

# Supervision during Resistance Training: A Comparison of Trainer and Trainee Perceptions

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## ABSTRACT

**Background:** Resistance training has well-documented health benefits; however, participation and adherence remain overwhelmingly low. Supervision has been evidenced to improve adherence, and produce favourable adaptations compared to unsupervised resistance training. A recent exploratory systematic review and meta-analysis on supervision during resistance training noted a lack of clarity as to the purpose/intent of the supervisor within the body of literature.

**Methods:** An online cross-sectional survey study was conducted in English and distributed primarily across social media platforms and through the authors' personal and professional networks. The aim of the survey was to compare the perceptions of supervision between trainers and trainees. Secondary outcomes included exploratory analyses of the impact of training experience, sex of participant, and comparison based on supervision type.

**Results:** 468 participants completed all elements of the survey (68% male, 32% female). Of which 236 were personal trainers/strength coaches, and 232 were trainees. In brief, descriptive data from the survey suggest that trainers perceived supervision as more important than trainees for the characteristics and variables measured. Females perceived

supervision in resistance training as more important than males. Trainees who engage in supervised resistance training reported supervision to be more important compared to those training alone or with a training partner. Technical coaching was reported to be the most important characteristic of supervision. Finally, trainers and trainees engaging in supervised strength training reported lower injury rates compared to those strength training unsupervised or with a training partner. Qualitative data are presented regarding perceptions of how and why supervision should differ based on sex, age, and experience, as well as reporting injury experiences.

**Conclusion:** Our data suggest that the perceived benefits of supervision vary based on population. We posit that the present data have implications for both trainers and trainees, which might serve to strengthen a relationship by aligning roles and realising goals in supervised resistance training. Further, this data might provide insight and prompt future research as to how to engage more people into resistance training.

**Keywords:** Strength training, resistance training, supervision, virtual, trainer, trainee

## Key Points:

- Females appeared to rate supervision in resistance training as more important than males.

- Technical coaching appeared to be the most important characteristic of supervision.
- Trainers and trainees engaging in supervised strength training reported lower injury rates compared to those strength training unsupervised or with a training partner.

## INTRODUCTION

Resistance training is recognised as the primary approach to maintain or increase human muscle size and muscular strength (Buckner, et al. 2020). In turn, these physiological responses drive a cascade of positive adaptations culminating in improvements in longevity and quality of life (Ruiz, et al. 2008; Srikanthan, et al. 2014). Despite the well-documented health benefits (Westcott, 2012), participation and adherence to resistance training remain overwhelmingly low (males = 18-35%, females = 14-26%; Nuzzo, 2020). Perceived complexity and difficulty are often-cited barriers to engagement in resistance training (Winnett, et al. 2009). As such, supervision (e.g., a personal trainer), especially in the early stages of participation, might serve to off-load programming decisions, defer technical coaching to a personal trainer, and ultimately promote greater enjoyment, as well as positive physiological adaptations. Indeed, supervision can improve adherence in previously untrained persons, and produce favourable adaptations compared to unsupervised resistance training (Rustaden, et al. 2017; Stefanov, et al. 2013; Hunter, et al. 2020). Furthermore, in trained persons, where intensity of effort seems important for continued adaptations (Grgic, et al. 2021), supervision can serve to increase the training stimulus through both increases in load and intensity of effort (Ratamess, et al. 2008; Dias, et al. 2017), once again resulting in greater physiological adaptations for supervised compared to unsupervised resistance training (Storer, et al. 2014). However, at present no research has considered perceptions of supervision from either a trainer or trainee perspective.

Historically, authors have stressed the importance of supervision as key elements to effective resistance training (Kraemer et al. 2013; Hillman and Pearson 1995). However, a recent review of the area identified multiple limitations and confounding variables in the body of literature (Fisher, et al. 2022). Of particular relevance is a lack of clarity as to the purpose of the coach/personal trainer as a supervisor in many of the studies. In fact, only 3 of 12 studies in the review (Fisher, et al. 2022) provided any clarity as to the

intent of supervision. These characteristics were identified as: technical coaching, encouraging effort, motivation for social and mental support, programme design, and safety of the trainee (Enoksen, et al. 2013; Rustaden, et al. 2017, Orange, et al. 2019). Since evidence supports greater adherence in supervised compared to unsupervised groups (Rustaden, et al. 2017; Stefanov, et al. 2013; Hunter, et al. 2020), likely through creating accountability, we have recognised this as a sixth characteristic of supervision.

