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Imposed versus affect-based resistance training intensities on adherence, session affect, session perceived exertion, and intrinsic motivation measures during a six-week program in novice female lifters

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Imposed versus Affect-based Resistance Training Intensities on Adherence, Session Affect, Session Perceived Exertion, and Intrinsic Motivation Measures during a 6-Week Program in Novice Female Lifters.

by

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ABSTRACT

The American College of Sports Medicine (ACSM) recommends that individuals perform resistance training exercises at a specific intensity based on external load (percentage of one repetition maximum; %1RM). However, only 29.6% of adults in 2013 reported strength training two or more times per week. Furthermore, individuals lifting at recommended percentages vary in their pleasure and displeasure. Self-selected exercise seems to promote positive affective responses, in part, due to the perceived autonomy. The effects of regulating exercise intensity using affect as opposed to imposed intensities as a means for improved fitness, promoting exercise behavior, and enhancing other psychological outcomes have yet to be established for resistance training. The primary purpose of this study was to determine whether affect-regulated exercise intensity during a 6-week resistance training program resulted in greater adherence than a traditional percentage-based exercise intensity. Participants included college-aged females (n=15; 21.53±1.96 years) novice lifters who completed baseline measures of their eight-repetition-maximum on the chest press, shoulder press, lat-pulldown, seated cable row, leg press, leg extension, and leg curl. They were randomly split into an affect-regulated exercise intensity group (+3; “Good”) or percentage-based exercise intensity group (70% 1RM) and followed a six-week unsupervised resistance training program based off of American College of Sports Medicine’s (ACSM) guidelines. Independent sample t-tests were used to examine differences between groups for adherence, session affect, and session perceived exertion. A mixed methods ANOVA was used to examine between and within groups for the four subscales of the Intrinsic Motivation Inventory. The results of this study indicated that there was no significant differences between adherence, session affect, session perceived exertion, and intrinsic motivation

subscale scores between the two groups. The results add to and provide insight into the direction of future studies in regards to affect-regulated exercise prescription for resistance training for novice lifters.

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CHAPTER 1

Introduction

Resistance training (RT) is considered to be a part of an overall healthy lifestyle and defined as a form of exercise training primarily designed to increase skeletal muscle strength, power, endurance, and mass (Physical Activity Guidelines Advisory Committee, 2008). The American College of Sports Medicine (ACSM) recommends that individuals perform RT at a specific intensity based on external load (percentage of one repetition maximum [%1RM]; Garber et al., 2011). ACSM (2013) recommends that those who resistance train should follow these recommendations: frequency (2-3 days per week), train each major muscle group (chest, shoulders, upper/lower back, abdomen, hips, and legs) with a 48 hour separation; type (free weights, machines, and resistance bands); volume (2-4 sets for each major muscle group with 2-3 minute rest intervals); intensity (8-12 repetitions per set, between 60-70% of one-repetition maximum for novice exercisers).

Individuals who engage in RT can benefit from the following: improved bone mass, glucose tolerance, musculotendinous integrity, ability to carry out the activities of daily living, improved fat free mass, and resting metabolic rate (ACSM, 2013). Additionally, adults who participate in RT are less likely to experience loss of muscle mass, functional decline, and fall-related injuries than adults who do not strength train (Centers for Disease Control [CDC], 2006). However, only 29.6% of adults in the United States in 2013 reported strength training two or more times per week (CDC, 2015). New York was slightly above the United States average at 30.1%, with 36.2% of men and 24.6% of women resistance training (CDC, 2015). Furthermore, 44.6% of those aged 18-24 reported resistance training with each

successive age group showing decreasing participation rates in resistance training (CDC, 2015).

The low rates of resistance training may be due to the lack of psychological adherence-related factors such as perceived autonomy and affective responses experienced during the resistance training session. The American College of Sports Medicine has called for further research before guidelines can be published recommending that affective responses be taken into account in exercise prescription settings (Garber et al., 2011). Oliveira, Deslandes, and Santos (2015) reported that self-selected exercise can promote positive affective responses due to the perceived autonomy associated with it. Relative to studies of aerobic exercise, researchers (Ekkekakis, Backhouse, Gray & Lind, 2008; Ekkekakis & Petruzzello, 2000) reported that when individuals are asked to self-select their exercise intensity, an intensity that results in a positive affective response is chosen. This finding seems to be robust as noted in corroborating investigations (Lind, Joens-Matre & Ekkekakis, 2005; Parfitt, Rose & Burgess, 2006; Rose & Parfitt, 2007). The affective responses experienced during the resistance training session may also affect future exercise behavior (Williams, Dunsiger, Jennings & Marcus, 2012; Williams et al., 2008). In a meta-analysis by Oliveira et al. (2015) the researchers concluded that the difference between affective responses in imposed and self-selected sessions was dependent on the imposed intensity. Thus, it appears that when prescribing resistance training intensities, the resistance imposed plays a critical role in the individual's exercise adherence (Dishman & Buckworth, 1996). Prescribing affective responses to regulate exercise intensity in resistance training may be a viable option to promote healthy behavior and help regulate exercise intensity in all individuals. However, there is little evidence to show that individuals who affect-regulate

their intensity will be more likely to adhere to a resistance training program than those who have imposed intensities.

Statement of the Problem

Despite the numerous health benefits associated with resistance training, less than 30% of U.S. adults participates in muscle strengthening exercise (CDC, 2015). The low prevalence rates in resistance training may be due to the lack of enjoyment and perceived autonomy due to the imposed intensities during the sessions. Displeasure from exercise has been shown to result in lower adherence rates and ultimately lead to a reduced amount of physical activity (Lox, Martin, & Petruzzello, 2014). Furthermore, approximately 50-65% of persons initiating exercise programs will drop out within 3-6 months (Annesi & Unruh, 2007; Buckworth & Dishman, 2002). Thus, a better understanding of the relationship between affect-based resistance training intensity prescription may contribute to improved resistance training adherence and result in experiencing the many benefits associated with resistance training.

Purpose of the Study

The purpose of this study was to compare two methods of prescribing exercise intensity in resistance training: affect-regulated versus percentage-based. The primary aim was to determine whether affect-regulated exercise intensity, using the Feeling Scale (FS; Hardy & Rejeski, 1989), would result in greater adherence as well as adherence-related psychological factors during a six-week unsupervised resistance training program than traditionally prescribed exercise intensity in novice exercisers.

Hypotheses

1.) Affect-regulated exercise intensity group (AREI) will have significantly greater

adherence (sessions attended) compared to the percentage-based exercise intensity group (PBEI).

2.) Affect will be significantly higher in the AREI group compared to the PBEI group.

3.) Session Rating of Perceived Exertion will be significantly higher in the PBEI group compared to the AREI group.

4.) AREI group will score significantly higher on the Intrinsic Motivation Inventory (IMI) subscales for interest/enjoyment, perceived competence, and perceived choice while lower of pressure/tension at the conclusion of the six-week intervention compared with the PBEI group.

Delimitations

The following study was delimited to:

1.) The frequency of the resistance training program is limited to three days per week for six weeks.
2.) Machine-based exercises (chest press, seated cable row, lat-pulldown, seated shoulder press, leg press, leg extension, and leg curl) were selected for both the testing of the participant's eight-repetition maximum as well as the resistance training program.
3.) The resistance training program consisted of 3 sets of 8 repetitions for both groups.
4.) An eight-repetition-maximum muscular strength assessment as opposed to a one-repetition-maximum to reduce the likelihood of injury. The AREI group self-selected intensities (weights) that corresponded to a +3 anchor on the Feeling Scale. The PBEI group were given an imposed intensity of 70% of their 1RM for each exercise.
5.) The participants performed their training programs unsupervised.
6.) Each resistance training exercise bout was limited to 60 minutes by program design

and mentioning to the participants.

7.) Participants included novice exercisers that showed no contraindications to exercise as assessed with the Physical Activity Readiness Questionnaire (PAR-Q) were recruited for this study.

Limitations

The following study was limited to:

1.) Appropriate reporting of weights and execution of the workout protocol could not be justified due to the un-supervision of the participants during the six-weeks.

2.) Machine-based equipment must be adjusted depending on the individual's anatomy. Thus, the likelihood of each novice exerciser adjusting each machine appropriately could not be justified.

3.) Time of day of each participant's workouts could not be standardized due to the participants outside obligations (career, family, and etc.)

4.) ACSM recommends that individuals progress their resistance training programs with the goal of improving muscular strength. The PBEI were not be able to progressively increase their sets, reps, or weight lifted throughout the six-weeks.

Assumptions

The following assumptions were made for this study:

1.) Not all participants will adhere to the 18 sessions of the resistance training program. Thus, some participants may see more improvements that may affect motivation to adhere.

2.) Individual factors such as resistance training experience, personality, motivation and other physiological and psychological factors of each participant will influence their

choice in intensity and ultimately their adherence and muscular strength improvements.

3.) The answers to the questionnaires are honest and accurate.
4.) Participants will complete each exercise for the prescribed amount of sets and repetitions.
5.) Participants will follow the proper form demonstrated during the familiarizations sessions.
6.) Participants will not engage in any other resistance training exercises during the study.

Definition of Terms

Adherence - The maintenance of an exercise regimen for a prolonged period of time (Lox et al., 2014).

Affect - Encompasses and is distinguished by basic valence affect (i.e., good/pleasure versus bad/displeasure) and distinct affective states, such as emotions and moods, which include this basic affective component plus a cognitive appraisal process (Ekkekakis, 2013).

Feeling Scale - The Feeling Scale is an 11-point bipolar scale of pleasure and displeasure that ranges from -5 to +5. Anchors are provided at o="Neutral" and at all odd integers, ranging from -5 = "Very bad" to +5 = "Very good." (Hardy & Rejeski, 1989).

Intrinsic Motivation - The inherent tendency to seek out novelty and challenges, to extend and exercise one's capability, to explore, and to learn (Ryan & Deci, 2000).

Muscular Strength - Refers to the muscle's ability to exert force (American College of Sports Medicine, 2013).

Perceived Autonomy - An experience of an internally locused, volitional intention to act that can be measured through self-reports of an internal perceived locus of causality, high volition, and a perceived choice over one's actions (Reeve & Jang, 2006).

Ratings of Perceived Exertion - Any subjective physical strains on exercisers experienced during their workouts. Examples can include an increase in heart rate, sweating, breathing, muscle fatigue, discomfort, strain, and etc. (Robertson & Noble, 1997).

Resistance Training - Exercise training primarily designed to increase skeletal muscle strength, power, endurance, and mass (Physical Activity Guidelines Advisory Committee, 2008).

Significance of the Study

Current research has focused mainly on aerobic activity in relation to affect-regulated intensity and exercise behavior. Novice exercisers have been shown to benefit from the choice of self-selecting their exercise intensity compared with experienced exercisers in aerobic exercise. ACSM has called for further research before guidelines can be published recommending that affective responses be taken into account in exercise prescription settings (Garber et al., 2011). Rose and Parfitt (2008) suggested that research should investigate whether or not individuals can use the FS to self-regulate exercise intensity. Furthermore, the effects of regulating exercise intensity using the FS and specifically using the FS +3 (good) anchor as an appropriate marker in regards to selecting an exercise intensity on exercise behavior and other psychological outcomes have yet to be established (Rose & Parfitt, 2008).

