95–0.99)	3.5	3.5
	Knee extensor	0.97 (0.93–0.99)	0.96 (0.91–0.98)	7.0	11.1
	Leg press	0.94 (0.88–0.98)	0.97 (0.95–0.99)	9.6	9.6
	Chest press	0.94 (0.86–0.97)	0.97 (0.93–0.99)	9.7	9.7
FS + 3	Biceps curl	0.98 (0.95–0.99)	0.99 (0.99–0.99)	3.6	3.6
	Knee extensor	0.95 (0.90–0.98)	0.90 (0.79–0.96)	6.0	10.6
	Leg press	0.93 (0.85–0.97)	0.98 (0.96–0.99)	4.5	4.5
	Chest press	0.98 (0.96–0.99)	0.99 (0.98–0.99)	4.2	4.2
FS + 1	Biceps curl	0.88 (0.73–0.95)	0.99 (0.99–0.99)	3.3	3.3
	Knee extensor	0.97 (0.95–0.99)	0.93 (0.84–0.97)	2.7	6.8
	Leg press	0.97 (0.94–0.99)	0.99 (0.98–0.99)	2.3	2.3
	Chest press	0.99 (0.98–0.99)	0.99 (0.99–1.00)	1.8	1.8
FS - 1	Biceps curl	0.85 (0.77–0.94)	0.99 (0.99–1.00)	1.4	1.4
	Knee extensor	0.90 (0.78–0.96)	0.87 (0.77–0.88)	3.7	8.0
	Leg press	0.92 (0.83–0.97)	0.99 (0.98–0.99)	2.6	2.6
	Chest press	0.98 (0.96–0.99)	0.99 (0.99–0.99)	3.6	3.6

Discussion

The purpose of this study was to investigate whether the FS could be used to regulate the exercise intensity during RT and to examine the reliability of the exercise intensity selected to feel "very good" (FS + 5), "good" (FS + 3), "fairly good" (FS + 1), or "fairly bad" (FS - 1) over nonconsecutive exercise bouts. Our results showed that FS is a valid, useful, and reliable tool to self-regulate the exercise intensity during RT. It was observed that the lower the ratings on the FS, the higher the exercise intensity (%1RM) and weight lifted. To the best of our knowledge, this is the first study to show the usefulness of the FS to regulate RT intensity, and these results are promising for the application of the FS as a means of self-regulating RT intensity in the field.

The fact that the perception of pleasure derived from the exercise can be used as a tool to self-select RT exercise is consistent with previous studies using affect-regulated exercise intensity in aerobic exercise.^[28–31] Studies have shown that during running and cycling exercise, the instruction to exercise to feel "good" (+3) and/or "fairly good" (+1) resulted in an exercise intensity that would generate cardiovascular improvements.^[28–30] Here we showed that sedentary participants exercising in RT to feel "good" (+3) to "fairly bad" (-1) achieved exercise intensities recommended by the ACSM to improve muscle strength and endurance (55% to 85% 1RM).^[3] Furthermore, our results extend previous findings demonstrating the inverse linear relationship between feeling of pleasure and exercise intensity during RT over a larger range of FS descriptors (+5 to -1).

In addition, participants could reproduce the load lifted across four nonconsecutive exercise sessions for each of the FS conditions, confirmed by the lack of a main effect for trial and high ICC. These results show that the FS is a reliable tool to determine RT load. It is important to note that to achieve this result, a familiarization session is needed where the FS is described and participants practice choosing an RT intensity based on the specific FS descriptor. Thus, it may take one exercise session for individuals to recognize the exercise intensity of RT that corresponds to an affective response on the FS. Once this is completed, individuals are able to replicate that intensity in the subsequent sessions. Moreover, it is important to note that there was an inverse linear relationship between the FS condition and the load; in other words, as the FS condition decreased from +5 to -1, there was an increase in absolute and relative intensity at each descriptor.

For the first time in 2009, the eighth edition of the ACSM's *Guidelines for Exercise Testing and Prescription*^[39] recommended the use of rating scales of affective valence, such as the FS,^[24] as an adjunct method of monitoring aerobic-based exercise intensity, alongside HR and RPE. Yet, in 2011, the ACSM in its latest position stand^[3] stated that insufficient evidence existed to support the use of the FS as a primary method of exercise prescription, especially for RT. Our results add to this evidence base. The results show that the RT intensity zones proposed by the ACSM^[3] can be achieved using the FS as a guide to intensity selection. The RT intensity zones proposed by the ACSM^[3] are "very light" (<30 %1RM), "light" (30–49 %1RM), "moderate" (50–69 %1RM), "vigorous" (70–84 %1RM), and "near-maximal to maximal" (≥85 %1RM). Accordingly, our results suggest that to achieve a "light" intensity, the individual should exercise to feel "very good" (+5); for a "moderate" intensity, they should exercise to feel "good" (+3) for the lower limit or "fairly good" (+1) for the upper limit (or a combination from +1 to +3); and for "vigorous" intensity, they should exercise to feel "fairly bad" (-1) (see for correspondence with the ACSM intensity zones). Therefore, using FS for RT prescription will correspond well with the ACSM intensity zones.

Table 2. Mean and SD of the percentage of %1RM self-selected for each FS condition.