To date, our understanding of supervision within resistance training is limited based on a paucity of controlled research. However, each of the six characteristics of supervision might prove important for enhancing adaptations, especially when considering trainee experience. For example, whilst hypothetical in nature; a trainer of less experienced trainees might be more focused on safety, technical proficiency, motivation towards enjoyment, and/or adherence. In contrast, a trainer of an experienced client a trainer might place greater emphasis on effort and/or programme design. We posit that greater understanding of the perceptions related to resistance training supervision might prove important to better understand and align a trainer/trainee relationship, as well as inform training principles, and lay a foundation to inform future research on low participation rates. As such, the aim of this study was to elucidate perceptions of supervision during resistance training.

## METHODS

### *Experimental Design*

An online cross-sectional survey study was conducted between April and July 2022. The primary research aim was to compare the perceptions of supervision between trainers and trainees. Secondary outcomes included exploratory analysis of the impact of training experience (years), sex of participant, and comparison based on supervision type (e.g., supervised vs. unsupervised trainees). This study received ethical approval from the Health, Exercise, and Sport Science (HESS) Ethics Committee at Solent University (fish1HESS2022).

### *Sampling and Population*

The survey was conducted in English and was primarily distributed across social media platforms and through a number of the authors' professional

and personal networks. The survey was completed by 469 participants with a 46% response rate. The first page of the survey provided participants with an information sheet containing all details of the study and then required confirmation they understood this and provide informed consent to participate.

## Survey

### *Details and demographics*

The survey was administered through JISC Online Surveys (Bristol, UK). Following informed consent, general demographic details were required. Participants were then guided through a series of questions with drop-down box options including (i). whether the participant had a university level qualification in physical activity, exercise, or sport, (ii). number of years resistance training experience, and (iii). to report their primary reason for beginning resistance training. The survey then screened for employment to differentiate between trainers and trainees asking, "Are you currently, or have you previously been employed as a personal trainer and/or strength coach, prescribing strength/resistance training exercise to clients?" and requiring simply a yes/no answer. The survey routed participants based on this answer. The full survey can be found at the following link: [https://osf.io/9jf7a?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/9jf7a?view_only=80ab7a7d755d4571b39130abd9393cb1).

Following completion of demographic details participants were routed to answer questions as a trainee or trainer based on current or previous employment as a personal trainer/strength coach.

### *Trainees*

Trainees completed a series of questions about their training habits, culminating in being asked whether they typically engage in training: (i). Alone unsupervised, (ii). Supervised by a personal trainer 1on1, (iii). Supervised by a coach in group exercise (e.g., CrossFit, BootCamp, BodyPump, etc.), or (iv). with a training partner. From this, trainees were routed based on the degree of supervision they typically have, to the main set of questions (see table 1.) relating specifically to perceptions of supervision. Some questions included asking participants who trained unsupervised their reasoning for doing so, which further allowed cross-tabulation (e.g., considering those who responded that supervision was unnecessary because of their years of experience training). Participants who responded that they typically train with a training partner were

asked to report on the qualifications and experience level of their typical training partner. Most questions required a likert scale type response including not important, somewhat important, modestly important, very important, and essential. However, some of the questions required simply a yes/no response and then provided an open text box for a qualitative answer should the participant choose to provide more detail. Finally, all trainees and trainers were asked whether they had been injured performing resistance training (never, occasionally, frequently, often), and if "yes" to provide details. Having completed these questions, trainees were routed to a final page that thanked them for completing the survey, and provided author contact details should they have any comments.