CHAPTER 2

Review of Literature

Resistance training is a form of exercise training primarily designed to increase skeletal muscle strength, power, endurance, and mass (Physical Activity Guidelines Advisory Committee, 2008). Individuals who engage in resistance training can benefit from the following: improved bone mass, glucose tolerance, postural integrity, ability to carry out the activities of daily living, and improved fat free mass and resting metabolic rate (American College of Sports Medicine [ACSM], 2013). Additionally, adults who participate in resistance training are less likely to experience loss of muscle mass, functional decline, and fall-related injuries than adults who do not strength train (Centers for Disease Control [CDC], 2006).

The American College of Sports Medicine (ACSM) recommends that individuals perform resistance training at a specific intensity based on external load (percentage of one repetition maximum [%1RM]) (Garber et al., 2011). Additional recommendations (ACSM, 2013) include the following: frequency (2-3 days per week), train each major muscle group (chest, shoulders, upper/lower back, abdomen, hips, and legs) with a 48 hour separation; type (free weights, machines, and resistance bands); volume (2-4 sets for each major muscle group with 2-3 minute rest intervals); intensity (8-12 repetitions per set, between 60-70% of one-repetition maximum).

However, only 29.6% of adults in 2013 reported resistance training two or more times per week (CDC, 2015). Furthermore, only 25.5% of men and 17.7% of women met the physical activity guidelines for muscle strengthening and aerobic training for United States adults (Nugent, 2016). These low rates in resistance training may be due to the lack of

perceived autonomy and affective responses experienced during the session. Imposing an exercise intensity that does not allow choice has the potential to negatively affect an-individual's perceived autonomy. In turn, the enjoyment experienced during the bout of resistance exercise may result in displeasure. Self-selecting resistance training exercise intensity can be one method to give the individual a sense of perceived autonomy and possibly induce positive affective responses during resistance training.

Ratings of Perceived Exertion and Resistance Training

Borg's Ratings of Perceived Exertion (RPE) scale has been the most widely used instrument to measure exercise intensity (Chen, Fan, & Moe, 2002). The original RPE scale is a 15-point scale ranging from 6 (No exertion at all) to 20 (Maximal exertion; Borg, 1998). Perceived exertion can be thought of as any subjective physical strains on exercisers experienced during their workouts. Examples can include an increase in heart rate, sweating, breathing, muscle fatigue, discomfort, strain, and etc. (Robertson & Noble, 1997).

A newer scale: the session rating of perceived exertion (RPE) is a modification of the original RPE scale, used to measure the intensity of an entire exercise session (Sweet, Foster, McGuigan, & Brice, 2004). Session RPE has been shown reliable in its ability to quantify exercise intensity with aerobic exercises, and it may be able to quantify resistance training (Sweet et al., 2004)

In regards to self-selected versus imposed resistance training intensities, studies have concluded that subjects' do not chose a high enough intensity to elicit strength or hypertrophy (Focht, 2007; Glass & Stanton, 2004). Focht (2007) found that an imposed intensity of 75% elicited a significantly higher RPE and resistance used compared with the self-selected group in untrained college-aged women. Glass and Stanton (2004) found that

self-selected loads were all below 60% of the participant's one-repetition maximum while repetitions completed and RPE were not different between genders in college-aged male and female novice weightlifters. Studies looking at degree of supervision have demonstrated that RPE and self-selected intensities used by women during resistance exercise were significantly greater with a personal trainer (Ratamess, Faigenbaum, Hoffman, & Kang, 2008).

Most research has focused on how RPE relates to physiological measures such as heart rate, blood lactate concentration, and oxygen uptake as well as psychological measures (Chen, Fan, & Moe, 2002). And the results of these studies have provided inconsistencies. Chen et al. (2002) concluded that although the RPE scale has been shown to be a valid measure of exercise intensity, due to the inconsistencies, the validity was found not be as high as previously thought. Furthermore, although the participants in the above studies were concluded not to have chosen high enough intensities to elicit strength or hypertrophy, the self-selected intensities may be more reliable for long-term resistance training behavior.

Feeling Scale

This scale was designed for use as an in-task measure of affect and has been used in several studies to measure affect during acute bouts of exercise (Lox et al., 2014). The FS has been used as a measure of affective valence in many physical activity studies and has been shown to be related to other measures of affective valence, as well as current and past physical activity participation (Williams et al., 2008; Hardy & Rejeski, 1989). Ekkekakis and Petruzzello (2000) mentioned that the rationale for selecting the FS was to choose a simplistic, but valid, measure of affect that would allow exercisers to effectively regulate their exercise intensity (Ekkekakis & Petruzzello, 2000).

The conceptual basis for the scale was derived from three studies by Hardy and Rejeski (1989). Experiment 1 result indicated that individuals evidently use different affective responses when feeling pleasure or displeasure during exercise. Furthermore, the data provided both face and content validity for the FS: the pleasure/displeasure bipolarization of affect during exercise seems to be assessing the pleasure/displeasure core of emotions (Hardy & Rejeski, 1989). Experiment 2, subjects rated how they felt during exercise at a rate of perceived exertion of 11, 15, and 19. There was significant heterogeneity in FS for each given RPE. Also, RPE and FS ratings were only moderately correlated (r = -.56) suggesting that the two scales are not similar. Experiment 3 involved three minute bouts of exercise at 30%, 60%, and 90% $V0_2max$. Pre- and post-exercise affect was assessed as well as RPE. The results revealed that RPE and FS were again moderately related, but only at easy and hard workloads. The FS ratings showed greater variability as intensity increased, and RPE steadily had a stronger relationship to physiological cues than had the responses to the FS (Hardy & Rejeski, 1989).

According to the learning theory, more immediate responses to exercise behavior should be more predictive of future exercise behavior than affective experiences occurring after the exercise (Neef, Shade, & Miller, 1994). And individuals are more likely to seek out activities that result in pleasure and enjoyment. If that individual does not feel good during the activity, even if he or she feels better afterwards, they might be less inclined to continue the activity (Emmons & Diener, 1986).

Traditionally, intensity has been examined as a percentage of either maximal heart rate or maximal/peak aerobic capacity. And individuals exercising at the same relative workload can have very different metabolic responses (Lox et al., 2014). Ekkekakis and

Petruzzello (1999) proposed that an approach that accounts for individualized assessments of metabolic landmarks (i.e., ventilatory threshold in aerobic training) might be more accurate in the study of exercise intensity effects. Affect has been shown to consistently decrease as exercise intensity increases (Acevedo, Kraemer, Haltom, & Tryniecki, 2003; Bixby, Spalding, & Hatfield, 2001). These findings led Acevedo and colleagues to propose that affect experienced during exercise could be important for enhancing adherence to exercise programs (Williams et al., 2008; Williams, Dunsiger, Jennings, & Marcus, 2012). Additionally, in a bout of 20 minutes of aerobic exercise, Parfitt, Rose, and Burgess (2006) were able to show that the participants exercising at a level exceeding the LT resulted in more negative affective responses than exercise below the lactate threshold or at a self-selected intensity.

Aerobic Training and Affect Responses

While the modality of this study is resistance training, it is necessary to briefly review studies of aerobic exercise and affective responses as a platform for establishing the potential importance on resistance training given the relatively few studies of affective responses and resistance training. Traditionally, intensity has been examined as a percentage of either maximal heart rate or maximal/peak aerobic capacity. And individuals exercising at the same relative workload can have very different metabolic responses (Lox et al., 2014). Ekkekakis and Petruzzello (1999) proposed that an approach that accounts for individualized assessments of metabolic landmarks (i.e., ventilatory threshold in aerobic training) might be more accurate in the study of exercise intensity effects. Affect has been shown to consistently decrease as exercise intensity increases (Acevedo, Kraemer, Haltom, & Tryniecki, 2003; Bixby, Spalding, & Hatfield, 2001).

Parfitt, Rose and Burgess (2006) compared the effects of exercise above the lactate threshold (LT), below the LT, and self-selected intensity on affective valence that would influence adherence among sedentary males. Their results indicated that participants working above the LT consistently declined in their affective valence whereas the participants in the below LT condition noted improvements. It was interesting to note that in the self-selected condition, there was a consistent improvement in affective valence even though the participants exercised around the LT and at a significantly higher intensity compared with the below LT group. A follow up study by Rose and Parfitt (2007) examined sedentary women but added an at-LT condition. Results were similar to the previous study of Rose et al. (2006). The self-selected exercise intensities chosen were higher than the below LT condition, and still experienced an improvement in affective valence, suggesting that other psychological variables due to self-selecting exercise may be worthwhile to consider.

Using the Feeling Scale to self-regulate exercise intensities during aerobic training was a question Rose and Parfitt (2008) sought out. Their results revealed that when sedentary women were asked to self-select an intensity that corresponded to either fairly good (FS+1) or good (FS+3) on the FS, they chose a higher intensity in the FS1 condition over eight sessions in a laboratory setting on a treadmill. And both conditions resulted in the participants exercising close to their VT. The authors concluded that the FS can be used by sedentary women to regulate their exercise intensity to achieve a positive affective state and exercise experience (Rose & Parfitt, 2008). Later on Parfitt, Blisset, Rose and Eston (2011) measured the affective responses of FS +1 and FS +3 anchors in active females. Their results were similar and further added to the evidence that women can base their feelings off of the exercise intensity to regulate their intensity and also increase the health and fitness benefits if

maintained (Parfitt et al., 2011).

Both sedentary and active women have been shown to be able to use the FS to regulate their exercise intensity (Parfitt et al., 2011; Rose & Parfitt, 2008). Although improved fitness over the course of an intervention was not yet observed. Parfitt, Alrumh, and Rowlands (2012) went to examine if affect-regulated exercise to feel "good" leads to improved fitness over the course of an eight week training program in sedentary women. Exercise intensity was affect-regulated to feel good (FS3). Results showed that there was a significant increase in time to reach VT in the training group compared to the control group. The authors concluded that affect-regulated exercise to feel good can be used in a training program to regulate exercise intensity and improved fitness in sedentary women (Parfitt et al., 2012).

The above studies were all performed in either a lab or supervised environment. Hamlyn-Williams, Tempest, Coombs & Parfitt (2015) sought to evaluate whether sedentary women can self-regulate their exercise intensity using the FS to experience positive affective responses in a gym environment using their own choice of exercise mode; cycling or treadmill. They found that participants worked close to their VT and increased their exercise intensity during the session. The authors concluded that previously sedentary women can use the FS in a natural setting to regulate their exercise intensity and that regulating intensity to feel 'good' should lead to individuals exercising at an intensity that would result in cardiovascular gains if maintained (Williams, Tempest, Coombs & Parfitt 2015).

In a recent meta-analysis by Oliveira, Deslandes and Santos, (2015), the researchers sought to determine the amount of differences in FS responses during self-selected and imposed exercise sessions. The researchers concluded that the difference between affective

responses in self-selected and imposed exercise sessions is dependent on the intensity of the imposed exercise session (Oliveira et al., 2015).