	Leg Press	Knee Extensor	Chest Press	Biceps Curl
FS + 5	42.5 ± 9.5	37.4 ± 9.6	42.4 ± 11.3	39.0 ± 8.1
FS + 3	58.2 ± 7.4 ^a	54.5 ± 9.3 ^a	54.9 ± 11.4 ^a	54.0 ± 9.7 ^a
FS + 1	69.9 ± 7.0 ^{a,b}	65.3 ± 8.7 ^{a,b}	66.4 ± 12.6 ^{a,b}	68.4 ± 5.9 ^{a,b}
FS - 1	80.7 ± 5.4 ^{a,b,c}	78.2 ± 5.9 ^{a,b,c}	78.2 ± 13.5 ^{a,b,c}	83.2 ± 3.0 ^{a,b,c}

^aDifferent from FS + 5.

^bDifferent from FS + 3.

^cDifferent from FS + 1 (all $P < 0.01$).

The advantage of using the FS as a complementary method to prescribe exercise intensity is that it may facilitate the experience of a positive affective response from the exercise, and this should provide extra motivation for the individual to consider repeating their exercise experience.^[21] This is particularly important considering that the improvement of adherence rates to physical exercise programs has become a major challenge in exercise sciences. For example, Sperandei et al.^[40] assessed a sample of 5240 members of a fitness center over 9 yr and showed that 63% of them abandoned activities before the third month. This result highlights the lower adherence rate in exercise programs. In this regard, the exercise intensity prescription based on a pleasurable range ("good" to "fairly good") may be a useful strategy to improve adoption and maintenance of regular exercise behavior, particularly for sedentary individuals, improving their perceived control, modulating emotion, and inducing a more pleasant affective state during RT. Furthermore, affect-regulated RT within a pleasant range will not put the individual at risk of experiencing a potentially discouraging unpleasant affective state or a reduction in the affective state during exercise. However, the implications of regulating exercise intensity using the FS and specifically using FS + 1 and FS + 3 as the potential optimum affective target on exercise behavior and other psychological outcomes have yet to be established.

Moreover, the descriptor +5 ("very good") was associated with an intensity of ~40% 1RM, professionals could use this descriptor to prescribe exercise intensity for untrained, very deconditioned, older, or frail individuals.^[3,41] The ACSM guidelines also highlight that deconditioned individuals initiating an RT regimen can begin with a lower exercise intensity (i.e., <50% of 1RM; light to moderate intensity) to improve muscular endurance.^[3] Then after an acceptable level of muscular conditioning has been achieved (i.e., strength, endurance), these individuals can increase the resistance. It is also important to mention that when a self-selected approach (self-selection not linked to the FS) is used in RT, exercise intensity is normally below the recommended range to improve strength and hypertrophy.^[26,27,42,43] In this sense, using FS descriptors may guide individuals in a way that they will achieve higher intensities without feeling displeasure (i.e., +1 to +3).

However, we do not propose that the affective responses are the only determinant of exercise adherence. There are several other factors that contribute. For example, in their systematic review, Rhodes et al.^[22] reported that besides affective judgments, other factors, namely, education, perceived health status, self-efficacy, intentions, self-regulation behaviors, quality of life, subjective norms, and program leadership, influenced RT participation. Furthermore, Sperandei et al.^[40] showed that less than 4% of the individuals entering an exercise facility will remain after 12 months and that even those with the best profile (i.e., over 35 yr old, active, not motivated by weight loss and motivated by hypertrophy, health, and aesthetics) presented a high risk of dropping out. Thus, it would be too simple to infer that the affective responses by itself could determine adherence. Nevertheless, affect should be added to the list of factors that contribute and play an important role.

It is important to highlight that, given that this is the first study of its type, we are not proposing affect-regulated RT to substitute other types of exercise prescriptions (e.g., %1RM, RPE, and maximum repetition zone). On the contrary, it is proposed as a complementary tool to improve affective responses to exercise and likely help to increase adherence, as proposed in the last position stand of the ACSM.^[3] In this regard, longitudinal studies testing adherence in an RT program with affect-regulated intensity as well as the adaptations to this type of exercise prescription would be of great importance, especially if compared with other forms of exercise prescriptions. Moreover, the affect-regulated exercise training approach does not imply that the individuals are going to perform the exercise by themselves. In this regard, Ratamess et al.^[43] demonstrated that the supervision of a personal trainer leads to the self-selection of greater workout intensities and RPE during RT as compared with unsupervised training. The core of affect-regulated exercise training is to give the individual the opportunity to choose an intensity to meet a

specific affective response to ensure that in that session/exercise/set, he/she will take pleasure from it. It is worth noting that the attainment of results is very important to keep the individual motivated, given that exercise has also to be effective. Therefore, it is likely that an interplay exists between pleasure and fitness progress.

Some strengths of the present study include the experimental design with the familiarization and four experimental sessions for each FS condition, four exercises incorporating both multi- and single-joint exercise of upper and lower limbs, which represents a recommended training session.^[2,3] However, one limitation is that only sedentary, young, and middle-age adult men took part in the study, which limits generalizability to other groups (e.g., elderly, women, physically active, and/or athletes). In addition, we did not ask participants to report which phase of exercise execution (concentric or eccentric), or which repetitions (beginning, middle, or last), they used to guide their affective ratings. Although this may be viewed as a potential limitation, the results of the present study demonstrate that the load selected for a given FS descriptor was reliable over four sessions. This suggests that at least intrinsically individuals used the same criteria to determine their affective ratings. Future research should confirm the findings in other populations as well as perform longitudinal studies to assess the adaptations in muscle strength and hypertrophy derived from RT using the FS to guide exercise intensity.

Conclusion

In conclusion, the FS is a useful and reliable tool for self-regulating exercise intensity and could be used to prescribe RT intensity. Different FS descriptors can be used to increase/decrease RT load in a dose–response relationship and will have well-defined correspondence with the ACSM RT intensity zones.

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