### *Trainers*

Following the question pertaining to employment, persons who responded positively to working as a personal trainer and/or strength coach were routed to a question asking: "Of the following options, which training type is your most frequent?" (i). 1-on-1, (ii). Group (e.g., CrossFit, Bootcamp, BodyPump, etc.), (iii). Virtual (e.g., using Skype, Zoom, Google Hangout or other). Trainers were then routed to answer the main question set (table. 1) relating to the training they deliver. Finally, all trainers were then asked about their own training and supervision habits with the following options (i). Alone unsupervised, (ii). Supervised by a personal trainer, (iii). With a training partner. This was identical to the process with trainees and routed trainers to now answer the same questions about their perceptions of supervision and resistance training habits as a trainee rather than a trainer. We believed this to be important because, while trainers might impress upon people the importance of their supervision, they might not engage in supervised training themselves and thus might provide different insight as a trainer and trainee. Lastly, all trainers were routed to the final page which thanked them for their time, and provided author contact details should they have any further comments. A survey map is available at [https://osf.io/h497d?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/h497d?view_only=80ab7a7d755d4571b39130abd9393cb1).

### *Statistical analysis*

Demographic data were analysed using descriptive statistics considering median and interquartile ranges (table. 1). The primary research aim was to compare perceptions of the importance of supervision between trainers and trainees; however,

Table 1. Main question set

| Question  | Answer Option  |
|---|--|
| How important do you perceive supervision to be for strength/resistance training?<br>Please rate the importance of supervision for these characteristics of strength/resistance training:<br>(i). Technical<br>(ii). effort<br>(iii). Programme Design<br>(iv). Motivational<br>(v). Accountability<br>(vi). Safety   | <ul style="list-style-type: none"> <li>• Not important</li> <li>• Somewhat important</li> <li>• Modestly important</li> <li>• Very Important</li> <li>• Essential</li> </ul> |
| Please rate the importance of supervision for these physiological adaptations to strength/resistance training:<br>(i). Strength increases<br>(ii). Hypertrophy/muscle mass increases<br>(iii). Sports/functional performance<br>(iv). Injury prevention<br>(v). Improved bone mineral density<br>(vi). improved metabolic rate and weight loss<br>(vii). Reduced blood pressure<br>(viii). decreased low back pain<br>(ix). Enhanced flexibility<br>(x). Improved aerobic fitness | <ul style="list-style-type: none"> <li>• Not important</li> <li>• Somewhat important</li> <li>• Modestly important</li> <li>• Very Important</li> <li>• Essential</li> </ul> |
| Please rate the importance of supervision for these psychological adaptations to strength/resistance training:<br>(i). Reduced anxiety<br>(ii). Improved self-esteem/confidence<br>(iii). Reduced depression<br>(iv). Improved cognitive function<br>(v). Reduced fear of falling<br>(vi). Improved sleep quality   | <ul style="list-style-type: none"> <li>• Not important</li> <li>• Somewhat important</li> <li>• Modestly important</li> <li>• Very Important</li> <li>• Essential</li> </ul> |
| Do you typically perform strength/resistance training using:<br>(i). Free weights<br>(ii). Resistance machines<br>(iii). Cable machines<br>(iv). Resistance Bands<br>(v). Medicine Balls, Power bags, ViPRs, Body Blade, etc.<br>(vi). Bodyweight exercises<br>(vii). manually applied resistance (e.g., your trainer/training partner applies resistance)<br>(viii). Other   | Select all that apply  |
| Please rate your perception of the importance of supervision for these resistance types:<br>(i). Free weights<br>(ii). Resistance machines<br>(iii). Cable machines<br>(iv). Resistance Bands<br>(v). Medicine Balls, Power bags, ViPRs, Body Blade, etc.<br>(vi). Bodyweight exercises<br>(vii). manually applied resistance (e.g., your trainer/training partner applies resistance)  | <ul style="list-style-type: none"> <li>• Not important</li> <li>• Somewhat important</li> <li>• Modestly important</li> <li>• Very Important</li> <li>• Essential</li> </ul> |
| Do(es) you(r trainer) record/track your workouts?   | <ul style="list-style-type: none"> <li>• Exercises only</li> <li>• Exercises and Load</li> <li>• Exercise, load, and Repetitions</li> <li>• Not at all</li> </ul>            |
| For whom do you perceive supervision to be most important:<br>(i). Inexperienced persons looking to learn exercise technique and improve adherence<br>(ii). Experienced trainees looking to make continued adaptations<br>(iii). Equal between the above options  | Option answer  |
| Do you perceive that supervision should differ between males and females, and if so, how?   | Open text  |
| Do you perceive that supervision should differ based on age, e.g., children, adolescents, adults, older adults, if so, how?   | Open text  |
| Do you perceive that supervision should differ based on trainee experience, if so, how?   | Open text  |
| Have you ever been injured performing strength training, (Never, Occasionally, Frequently, Often).  | Open text  |
| If "yes" please provide details   | Open text  |