There are a respectable amount of studies that have shown that when individuals are allowed to self-select an exercise intensity, they are likely to select an intensity that approaches, but does not go beyond the VT (Ekkekakis, Lind, & Joens-Matre, 2006; Lind, Joens-Matre, & Ekkekakis, 2005; Parfitt et al., 2006; Rose & Parfitt, 2007). Furthermore, studies have shown that when the researchers ask the participants to select an exercise intensity, the participants chose an intensity that results in a positive affective response (Ekkekakis et al., 2008; Ekkekakis & Petruzzello, 2000). And studies have shown that when individuals exercise at or above their VT, they experience a decline in affective valence (Parfitt et al., (2006); Rose & Parfitt, 2007). Therefore, individual's exercise that is self-selected seems less likely to go beyond the VT than exercise intensity prescribed by traditional methods. And thus, individuals may be less likely to decline in their affective valence and more likely to adhere to exercise (Williams, 2008).

Resistance Training and Affect Responses

Research examining affective responses to resistance training is minute in comparison to aerobic training (Lox et al., 2014). Furthermore, according to Elsangedy, Krinski, Machado, Okano and Silva (2016) to date, very few studies have examined the relationship between self-selected intensity and the recommendations of the ACSM in RT as well as the affective responses to it.

In a study by Portugal, Lattari, Santos, and Deslandes (2015), the researchers found that only the 80% 1RM imposed condition (highest imposed intensity condition) showed a reduction in affective responses compared to the control condition (no exercise) in healthy

active males during resistance training. However in a study by Benites, Alves, Ferreira, Follador and Silva (2016), the researchers found that an imposed intensity of 70% of the participants 1RM did not provide feelings of displeasure over an eight week prescribed RT program in sedentary elderly women. Both studies imposed intensity of between 70-80% are within ACSM's recommended guidelines during resistance training.

Elsangedy et al. (2016) examined the exercise intensity and psychophysiological responses to a self-selected resistance training session in sedentary males. The results revealed that the %1RM each participant chose was greater than 51% and the affective responses was between neutral and fairly good. They concluded that sedentary male subjects self-selected approximately 55% of their 1RM, which was above the intensity suggested to increase strength in sedentary individuals (Elsangedy et al., 2016).

In a study by Focht et al. (2015), the researchers found that in recreationally trained women, self-efficacy and intention to exercise was highest in the self-selected condition as opposed to the imposed intensities conditions. Although, their results suggested that self-efficacy and intention to exercise in the future did not show a relationship with the affective responses experienced by the participants. Lastly, in a study on undergraduate students on affect and anxiety, the researchers concluded that fitness professionals may want to emphasize light intensity resistance programs for novice clients to improve psychological benefits that may improve the affect compliance and adherence (Bibeau, Moore, Mitchell, Vargas-Tonsing & Bartholomew 2010).

There are a variety of populations chosen across these studies both in gender and exercise experience. In either case, both factors may influence whether the participants prefer an imposed intensity or self-selected intensity. However, most studies primarily focused on

whether or not the individuals would chose a high enough intensity to elicit strength or hypertrophy improvements, rather than future exercise behavior.

Intra-individual Factors

There are many important factors to consider in regards to an individual's motivation to perform exercise, and individual differences have been given little attention (Lox et al., 2014). The common approach to aerobic exercise has been focusing on average responses across individuals rather than focusing within the individual (Ekkekakis, 2005). Acevedo, Rinehardt and Kraemer (1994) were able to show that during running, the variability in FS ratings increased relative to the lower and moderate intensities compared with higher intensities. And this led the researchers to suggest the importance of examining individual difference factors that might influence affective responses (Acevedo et al., 1994). In 2000, Van Landuyt, Ekkekakis, and Hall echoed this idea and proposed starting at the individual and looking for responses first, then differences between individuals in regards to affective responses.

There are many different methods to enhance the perception of autonomy during resistance training for individuals. Research has shown that ability to choose one's mode of exercise is related to more positive affective response to the exercise compared to when the mode is imposed (Daley & Maynard, 2003; Parfitt & Gledhill, 2004). Allowing the individual to self-select their exercise intensity (weights chosen) would also seem to give the perception of autonomy in comparison of imposing an intensity (i.e., 70 % of their one-repetition maximum). Depending on the population, such as a competitive powerlifter, the competitor may benefit more from an imposed intensity based off of their one-repetition maximum due to their sport demands. However, in novice exercisers, if they were to be given

an imposed intensity and that intensity resulted in displeasure, they may be less likely to return to exercise.

And the affective response variability in aerobic exercise below the VT has been attributed to mostly cognitive factors (Williams, 2008). In aerobic exercise, many researchers have said that the influence of choice of exercise intensity is similar to the self-determination theory (Ekkekakis & Lind, 2006; Parfitt et al., 2006; Parfitt, Rose, & Markland, 2000; Rose & Parfitt, 2007). And the self-determination theory suggests that increased choice over an individual's behavior can lead to heightened perceptions of competence and autonomy (Deci & Ryan, 1985; Ryan & Deci, 2000). Altogether, this choice given to the participants over their behavior (exercise) leads to greater feelings of autonomy which in turn enhances behavior and increases adherence (Moller, Deci, & Ryan, 2006; Thogerson-Ntoumani & Ntoumanis, 2006; Williams, Freedman, & Deci, 1998; Williams, Grow, Freedman, Ryan, & Deci, 1996).

Based off the self-determination theory, perceived autonomy is a potential cognitive pathway that could facilitate the impact of self-selected exercise on affective response to resistance training. However, unlike aerobic training where it has been shown that cognitive factors are more dominant below an individual's VT, we are unsure at which percentage of an individual's one-repetition maximum this may be at. Furthermore, currently there is very little data that directly supports this argument, especially in regards to resistance training (Williams, 2008).

Summary

The benefits of RT and imposing exercise intensities on the individual have clearly not been enough to overcome the low rates of under 30% of the nation partaking in RT

(Centers for Disease Control [CDC], 2015). These low rates in RT may be due to the affective responses experienced during the session, lack of perceived autonomy, and intrinsic motivation experienced by the individuals. Imposing an intensity does not allow choice, and self-selected exercise can be one method to give the individual a sense of autonomy in their workouts.

Both studies by Focht (2007) and Glass and Stanton (2004) revealed that novice resistance exercisers do not self-select a sufficient intensity to induce hypertrophy or strength increases, although both studies were no longer than two sessions. Rose and Parfitt (2008) results revealed that across eight sessions, self-selected intensities increased across time to maintain the required affective state in aerobic training (Rose & Parfitt, 2008). Researchers have suggested that prescribing self-selected exercise may have significant potential for increasing adherence to exercise programs (Ekkekakis & Lind, 2006; Parfitt, Rose, & Burgess, 2006). Thus, the results shown by Focht (2007) and Glass and Stanton (2004) require further research to either support or deny their conclusions in regards to novice RT exercisers self-selecting intensities that elicit muscular strength and adherence to an RT program.

Self-selecting exercise intensities in aerobic training has been shown to promote positive affective responses due to the perceived autonomy associated with it (Oliveira, Deslandes & Santos, 2015). And the affective responses experienced during the RT session may also affect exercise adherence within the individual (Williams, Dunsiger, Jennings & Marcus, 2012; Williams et al., 2008). Thus, depending on the individual they may or may not enjoy the resistance training experience due to the imposed intensity level causing a domino effect of the lack of perceived autonomy associated with the exercise. And using affective

responses may be a feasible option to promote adherence and help regulate exercise intensity in all individuals.

CHAPTER 3

Manuscript

INTRODUCTION

Resistance training (RT) is considered to be a part of an overall healthy lifestyle and defined as a form of exercise training primarily designed to increase skeletal muscle strength, power, endurance, and mass (Physical Activity Guidelines Advisory Committee, 2008). The American College of Sports Medicine (ACSM) recommends that individuals perform RT at a specific intensity based on external load (percentage of one repetition maximum [%1RM]) (Garber et al., 2011). ACSM (2013) recommends that those who resistance train should follow these recommendations: frequency (2-3 days per week), train each major muscle group (chest, shoulders, upper/lower back, abdomen, hips, and legs) with a 48 hour separation; type (free weights, machines, and resistance bands); volume (2-4 sets for each major muscle group with 2-3 minute rest intervals); intensity (8-12 repetitions per set, between 60-70% of one-repetition maximum for novice exercisers).

Individuals who engage in RT can benefit from the following: improved bone mass, glucose tolerance, musculotendinous integrity, ability to carry out the activities of daily living, improved fat free mass, and resting metabolic rate (ACSM, 2013). Additionally, adults who participate in RT are less likely to experience loss of muscle mass, functional decline, and fall-related injuries than adults who do not strength train (Centers for Disease Control [CDC], 2006). However, only 29.6% of adults in the United States in 2013 reported strength training two or more times per week (CDC, 2015). New York was slightly above the United States average at 30.1%, with 36.2% of men and 24.6% of women resistance training.

Furthermore, 44.6% of those aged 18-24 reported resistance training and each age group above them decreased in the average amount of resistance training.

The low rates of resistance training may be due to the lack of psychological adherence-related factors such as intrinsic motivation and affective responses experienced during the resistance training session. Oliveira, Deslandes, and Santos (2015) reported that self-selected exercise can promote positive affective responses due to the perceived autonomy associated with it. Ekkekakis et al. (2008) and Ekkekakis and Petruzzello (2000) reported that in aerobic exercise, when individuals are asked to self-select their exercise intensity, an intensity that results in a positive affective response is chosen. The affective responses experienced during the resistance training session may also affect future exercise behavior (Williams, Dunsiger, Jennings & Marcus, 2012; Williams et al., 2008). In a meta-analysis by Oliveira et al. (2015) the researchers concluded that the difference between affective responses in imposed and self-selected sessions was dependent on the imposed intensity (Oliveira et al., 2015). Thus, the exercise prescription method plays a valuable role in the individual's exercise adherence (Dishman & Buckworth, 1996). Prescribing affective responses to regulate exercise intensity in resistance training may be a viable option to promote healthy behavior and help regulate exercise intensity in all individuals.

The benefits and imposed intensities of resistance training have not been enough in getting individuals to adhere to a resistance training program due to the low rates of less than 30% of the nation partaking in resistance training (Centers for Disease Control [CDC], 2015). The low rates in training may be due to the lack of perceived autonomy and affective responses experienced during the session. And an alternative method is to account for these variables by allowing individuals to self-select their intensities through affect during the

resistance training session. ACSM has called for further research before guidelines can be published recommending that affective responses be taken into account in exercise prescription settings (Garber et al., 2011).

This study involved four hypotheses: a) affect-regulated exercise intensity group (AREI) will have significantly greater adherence (sessions attended) compared to the percentage-based exercise intensity group (PBEI); b) affect will be significantly higher in the AREI group compared to the PBEI group; c) session perceived exertion will be significantly higher in the PBEI group compared to the AREI group and; d) AREI group will score significantly higher on the Intrinsic Motivation Inventory (IMI) subscales for interest/enjoyment, perceived competence, and perceived choice while lower of pressure/tension at the conclusion of the six-week intervention compared with the PBEI group.

Research has shown that when individuals are asked to self-select their exercise intensity during aerobic exercise, they chose an intensity that results in a positive affective response (Ekkekakis, Backhouse, Gray & Lind, 2008; Ekkekakis & Petruzzello, 2000). Thus, one method to overcome this problem is to allow individuals to self-regulate their exercise to an intensity that they prefer (Lind, Joens-Matre & Ekkekakis, 2005; Parfitt, Rose & Burgess, 2006; Rose & Parfitt, 2007). The purpose of this study was to determine whether affect-regulated exercise intensity, using the Feeling Scale (FS; Hardy & Rejeski, 1989), would result in greater adherence as well as adherence-related psychological factors during a six-week unsupervised resistance training program than traditionally prescribed exercise intensity in novice exercisers. However, there is little evidence to show that individuals who affect-regulate their intensity will be more likely to adhere to a resistance training program

than those who have imposed intensities.

METHODS

Participants

Participants included novice college-aged females from the State University of New York at Cortland. A total of 24 participants (males; n=3; females; n=21) were recruited by means of email, flyers, and word of mouth. Only participants that met the inclusion criteria participated in this study. Criteria for inclusion in the study were (a) considered novice exercisers to resistance training (self-reported no more than 2-3 days per week of consecutive resistance training within the last six months) and (b) currently were taking no medications that would influence cognitive or physiological function (self-reporting taking no medications). Participants were excluded if they (a) responded positively on the Physical Activity Readiness Questionnaire (PAR-Q) (b) planned on resistance training with an outside source (personal trainer, club team, etc.) during the six-week intervention. Descriptive statistics for Group 1 (PBEI) and Group 2 (AREI) participants are presented in Table 1.

Each participant received a verbal description of the study and provided informed consent prior to participating. The study received approval from the college's institutional review board.

Demographic Profile and Informed Consent

Informed consent (Appendix B) was distributed and signed prior to the start of the study. Participants were notified that they can withdraw from the study at any point. The informed consent also contained information regarding the purpose of the study, the expected length of the study, risks and benefits, IRB approval information, and contact information for the researcher.

Physical Activity Readiness Questionnaire (PAR-Q) (Appendix C) was distributed and signed prior to the start of the study. If any participant answered yes to any of the questions, they were excluded from the study indicating that they needed to check with their physician before participating in physical activity.

Table 1

Descriptive Statistics for Participant Characteristics (n = 15)

	PBEI		AREI	
Variable	*M*	*SD*	*M*	*SD*
Age (y)	21.14	1.46	21.88	2.36
Height (cm)	162.92	6.46	160.66	7.65
Weight (kg)	75.12	17.39	64.14	10.02
BMI (kg/m^2)	28.13	1.94	24.81	2.99

Note. n=number of participants. M= mean. SD=standard deviation. BMI=body mass index.

Psychological Measures

Feeling Scale

Affective responses were assessed using the Feeling Scale (FS; Hardy & Rejeski, 1989). The FS (Appendix E) is a single-item, 11-point measure of affective valence (pleasure/displeasure) ranging from +5 to -5, with verbal anchors at all odd integers and at the zero point (+5 = very good, +3 = good, +1 = fairly good, 0 = neutral, -1 = fairly bad, -3 = bad, -5 = very bad. All participants read standardized instructions to insure they understood the nature and response options of the scale. The researcher clearly stated that he wanted the participants to choose intensity (weights) that corresponds to the FS anchor +3 ‘feels good’.

This scale was used for the participants in the affect-regulated exercise intensity group to regulate their exercise intensity during the workouts.

Intrinsic Motivation Inventory

The Intrinsic Motivation Inventory (IMI; Ryan, 1982) is a multidimensional measurement device intended to assess participants subjective experience related to a target activity in laboratory experiments. This study used a 22 item version of the scale (Appendix F) to assess participants interest/enjoyment, perceived competence, perceived choice, and pressure/tension while performing the resistance training program, yielding four subscale scores. It was given to the participants immediately after week 1 of the six-week intervention and again after the conclusion of the six-week intervention.

Perceived Exertion

Effort sense (Appendix G) was measured using the Rating of Perceived Exertion scale (RPE; Borg, 1983). The scale provided a measure of whole-body rating of perceived exertion immediately after each exercise session (Foster et al., 2001). The RPE scale is a 10-point category scale ranging from 0 (No exertion at all) to 10 (Maximal exertion). All participants read standardized instructions to insure they understood the nature and response options of the scale.

Physical Measures

Muscular Strength Repetition Maximum Testing

Muscular strength (Appendix H) was tested using the American College of Sports Medicine (2013) "Guidelines for Exercise Testing." Participants were asked to perform sets of eight repetitions and encouraged to progress their weight each set until they (a) could not physically perform more than eight-repetitions following the standardized conditions or (b)

verbally told the researcher that they did not think they could do anymore. Reynolds, Gordon, and Robergs (2006) have demonstrated that multiple repetition tests in the 4- to 8-RM range provide a reasonably accurate estimate of 1-RM.

ACSM's guidelines consisted of the following: a warm-up consisting of five minutes of light intensity aerobic exercise on the treadmill (Precor, TRM 811/835/885) followed by specific light intensity repetitions (eight) of the testing exercises. Standardized conditions were set (strict posture, consistent repetition duration, full range of motion, and at least one spotter). The exercises were all machine-based and performed in the following order with a maximum of ten minute rest breaks after completion of each exercise: Hoist Roc-it Selecterized Seated Chest Press, Hoist Roc-It Selecterized Seated Leg Press, Precor Long Pull 302 Seated Cable Row, Precor Selecterized Seated Leg Extension, Hoist Roc-It Selecterized Seated Lat-Pulldown, Precor Selecterized Seated Leg Curl, and Hoist Roc-It Selecterized Seated Shoulder Press. Testing was performed during week one, day two and only for the percentage-based exercise intensity group, which was determined by randomly selecting half of the participants. The participant's eight-repetition maximums were then inputted in ExRX.net online repetition-maximum calculator to predict each participant in the PBEI group's one-repetition maximum for each exercise. Then 70% of their predicted one-repetition maximum for each exercise was used for their six-week intervention. The formula was as follows: Take participants 8RM, divide by .80 to get their predicted 1RM and multiply by .70 to get their imposed intensity of 70% of their 1RM.

Anthropometric Measures

Height (Appendix D) was taken using a standard stadiometer (Detecto, Webb City, MO). Participants were measured without shoes and standing straightforward. A measuring

platform was raised over the participant's head and they were instructed to take a deep breath and step forward away from the stadiometer. Height was recorded to the nearest tenth of a centimeter (cm).

Weight (Appendix D) was measured using a Tanita digital scale (BF522W Body Fat / Body Water Analyzer). Participants were instructed to stand on the scale without shoes but with athletic clothing. Weight was recorded to the nearest tenth of a kilogram (kg).

The participants body mass index (BMI) (Appendix D) was calculated using ACSM's guidelines (body weight in kilograms divided by height in meters squared) and taken both before and after the six-week training protocol.

Experimental Approach to the Problem

Pre-Testing

Only participants randomly selected into the PBEI group were required to go through pre muscular strength assessments. The protocol followed ACSM's (2013) muscular strength testing guidelines. Two days were used during week one of the baseline data collection. Day one consisted of the following: Anthropometric measures (height, weight, and body mass index) taken; familiarization and testing procedures of the exercises to be tested on the participant's eight-repetition maximum. Day two consisted of the actual eight-repetition maximum testing. The participants were asked to complete a warm-up consisting of 5 minutes of light intensity aerobic exercise on the treadmill followed by specific light intensity repetitions (eight) of the testing exercises. Standardized conditions were set (strict posture, consistent repetition duration, full range of motion, and one spotter).

The exercises were all machine-based and performed in the following order with a maximum of ten minute rest breaks after completion of each exercise: seated chest press, leg

press, seated cable row, seated leg extension, seated lat-pulldown, seated leg curl, and seated shoulder press.

Resistance Training Exercise Prescription

Both groups followed a near identical training protocol (Appendix I). Participants in the PBEI group were given an imposed intensity at 70% of their eight-repetition maximum for each exercise set to be completed. Participants in the AREI group were asked to choose a weight that "feels good", representing the FS +3 anchor for each set of each exercise. The training protocol was based off of ACSM's (2013) exercise prescription guidelines for RT. Except for the exercise intensity prescription, both groups were asked to follow the following guidelines: three days per week for six weeks with at least 48 hours of separation between each exercise session; three sets of eight repetitions for each exercise (seated chest press, seated leg press, seated cable row, seated leg extension, seated lat-pulldown, seated leg curl, and seated shoulder press); and a maximum of two minute rest intervals between sets. Please see Appendix I for the three day RT program. The protocol for reporting weights, using the FS, and executing the training program were gone over on both days of the first week of baselines measurements and testing. Participants in both groups were also be asked to complete the Intrinsic Motivation Inventory upon completion of the first week of the RT program. Each participant were told that they were allowed to ask any questions during the six-week intervention pertaining to performing the exercises and following the program properly. Attendance was checked weekly through the researcher checking each participant's packets as well as attendance through the universities membership software.

Post-Testing

The participant's resistance training program data packets were collected by the

researcher upon the final day of the intervention. The anthropometric tests from pre-testing were replicated for post-testing. Additionally, the participants were asked to complete the Intrinsic Motivation Inventory (IMI). Following the conclusion of all testing, the researcher announced that he would email the subjects the results of the research (if preferred) and all were thanked for their time and cooperation.

Statistical Analysis

Descriptive statistics (means ± standard deviation) were calculated for adherence, session affect, session perceived exertion, and the four subscales of intrinsic motivation (interest/enjoyment, perceived competence, perceived choice, and pressure/tension). An independent-samples *t*-test was run to analyze differences post-training between groups for session affect, session perceived exertion, and adherence. A 2 x 2 mixed methods ANOVA was run to analyze differences between and within-groups from pre-to-post training for the four subscales of intrinsic motivation. Significance for all statistical analyses were set at $\alpha \leq 0.05$. Data was analyzed using SPSS Statistical Software (version 23.0; SPSS Inc., Chicago, IL).

RESULTS

A total of 15 out of 24 possible participants were analyzed: three participants being excluded due to injury (non-related to the intervention); one participant being non-responsive to the questionnaires and non-compliant with appropriately filling out the data collection packet; three participants being extreme outliers for age; and two participants being extreme outliers as males. Participants that were injured were excluded because they were unable to perform the exercises in the workout. There were no significant differences between group demographics ($t(13) = -.709$, $p = .491$), ($t(13) = .615$, $p = .549$), ($t(13) = 1.525$, $p = .151$),

($t(13) = 1.557$, $p = .143$), for age, height, weight, and BMI, respectively.

During the intervention the chest press machine became out of order for about one-week. The researcher emailed out to all participants asking to skip that exercise until available again. Although after looking through participants packets, some skipped the exercise while others used a different chest press machine. Data were still entered into the statistical analysis portion of the study since this is a realistic consequence of resistance training programs.