secondary analyses were also performed by subgroup based on supervision for trainees, (e.g., whether a trainee responded to training alone unsupervised, supervised 1on1, supervised in a group, or with a training partner). Further exploratory analyses considered the impact of training experience (years) and sex of participant. Data are reported as percentages of total respondents by grouping to accommodate variance in between-group values. Qualitative content analysis was performed for questions that required an open-text response (Elo and Kyngäs, 2008). Qualitative responses were assessed independently by two authors (JPF and PAK) and grouped and coded based on the supervision characteristics identified in the body of literature (i.e., technical, effort, motivation, programme design, accountability, and safety). In some cases, responses related to a “level” of supervision, “more” supervision, or a difference in communication, but was nonspecific as to what supervision characteristic this related to. If the comment was codable as an existent characteristic, and occurred with sufficient frequency, it was reported as an additional characteristic within the results. Notably, since respondents were permitted open text answers, many responses included multiple supervision characteristics, e.g., *technical and programme design*. Finally, where participants were asked how much they would pay, currently pay, or charge for supervised resistance training, the results were converted into GBP from the currency reported using xe.com (28th September 2022).

## RESULTS

Participants’ demographic data (age, sex, BMI, race, continent of residence, employment status, exercise qualification, number of years training experience, and primary reason to begin resistance training) are presented in table 2. Further, table 2 reports the number (and percentage) of participants who completed the survey as a trainer ( $n=232$ , 49.6%) or trainee ( $n=236$ , 50.4%). All trainers also clarified their most common resistance training method (1on1 = 75.8%, group = 20.3%, and virtual = 3.8%) and answered questions in reference to this method of supervision. Data for resistance training frequency and duration is presented as table S1 in supplementary material; [https://osf.io/qzrw8?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/qzrw8?view_only=80ab7a7d755d4571b39130abd9393cb1).