Exercise Adherence

An independent-samples *t*-test was calculated comparing the mean score of exercise adherence of the PBEI participants to the mean score of the AREI participants. No significant difference was found ($t(13) = 1.069$, $p = .304$). Group descriptive statistics for adherence are presented in Table 2.

Session Affect

An independent-samples *t*-test was calculated comparing the mean score of session affect of the PBEI participants to the mean score of the AREI participants. No significant difference was found ($t(13) = .277$, $p = .786$). Group descriptive statistics for session affect are presented in Table 2.

Session Rating of Perceived Exertion

An independent-samples *t*-test was calculated comparing the mean score of session perceived exertion of the PBEI participants to the mean score of the AREI participants. No significant difference was found ($t(13) = 1.22$, $p = .244$). However, session RPE was slightly lower in AREI. Group descriptive statistics for session perceived exertion are presented in Table 2.

Intrinsic Motivation Inventory

PBEI and AREI descriptive statistics for each subscale of the IMI from pre- to post-program are presented in Table 3. PBEI and AREI descriptive statistics for each subscale of the IMI between group scores are presented in Table 4.

Subscale: Interest and Enjoyment

A 2 x 2 between-subjects factorial ANOVA was calculated comparing the interest and enjoyment scores for participants from pre to post intervention within each groups and between the AREI and PBEI groups. The main effect for interest and enjoyment from pre to post intervention within groups was not significant ($F(1,13) = 1.00$, $p > .05$). The main effect for interest and enjoyment between groups was also not significant ($F(1,13) = .04$, $p > .05$). Finally, the interaction was not significant ($F(1,13) = 1.671$, $p > .05$). Thus, it appears that neither pre to post intervention within groups or between groups has any significant effect on interest and enjoyment.

Subscale: Perceived Competence

A 2 x 2 between-subjects factorial ANOVA was calculated comparing the perceived competence scores for participants from pre to post intervention within their groups and between the AREI and PBEI groups. The main effect for perceived competence from pre to post intervention within groups was not significant ($F(1,13) = 2.01$, $p > .05$). The main effect for perceived competence between groups was also not significant ($F(1,13) = 2.25$, $p > .05$). Finally, the interaction was not significant ($F(1,13) = .308$, $p > .05$). Thus, it appears that neither pre to post intervention within groups or between groups has any significant effect on perceived competence.

Subscale: Perceived Choice

A 2 x 2 between-subjects factorial ANOVA was calculated comparing the perceived choice scores for participants from pre to post intervention within their groups and between the AREI and PBEI groups. The main effect for perceived choice from pre to post intervention within groups was not significant ($F(1,13) = .265$, $p > .05$). The main effect for perceived choice between groups was also not significant ($F(1,13) = .44$, $p > .05$). Finally, the interaction was not significant ($F(1,13) = 2.651$, $p > .05$). Thus, it appears that neither pre to post intervention within groups or between groups has any significant effect on perceived choice.

Subscale: Pressure and Tension

A 2 x 2 between-subjects factorial ANOVA was calculated comparing pressure and tension scores for participants from pre to post intervention within their groups and between the AREI and PBEI groups. The main effect for pressure and tension from pre to post intervention within groups was not significant ($F(1,13) = 1.21$, $p > .05$). The main effect for pressure and tension between groups was not significant ($F(1,13) = 1.70$, $p > .05$). Finally, the interaction was not significant ($F(1,13) = 4.236$, $p > .05$). Thus, it appears that neither pre to post intervention within groups or between groups has any significant effect on pressure and tension.

Total Weight Lifted

A comparison of total weighted lifted for each exercise between groups is presented in Table 5. On average, the PBEI group seemed to lift more weight during each exercise than the AREI group.

Table 2

Descriptive Statistics for Adherence, Session Affect, and Session Ratings of Perceived Exertion Between Groups (n = 15)

	PBEI					AREI		
Variable	*M*	*SD*	*R*	95% *CI*	*p*	*M*	*SD*	*R*
Adherence	11.43	4.89	6-18	[-2.86, 8.47]	.304	8.63	5.21	3-16
Session Affect	3.52	1.32	0-+5	[-0.98, 1.27]	.786	3.38	0.62	0-+5
Session RPE	4.95	1.74	1.5-9.5	[-0.71, 2.55]	.244	4.03	1.16	2-7

Note. n=number of participants. M= mean. SD=standard deviation. R= Range. CI= confidence interval. *p*=level of significance RPE=ratings of perceived exertion

Table 3

Descriptive Statistics of PBEI and PBEI Group Pre to Post Scores for Each Intrinsic Motivation Subscales (n = 15)

	Pre				Post	
Subscale	*M*	*SD*	*t* (13)	*p*	*M*	*SD*
Interest/Enjoyment	5.03	.902	1.00	.335	5.29	1.16
Perceived Competence	4.26	.759	2.01	.180	4.37	1.23
Perceived Choice	5.81	.987	.265	.616	5.28	1.29
Pressure/Tension	3.03	.83	1.21	.291	2.56	.79

Note. n=number of participants. M= mean. SD=standard deviation. T= test statistic. *p*=level of significance.

Table 4

Descriptive Statistics of Between Group Post-Intervention Scores for Each Intrinsic Motivation Subscales (n = 15)

	PBEI				AREI	
Subscale	*M*	*SD*	*t* (13)	*p*	*M*	*SD*
Interest/Enjoyment	5.45	.94	.04	.84	5.14	1.36
Perceived Competence	4.91	1.04	2.25	.16	3.90	1.24
Perceived Choice	5.37	.84	.44	.52	5.20	1.66
Pressure/Tension	2.66	.89	1.70	.21	2.48	.73

Note. n=number of participants. M= mean. SD=standard deviation. T= test statistic. *p* =level of significance.

Table 5

Descriptive Statistics for Total Weight Lifted for each Exercise Between Groups in Pounds (n = 15)

	PBEI	AREI
Exercise	*M*	*M*
Chest Press	825	788
Shoulder Press	1920	1183
Seated Cable Row	1260	1205
Lat Pulldown	1380	1075
Leg Press	4965	3320
Leg Extension	1965	1690
Leg Curl	2280	1980

Note. n=number of participants. M= mean.

DISCUSSION

To the best of our knowledge, this is the first study to compare the two intensity prescription methods in resistance training (affect-regulated and percentage-based) in novice college-aged female resistance training participants while measuring adherence-related psychological factors.

ACSM has called for further research before guidelines can be published recommending that affective responses be taken into account in exercise prescription settings (Garber et al., 2011). From a theoretical perspective, we can form questions and hypotheses on how to design interventions that will help novice exercisers adhere to a resistance training program by taking into account how to enhance positive affective responses, facilitate autonomy, and ultimately prescribe the closest beneficial dosage of exercise prescription variables on the individual's level. From a practical perspective, designing interventions that allow novice resistance training exercisers to choose their intensity that will result in a positive affective response can improve the likelihood of them adhering to resistance training.

Adherence

Hypothesis one sought to determine whether the AREI group will have significantly greater adherence (sessions attended) compared to the PBEI group. No statistically significant differences were found between the two groups. Even more, the PBEI group actually had a greater mean sessions attended than the AREI group. This data is inconsistent with theoretical predictions. In theory, prescribing an exercise intensity that "feels good" by allowing participants to self-select that intensity would result in greater positive affective responses, a greater perception of autonomy and thus more sessions attended compared to

imposing an exercise intensity.

Focht et al. (2015) research found that in recreationally trained college-aged females, self-selecting their exercise intensity resulted in significantly greater intention to resistance train in the future compared to the imposed exercise intensity group. One possible reason that our findings were inconsistent with past literature and theoretical predictions could be the lack of experience in resistance training from our participants. Novice female lifters may seek stricter guidelines at first, such as an imposed intensity to improve their competence before allowing them to self-select an intensity that they are unfamiliar and incompetent with at the beginning of a resistance training program.

Affect

Hypothesis two sought to determine whether session affect will be significantly higher in the AREI group compared to the PBEI group. Our results indicated that session affect was higher in the PBEI group, however there were no statistically significant differences found. Our findings are inconsistent with theoretical predictions. In theory, prescribing an exercise intensity that "feels good" should result in greater affective responses due to the perceived autonomy associated with it compared to imposing an exercise intensity. However, consistent with ACSM's (2013) exercise prescription guidelines for novice exercisers, which state recommending 70-80% imposed intensity, seems to not produce feelings of displeasure and apparently can result in greater affective responses than allowing novice female participants to self-select. Furthermore, Benites et al. (2016) found that an imposed intensity of 70% of their participants 1RM did not provide feelings of displeasure over an eight week prescribed RT program in sedentary elderly women. These findings may seem to be in-line with ours in that the imposed intensity of 70% within the PBEI group may

not have been high enough to elicit feelings of displeasure and thus show any meaningful significant differences between the groups. Thus, prescribing an imposed intensity of 70% may also be an ideal percentage for novice resistance training exercisers.

Williams et al. (2012; 2008) stated that affective responses experienced during the resistance training session may affect future exercise behavior. In our study, on average, both groups overall session affect corresponded to a +3 anchor "feels good" on the Feeling Scale. This may indicate that both exercise intensity prescription methods could have a positive outcome on resistance exercise maintenance. And the goal of most exercise prescription programs should be to help the individual stick with their routines.

Perceived Exertion

Hypothesis three sought to determine whether session perceived exertion would be significantly higher in the PBEI group compared to the AREI group. Although the mean scores were slightly lower in the AREI group, there were no statistically significant differences between the groups. In theory, perceived exertion would seem to be significantly greater in an imposed versus self-selected group.

Focht (2007) found that an imposed intensity of 75% elicited a significantly higher RPE and resistance used compared with the self-selected group in untrained college-aged women. In our study, session RPE scores were only slightly higher in the PBEI group compared with the AREI group. The non-significant findings may have been due to our 70% imposed intensity prescription being on the lower end of recommended intensities for novice resistance training exercisers recommended by ACSM's guidelines. Also supporting that 70% imposed intensity for novice resistance training exercisers can be an ideal percentage.

Intrinsic Motivation Subscales

Lastly, hypothesis four sought to determine whether the AREI group would score significantly higher on the IMI subscales (interest/enjoyment, perceived competence, perceived choice) and lower on the pressure/tension subscale at the conclusion of the six-week intervention compared with the PBEI group. The results between groups for interest/enjoyment, perceived competence, and perceived choice subscales were all slightly greater in the PBEI group, while the pressure/tension subscale was slightly lower in the AREI. All findings were statistically non-significant.

The self-determination theory suggests that increased choice over an individual's behavior can lead to heightened perceptions of competence and autonomy (Deci & Ryan, 1985; Ryan & Deci, 2000). And altogether, this choice given to the participants over their behavior (exercise) leads to greater feelings of autonomy which in turn enhances behavior and increases adherence (Moller, Deci, & Ryan, 2006; Thogerson-Ntoumani & Ntoumanis, 2006; Williams, Freedman, & Deci, 1998; Williams, Grow, Freedman, Ryan, & Deci, 1996). Thus, facilitating one's intrinsic motivation by allowing choice should improve their intrinsic motivation, however our findings are inconsistent with these theoretical predictions.

Although the pressure/tension subscale was lower within the AREI group. In our study, the imposed intensity group resulted in slightly greater affective responses and perceived choice. Perceived competence was also greater in the PBEI group. The greater score in perceived competence may have affected the participant's affective responses and thus resulting in more sessions attended in the PBEI group compared to the AREI group. Thus, perceived competence may want to be considered first when suggesting self-selection prescription methods. For example, if a novice exerciser feels competent in choosing their intensity, allow them to. If they do not feel competent, suggest an imposed intensity for them.

Our theoretical knowledge of how the factors underlying affective responses to exercise has advanced from this study in the following way. The non-significant results of this study may best indicate that affective responses experienced from exercise prescription depends on the individual. Both groups consisted of novice college-aged female exercisers and there were no significant differences in adherence, session affect, session perceived exertion, and subscale scores on intrinsic motivation. In short, there is no "one size fits all" for exercise prescription and the population targeted. However, perceived competence was higher within the PBEI group which may have affected affective responses and thus sessions attended. If a novice exerciser is incompetent due to their lack of experience, they may wish to have an imposed intensity at first. Once they feel more competent, they may then wish to self-select their own intensities which may improve adherence rates.

There are many practical applications professionals can take into consideration. First and most importantly, those who prescribe exercise may want to consider best practices for adherence to an exercise program. Individuals usually do not continue to do activities that are unpleasant to them. By educating individuals on how to use the FS to regulate their exercise intensity, recommending them to select weights that 'feel good' should help them to stick with their routine. Furthermore, asking the individual if they prefer to be prescribed an imposed intensity to "take the guess work" out may be beneficial as seen in our study. The exercise prescription style will vary within the same population depending on the individual. However, FS is a very easy prescription method to use, especially for novice exercisers.

Second, allowing choice within exercise prescription can also lead to greater affective responses and future exercise participation. Allowing individuals to self-select their weights while recommending they choose weights that 'feel good' could both improve positive

affective responses and future exercise participation. On the other hand, some individuals may require or even desire less freedom in exercise programs, for example a competitive powerlifter that needs to base their program off of exact intensities to elicit the greatest muscular strength improvements. Although in novice exercisers the main goal is to help them start and stick to an exercise program.

Novice exercisers will usually see results in strength, especially if they have not resistance trained in the past. Focusing on this one variable, as many studies have, may not be as beneficial for a beginner exerciser. Rather, focusing on how the professional can best make the exercise prescription enjoyable can encourage maintenance of the exercise program. Also, there are other ways of allowing choice within exercise prescription such as allowing choices within the FITT principles (frequency, intensity, time, and type). The more choices a coach can provide an individual under proper conditions specific to the individual's goal, the greater likelihood for adherence to an exercise program.

Limitations

There are a couple of limitations to this study that need to be addressed. First, the sample size was relatively small (n = 15). Also, the majority of this population were undergraduate students participating in a 3x/week resistance training study beginning on the second half of the semester close to final exams and graduation which may have affected their results. And from analyzing the data, the majority sessions missed were closest to the final week of classes.

Second, from analyzing the data a couple of participants seemed to unintentionally misuse the RPE and FS instruments. Two participants indicated on the RPE data entry sheet wrote in a "+ or –"sign, which was not indicated in the directions. And one participant

entered a number value higher than 5 on the FS data entry sheet, which only goes as high as 5.

Third, about three weeks into the intervention, the chest press machine went out of order for about 1-week. Participants noted this in their packets and skipped the exercise. This could have affected their session affect scores for that workout along with their session RPE scores. Although this was unpredictable, future studies may want to consider mentioning that if this were to happen what the participant's protocol would be.

Lastly, since this was an unsupervised resistance training intervention, participants may not have attended their sessions due to the low level of support and competence in performing the program effectively. Realistically, social support is something human-beings naturally seek out for the most part. This study encouraged participants to limit working out with a friend.

Future Research Recommendations

Intra-individual variability among participants along with individual differences between participants has been given very little attention to within resistance training studies; especially in regards to adherence of a RT program. Individuals respond differently to exercise prescription and at difference time points. The more research we can conduct to show what type of populations respond best to the type of exercise prescription for resistance training (for example, imposed versus affect-regulated), the more likely we can decrease the high exercise dropout rates and increase resistance training participation. Furthermore, the more psychological measurements such as screening for personality types, the greater likelihood we may be able to prescribe the right exercise prescription for that individual.

One way to do so is to compare two different exercise prescription methods while

measuring psychological adherence-related factors such as affective responses, perceived autonomy, perceived competence, relatedness, and personality. Especially in the populations that need the most attention; novice exercisers, females, and overweight individuals.

Future research may also want to consider measuring social support and personality type within the context of future exercise behavior. Social support can give the individual a sense of community and accountability to stick with their routines. Although some people may not desire this, for example some introverts. Taking into account an individual's personality type and how they respond to social support in regards to adherence may be another measure for future research.

This study asked novice exercisers to exercise three days per week. Most novice exercisers have either never resistance trained or have been very inconsistent. Three days per week can be a lot to ask for going from not working out at all. Future research may want to consider less frequency (1-2x per week) or even separate groups into various frequency and look for differences among them.

Lastly, a more longitudinal study (for example 6 months or greater) could give greater significance to the adherence variable. This study lasted 6-weeks in duration, ending on a busy time frame for the students to begin studying for their finals. A more longitudinal study could help show more realistic effects of this type of exercise prescription method and a three or six month follow up may make conclusions stronger.

Conclusion

The results of this study did not show any statistically significant differences between the groups for adherence, session affect, session RPE, and the four subscales of the IMI during the six-week unsupervised resistance training program in novice exercisers. Life gets

in the way and novice exercisers would seem to be the first to discontinue exercise when obstacles do arise.

ACSM has called for further research before guidelines can be published recommending that affective responses be taken into account in exercise prescription settings (Garber et al., 2011). This study has added to this minute body of knowledge and we hope that future researchers expand on measuring the psychological adherence-related factors to resistance training to improve the dropout rates and help individual's adherence to resistance training exercise

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APPENDIX A: Institutional Review Board Approval Letter

MEMORANDUM

SUNY Cortland
Institutional Review Board

To: Ryan Brennan
Erik Lind

From: Peter McGinnis, Reviewer *on behalf of*
Institutional Review Board

Date: 2/28/2017

RE: Institutional Review Board Approval

In accordance with SUNY Cortland's procedures for human research participant protections, the protocol referenced below has been approved for a period of one year:

Title of the study:	Psychological Responses to Resistance Training Intensities during a Six Week Intervention		
Level of review:	Expedited	Protocol number:	161735
Project start date:	Upon IRB approval	Approval expiration date*:	2/27/2018

* Note: *Please include the protocol expiration date to the bottom of your consent form and recruitment materials.*
For more information about continuation policies and procedures, visit
www.cortland.edu/irb/Applications/continuations.html

The federal Office for Research Protections (OHRP) emphasizes that investigators play a crucial role in protecting the rights and welfare of human subjects and are responsible for carrying out sound ethical research consistent with research plans approved by an IRB. Along with meeting the specific requirements of a particular research study, investigators are responsible for ongoing requirements in the conduct of approved research that include, in summary:

- obtaining and documenting informed consent from the participants and/or from a legally authorized representative prior to the individuals' participation in the research, unless these requirements have been waived by the IRB;
- obtaining prior approval from the IRB for any modifications of (or additions to) the previously approved research; this includes modifications to advertisements and other recruitment materials, changes to the informed consent or child assent, the study design and procedures, addition of research staff or student assistants, etc. (except those alterations necessary to eliminate apparent immediate hazards to subjects, which are then to be reported by email to irb@cortland.edu within three days);
- providing to the IRB prompt reports of any unanticipated problems involving risks to subjects or others;
- following the principles outlined in the Belmont Report, OHRP Policies and Procedures (Title 45, Part 46, Protection of Human Subjects), the SUNY Cortland College Handbook, and SUNY Cortland's IRB Policies and Procedures Manual;
- notifying the IRB of continued research under the approved protocol to keep the records active; and,
- maintaining records as required by the HHS regulations and NYS State law, for at least three years after completion of the study.

Miller Building, Room 402 • P.O. Box 2000 • Cortland, NY 13045-0900
Phone: (607) 753-2511 • Fax: (607) 753-5590

In the event that questions or concerns arise about research at SUNY Cortland, please contact the IRB by email irb@cortland.edu or by telephone at (607)753-2511. You may also contact a member of the IRB who possesses expertise in your discipline or methodology, visit http://www.cortland.edu/irb/members.html to obtain a current list of IRB members.

Sincerely,

Peter McGinnis, Reviewer *on behalf of*
Institutional Review Board
SUNY Cortland

APPENDIX B: Informed Consent

TITLE: Psychological Responses to Resistance Training Intensities during a Six Week Intervention.

STUDENT INVESTIGATOR: Ryan Brennan, (585) 750-6831

FACULTY SUPERVISOR: Erik Lind, PhD., Associate Professor, Kinesiology Department, SUNY-Cortland

You have been asked to participate in a research study being conducted by Ryan Brennan of the Kinesiology Department at SUNY Cortland. Ryan requests your informed consent to be a participant in the project described below. Please feel free to ask about the project, its procedures, or objectives.

PURPOSE: The purpose of this study is to compare psychological responses to two methods of exercise intensity prescription in resistance training over the course of six weeks of resistance training.

PROCEDURES: The duration of this study is 8 weeks. All activities involved in the study will occur in the SUNY Cortland Student Life Center. During Week 1, you will participate in two sessions. Each session will take approximately 1-2 hours. Each session will be separated by 24-48 hours. The first session, your height and weight will be measured and you will be familiarized with the muscular strength testing protocol and the six-week unsupervised resistance training program. During the second session your muscular strength will be tested and you will again be familiarized with the six-week unsupervised resistance training program. The following week (Week 2) you will begin the six-week unsupervised resistance training program which includes three training sessions per week. After the third training session of Week 2 is completed, you will fill out a psychological questionnaire, the Intrinsic Motivation Inventory. During the week after the six-week resistance training program is completed, Week 8, you will report for a final session to have your weight measured and to fill out the Intrinsic Motivation Inventory again. All resistance training exercises will be unsupervised during the six-week program. However, the researcher will check in periodically to answer any questions you may have during the six-week period.

RISKS: The proper precautions will be to taken to ensure that the testing area, as well as all of the equipment being used, is safe for all participants involved in the study. The primary risk associated with this study is muscle soreness that could be experienced during resistance training. The risk of injury in this study is minimal. However, to minimize the risk of discomfort or muscle soreness, sessions will be scheduled with 48-72 hours in between to allow for recovery.

BENEFITS: You will learn how to properly perform machine-based exercises and may become more competent and confident as a resistance training exerciser. You may also experience health benefits from muscle strengthening exercises. The results of this study may show that a non-traditional prescription practice for resistance training may be more likely to cause novice exercisers to adhere to their resistance training program than a traditional

prescription practice for resistance training. This may help in intervention campaigns to help others increase physical activity levels.

LENGTH of PARTICIPATION: The duration of the study is 8 weeks: 1 week of pre-testing and education (2 sessions), 6 weeks of resistance training (3 sessions per week), and 1 week of post-testing (1 session). The 6 weeks of resistance training consist of 18 - 30 to 60 minute exercise sessions over the six-week period with 48-72 hours in between sessions. The two pretesting sessions in the first week of the study will be 1-2 hours each and the post testing session in week eight will be 1-2 hours. The total time commitment for the study will be approximately 22 hours.

CONFIDENTIALITY: Your responses will only be identified by a 3 digit code. You will be provided with a workout log for each week located at the weight room area desk in a bin underneath the desk. The only identification you will have on your workout log sheet is your 3 digit code. At the end of each week, the lead investigator will bring your sheets to the faculty sponsor's office to be secured in the locked cabinet with the key kept in the locked office. Only the lead investigator will have access to the key that links your name to your code. This key will be secured in a locked cabinet in the faculty sponsor's office. All of the data from the experiment will be stored on the investigator's password protected computer with your identity protected by a 3 digit code.

FREEDOM TO WITHDRAW: Participation in this study is completely voluntary, and you may withdraw from the study at any time for any reason. You will not have any negative consequences from the investigators if you do not participate in this study, or if you decide to withdraw once you have started. Additionally, you may ask the researcher to destroy any responses you may have given.

For more information about this study, please contact Ryan Brennan at (585) 750-6831 or Ryan.Brennan@Cortland.edu. This study has been approved by the Institutional Review Board at SUNY Cortland. For more information about research at SUNY Cortland or information about the rights of research participants, please contact the Institutional Review Board by email irb@cortland.edu, or by phone (607) 753-2511.

I have read the description of the project for which consent is requested, I understand the activities requested for my involvement in this project, and I hereby consent to participate in this study.

Name: _____ Telephone#: _____ (*print*)

Signature: _____ Date: _____ (*sign*)

Researcher's Signature: _____ Date: _____

SUNY Cortland IRB Protocol Approval
Date: 2/28/2017 Protocol Expiration
Date: 2/27/2018

APPENDIX C: Demographic Profile and

Physical Activity Readiness Questionnaire (PAR-Q)

*Name _____

*Gender _____

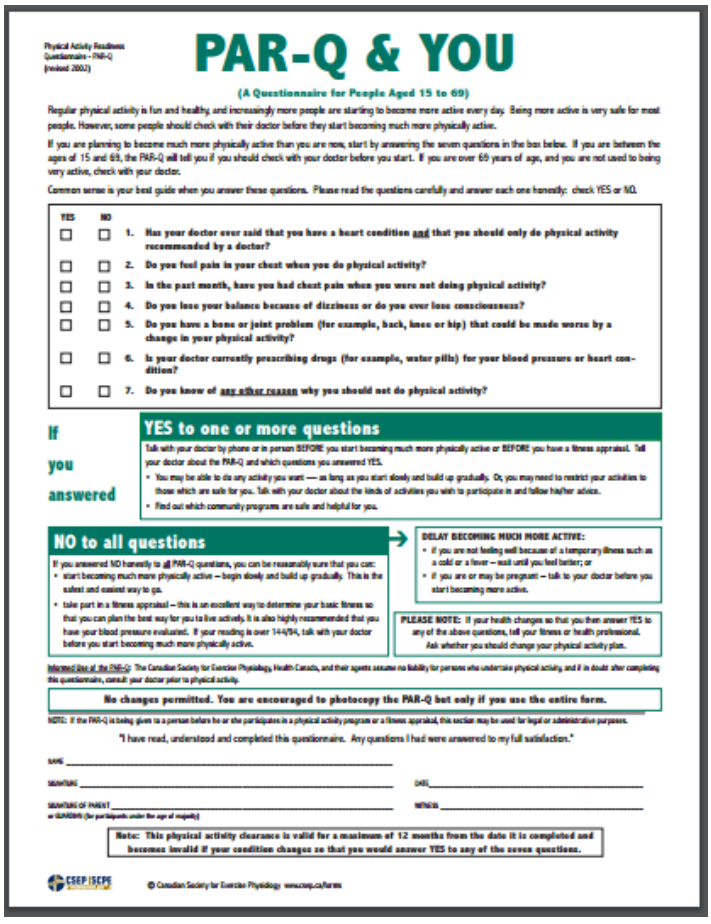
*Email Address _____

Cell phone number _____

*Date of birth _____

*Age _____

*required



Physical Activity Readiness Questionnaire - PAR-Q (revised 2002)

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO	
☐	☐	1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
☐	☐	2. Do you feel pain in your chest when you do physical activity?
☐	☐	3. In the past month, have you had chest pain when you were not doing physical activity?
☐	☐	4. Do you lose your balance because of dizziness or do you ever lose consciousness?
☐	☐	5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?
☐	☐	6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
☐	☐	7. Do you know of any other reason why you should not do physical activity?

If you answered

YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or
- if you are or may be pregnant – talk to your doctor before you start becoming more active.

PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME _____

SIGNATURE _____ DATE _____

SIGNATURE OF PARENT _____ WITNESS _____
or GUARDIAN (for participants under the age of majority)

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.

CSEP | SCEPE

© Canadian Society for Exercise Physiology www.csep.ca/forms

APPENDIX D: Anthropometric Measures

1. Name _____
2. Height____(ft)_____(in)_____
3. Weight _____(lbs)_____
4. BMI _____

APPENDIX E: The Feeling Scale

Feeling Scale (FS)
(Hardy & Rejeski, 1989)

While participating in exercise, it is common to experience changes in mood. Some individuals find exercise pleasurable, whereas others find it to be unpleasant. Additionally, feeling may fluctuate across time. That is, one might feel good and bad a number of times during exercise. Scientists have developed this scale to measure such responses.

+5 Very good

+4

+3 Good

+2

+1 Fairly good

0 Neutral

-1 Fairly bad

-2

-3 Bad

-4

-5 Very bad

APPENDIX F: Intrinsic Motivation Inventory

For each of the following statements, please indicate how true it is for you, using the following scale:

1 2 3 4 5 6 7
Not at all true Somewhat True Very True

1.) While I was working out I was thinking about how much I enjoyed it:_____

2.) I did not feel at all nervous about resistance training:___

3.) I felt that it was my choice to workout:___

4.) I think I am pretty good at resistance training:_____

5.) I found resistance training very interesting:_____

6.) I felt tense while working out:___

7.) I think I did pretty well at resistance training, compared to other participants:___

8.) Doing resistance training was fun:_____

9.) I felt relaxed while working out:___

10.) I enjoyed doing the working out very much:_____

11.) I didn't really have a choice about working out:_____

12.) I am satisfied with my performance at resistance training:_____

13.) I was anxious while working out:_____

14.) I thought the resistance training was very boring:_____

15.) I felt like I was doing what I wanted to do while I was working out:___

16.) I felt pretty skilled at this resistance training program:___

17.) I thought the resistance training program was very interesting:___

18.) I felt pressured while doing the resistance training program:_____

19.) I felt like I had to do the workout:_____

20.) I would describe the workout as very enjoyable:_____

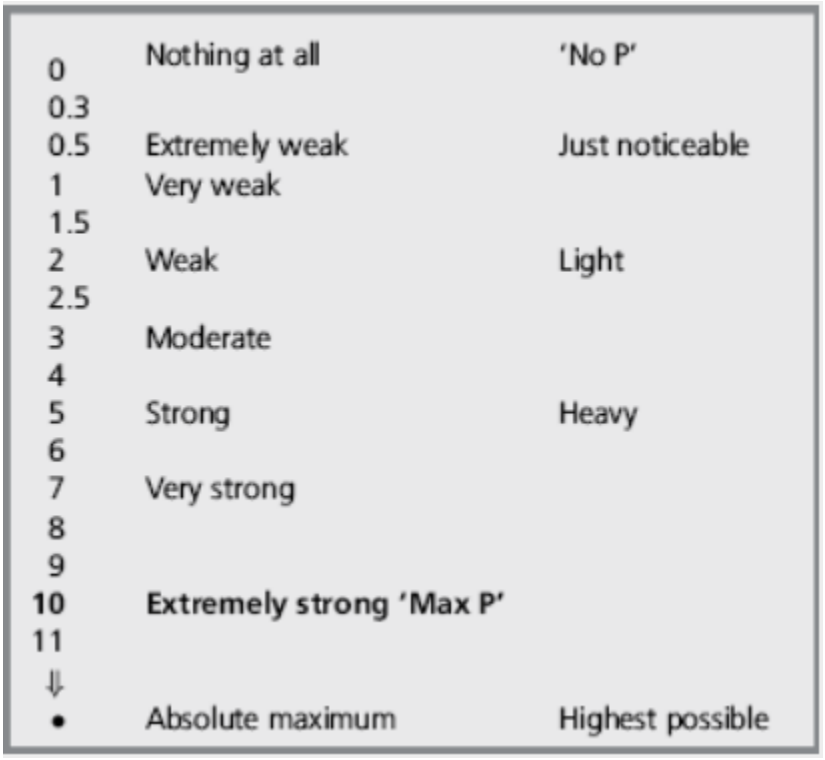
21.) I did the workout because I had no choice:_____

22.) After working at resistance training program for a while, I felt pretty competent:____

APPENDIX G: Rating of Perceived Exertion

Please rate your perceived (P) exertion: how heavy and strenuous the exercise *session* felt to you. This depends mainly on the strain and fatigue in your muscles.

Start with by looking at the verbal expression's (i.e., 'nothing at all') and then choose a number to the left of the verbal expression. If your perception is 'Very weak', record 1; if 'Moderate', record 3; and so on. You are welcome to use half values (such as 1.5, or 3.5 or decimals, for example, 0.3, 0.8, or 2.3). It is very important that you answer that *you* perceive and not what you believe you ought to answer. Be as honest as possible and try not to overestimate or underestimate the intensities.



0	Nothing at all	'No P'
0.3		
0.5	Extremely weak	Just noticeable
1	Very weak	
1.5		
2	Weak	Light
2.5		
3	Moderate	
4		
5	Strong	Heavy
6		
7	Very strong	
8		
9		
10	**Extremely strong 'Max P'**	
11		
⇓		
•	Absolute maximum	Highest possible

APPENDIX H: Muscular Strength Repetition Maximum Testing

Muscular Strength Testing Protocol

Name:

Date/Time:

Warm-up:

- 5 minutes of light intensity (work up to a fast-paced walk) aerobic exercise on the treadmill immediately before beginning the first muscular strength 8RM testing exercise (chest press)

Muscular Strength 8RM Testing:

- Familiarize participant with standardized conditions protocol and ask participants if they have any questions afterwards (see next page for standardized conditions)
- Perform exercises in the following order: chest press, leg press, seated cable row, seated leg extension, seated lat-pulldown, seated leg curl, and seated shoulder press
- Allow maximum 10 minutes of rest in-between exercises
- Start by selecting a weight that is within the subject's perceived capacity (`50%-70% of capacity)
- Allow maximum of 3 minute rest periods between each set
- Progressively increase resistance by 5.5-44.0lbs until the participant cannot complete the selected repetitions
- Record weight lifted each set in the tables provided for each testing exercise
- Record adjustment numbers
- At least one spotter per exercise

Standardized Conditions:

- *Strict Posture*
  -cue "superman chest" and "shoulders back"

- *Consistent Repetition Duration*
  -ask the participant to do their best to replicate their first repetition

- *Full Range of Motion*:

Chest Press: sets up with elbows 45 degrees with shoulder and body, presses horizontally to full lockout at elbow, and returns to starting position

Set	Weight Lifted (lbs)	Adjustment #'s
Set 1		
Set 2		
Set 3		
Set 4		

Leg Press: sets up with femur vertical to ceiling, presses to full lockout at knee, and returns to starting position

Set	Weight Lifted (lbs)	Adjustment #'s
Set 1		
Set 2		
Set 3		
Set 4		

Seated Cable Row: sets up with weight stack to be lifted away from non-lifting plates and arms fully extended, brings weight towards body until elbows directly in-line with shoulders, full lockout at elbows, and returns to starting position

Set	Weight Lifted (lbs)	Adjustment #'s
Set 1		
Set 2		
Set 3		
Set 4		

Seated Leg Extension: sets up with ankle aligned directly underneath knee, presses to full lockout at knee, and returns to starting position

Set	Weight Lifted (lbs)	Adjustment #'s
Set 1		
Set 2		
Set 3		
Set 4		

Seated Lat-Pulldown: sets up with hands gripping shoulder width with arms fully lengthened, brings bar towards chest and stops when elbows are in-line with shoulders, returns to starting position

Set	Weight Lifted (lbs)	Adjustment #'s
Set 1		
Set 2		
Set 3		
Set 4		

Seated Leg Curl: sets up with ankle/knee/hip joint in-line and perpendicular to body with toes curled towards participant, brings ankle aligned directly underneath knee, and returns to starting position

Set	Weight Lifted (lbs)	Adjustment #'s
Set 1		
Set 2		
Set 3		
Set 4		

Seated Shoulder Press: sets up with elbows aligned parallel with shoulder height, presses towards ceiling until elbows fully lockout, and returns to starting position

Set	Weight Lifted (lbs)	Adjustment #'s
Set 1		
Set 2		
Set 3		
Set 4		

APPENDIX I: Resistance Training Six-Week Program

Six-Week Resistance Training Program (Data Collection Sheet – Imposed Intensity Group)

PIN:

Acknowledgement:

Thank you for participating in this SUNY Cortland research study for the graduate student, Ryan Brennan.

Benefits of Resistance Training:

There are many benefits of resistance training including improved bone mass, glucose tolerance, musculotendinous integrity, ability to carry out the activities of daily living, and improved fat free mass and resting metabolic rate (American College of Sports Medicine [ACSM], 2013). Resistance training can also help with weight loss and weight maintenance. It has been recommended that adults engage in muscle strength training at least two times per week for 30 minutes to one hour.

Guidelines:

Your six-week resistance training program will consist of the following guidelines: (a) 3 days per week; (b) allow at least 24-48 hours between exercise sessions (for example: Monday, Wednesday, Friday routine); (c) 3 sets (rounds) of eight repetitions for each exercise; (d) two-minute rest periods after each pair of exercise (i.e., perform chest press then perform seated cable row and then rest for at most 2 minutes and repeat for a total of 3 times); (e) record in the table provided underneath each workout day whether you completed the workout or not; (f) in the same table, please provide your overall rating of perceived exertion (see page 5) from the entire workout session immediately after the workout is completed; (g) in the same table, please provide your overall feeling using the Feeling Scale anchors from +5 to -5 (see page 6) from the entire workout session immediately after the workout is completed; (h) lastly, do your best to work out 30 minutes to one hour by adhering to the guidelines mentioned above. Thanks!

Resistance Training Workouts

Warm Up/Cool Down:

For each workout day please perform the following: select any type of cardio equipment (i.e., treadmill, elliptical, Jacobs ladder, bicycle, etc.) and warm-up/cool down selecting a light-moderate pace between 5-10 minutes

Day 1 (Upper Body):

Exercise	Sets	Reps	Rest time	Prescribed Weight
A1) Seated Chest Press	3	8		
A2) Seated Cable Row	3	8	2 min	
B1) Seated Overhead Shoulder Press	3	8		
B2) Seated Lat-Pulldown	3	8	2 min	

Week	Completed? (indicate yes or no)	Session RPE/FS (immediately after end of session)	
1		RPE:	FS:
2		RPE:	FS:
3		RPE:	FS:
4		RPE:	FS:
5		RPE:	FS:
6		RPE:	FS:

REMINDER:

Immediately upon completing your training session, please record your overall perceived exertion from the session using the RPE and FS scales provided on the last pages. Thank you!

Day 2 (Lower Body):

Exercise	Sets	Reps	Rest time	Prescribed Weight
A1) Leg Press A2) Seated Leg Curl	3 3	8 8	 2 min	
B1) Leg Extension B2) Seated Cable Row	3 3	8 8	 2 min	

Week	Completed? (indicate yes or no)	Session RPE/FS (immediately after end of session)
1		RPE: FS:
2		RPE: FS:
3		RPE: FS:
4		RPE: FS:
5		RPE: FS:

REMINDER:

Immediately upon completing your training session, please record your overall perceived exertion from the session using the RPE and FS scales provided on the last pages. Thank you!

Day 3 (Total Body):

Exercise	Sets	Reps	Rest time	Prescribed Weight
A1) Leg Press A2) Chest Press	3 3	8 8	 2 min	

B1) Seated Cable Row B2) Seated Leg Curl	3 3	8 8	 2 min	

Week	Completed? (indicate yes or no)	Session RPE/FS (immediately after end of session)	
1		RPE:	FS:
2		RPE:	FS:
3		RPE:	FS:
4		RPE:	FS:
5		RPE:	FS:
6		RPE:	FS:

REMINDER:

Immediately upon completing your training session, please record your overall perceived exertion from the session using the RPE and FS scales provided on the last pages. Thank you!

Exercise Library

(Please use these exact machines for consistency purposes, thank you!)

Hoist Roc-It Selecterized Seated Shoulder Press

Hoist Roc-it Selecterized Seated Chest Press

Precor Long Pull 302 Seated Cable Row

Hoist Roc-It Selecterized Seated Lat-Pulldown

Precor Selecterized Seated Leg Curl

Precor Selecterized Seated Leg Extension

Hoist Roc-It Selecterized Seated Leg Press

Six-Week Resistance Training Program
(Data Collection Sheet – Affect-Regulated Group)

PIN:

Acknowledgement:

Thank you for participating in this SUNY Cortland research study for the graduate student, Ryan Brennan.

Benefits of Resistance Training:

There are many benefits of resistance training (RT) including improved bone mass, glucose tolerance, motor control, ability to carry out the activities of daily living, and improved fat free mass and resting metabolic rate (American College of Sports Medicine [ACSM], 2013). RT can also help with weight loss and weight maintenance. Adults should engage in RT at least two times per week for 30 minutes to one hour.

Guidelines:

Your six-week resistance training program will consist of the following guidelines: (a) 3 days per week; (b) allow at least 24-48 hours between exercise sessions (for example: Monday, Wednesday, Friday routine); (c) 3 sets (rounds) of eight repetitions for each exercise; (d) self-select a weight that "Feels Good" (+3 on the Feeling Scale) for every exercise set and record weight used in the box labeled "weights used" for each set; (e) two-minute rest periods after each pair of exercise (i.e., perform chest press then perform seated cable row and then rest for at most 2 minutes and repeat for a total of 3 times); (f) record in the table provided underneath each workout day whether you completed the workout or not; (g) in the same table, please provide your overall rating of perceived exertion (see page 6) from the entire workout day immediately after the workout is completed; (h) in the same table, please provide your overall feeling using the Feeling Scale anchors from +5 to -5 (see page 5) from the entire workout day immediately after the workout is completed, and (i) lastly, do your best to work out 30 minutes to one hour by adhering to the guidelines mentioned above. Thanks!

Resistance Training Workouts

Warm Up/Cool Down:

For each workout day perform the following: select any type of cardio equipment (i.e., treadmill, elliptical, Jacobs's ladder, bicycle, etc.) and warm-up/cool down selecting a light-moderate pace between 5-10 minutes

Day 1 (Upper Body):

For *every exercise set*, please select a weight that corresponds to the +3 anchor "feels good".

Exercise	**Sets**	**Reps**	**Rest time**	**Plate Setting**		
A1) Seated Chest Press	3	8		Set 1:	Set 2:	Set 3:
A2) Seated Cable Row	3	8	2 min	Set 1:	Set 2:	Set 3:
B1) Seated Overhead Shoulder Press	3	8		Set 1:	Set 2:	Set 3:
B2) Seated Lat-Pulldown	3	8	2 min	Set 1:	Set 2:	Set 3:

Week	**Completed? (indicate yes or no)**	**Session RPE/FS (immediately after end of session)**	
1		RPE:	FS:
2		RPE:	FS:
3		RPE:	FS:
4		RPE:	FS:
5		RPE:	FS:
6		RPE:	FS:

REMINDER:

Immediately upon completing your training session, please record your overall perceived exertion from the session using the RPE and FS scales provided on the last pages. Thank you!

Day 2 (Lower Body):

For *every exercise set*, please select a weight that corresponds to the +3 anchor "feels good".

Exercise	**Sets**	**Reps**	**Rest time**	**Plate Setting**		
A1) Leg Press	3	8		Set 1:	Set 2:	Set 3:
A2) Seated Leg Curl	3	8	2 min	Set 1:	Set 2:	Set 3:
B1) Seated Leg Extension	3	8		Set 1:	Set 2:	Set 3:
B2) Seated Cable Row	3	8	2 min	Set 1:	Set 2:	Set 3:

Week	**Completed? (indicate yes or no)**	**Session RPE/FS (immediately after end of session)**	
1		RPE:	FS:
2		RPE:	FS:
3		RPE:	FS:
4		RPE:	FS:
5		RPE:	FS:
6		RPE:	FS:

REMINDER:

Immediately upon completing your training session, please record your overall perceived exertion from the session using the RPE and FS scales provided on the last pages. Thank you!

Day 3 (Total Body):

For *every exercise set*, please select a weight that corresponds to the +3 anchor "feels good".

Exercise	Sets	Reps	Rest time	Plate Setting		
A1) Leg Press	3	8		Set 1:	Set 2:	Set 3:
A2) Chest Press	3	8	2 min	Set 1:	Set 2:	Set 3:
B1) Seated Cable Row	3	8		Set 1:	Set 2:	Set 3:
B2) Seated Leg Curl	3	8	2 min	Set 1:	Set 2:	Set 3:

Week	Completed? (indicate yes or no)	Session RPE/FS (immediately after end of session)	
1		RPE:	FS:
2		RPE:	FS:
3		RPE:	FS:
4		RPE:	FS:
5		RPE:	FS:
6		RPE:	FS:

REMINDER:

Immediately upon completing your training session, please record your overall perceived exertion from the session using the RPE and FS scales provided on the last pages. Thank you!