### Training supervision

Both trainers and trainees were asked about the

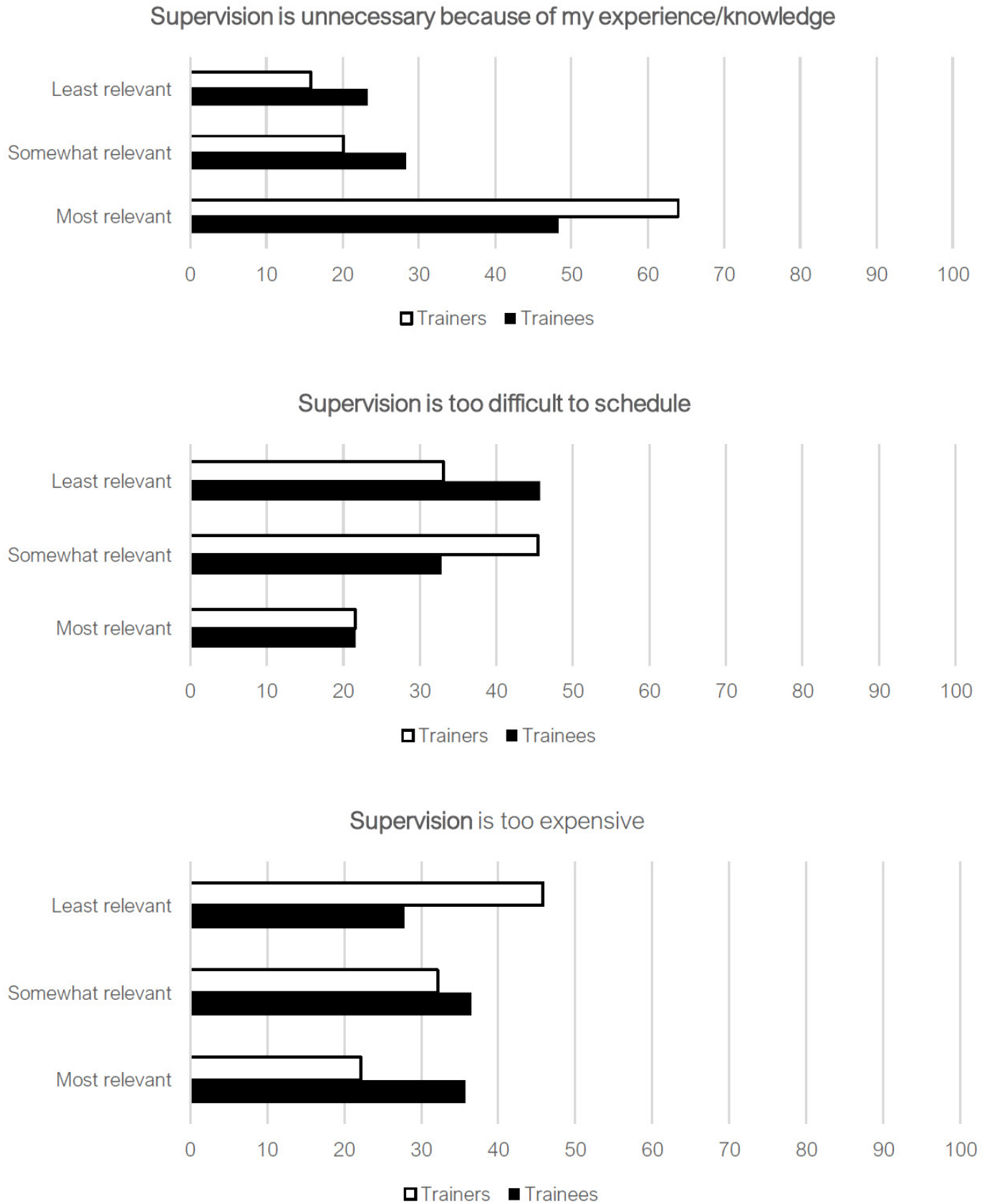
supervision of their typical training. Most participants trained alone unsupervised. However, this response was higher for trainers compared to trainees (62.7% vs. 53.9%). Further, a greater percentage of trainers than trainees trained with a partner (14.8% vs. 5.6%). In contrast, fewer trainers than trainees reported training supervised by a personal trainer 1on1 (22.5% vs. 34.1%; see table 3). Data for follow up questions for participants engaged in unsupervised resistance training are presented in figure 1. In brief, 64% of trainers and 48% of trainees responded most relevant to the statement “*Supervision is unnecessary because of my knowledge/experience*”. Data for a comparison between training experience (years) and response to “*Supervision is unnecessary because of my knowledge/experience*” is presented in table 4. In brief, the percentage of participants who responded to this question as most relevant ranged from 1.4% for persons with <1 year experience up to 37.0% for persons with 20+ years resistance training experience.

For participants who reported engaging in resistance training with a training partner, more trainers than trainees had a training partner who had a recognised certification/qualification (37.1% vs. 6.7%). For participants who reported that their training partner did not have a certification/qualification, 40% of trainers and trainees responded that their training partner had 24+months training experience; see table 5).

Participants were also asked about how supervision and cost of supervision impacts their perception of accountability. Full data is presented in table S2 and S3 in supplementary material ([https://osf.io/qzrw8?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/qzrw8?view_only=80ab7a7d755d4571b39130abd9393cb1)), however, in brief, ~70% of both participants reported that they perceived that they would engage in strength training less frequently if it weren’t for the accountability of supervision.

### Importance of Supervision

Participants were asked “*How important do you perceive supervision to be for strength/resistance training?*”. A greater number of trainers reported supervision as very important or essential (78.9%) compared to trainees (53.4%). Participants were also asked their perception of the importance of supervision for specific characteristics (i.e., technical, effort, programme design, motivational, accountability, and safety). Typically, a greater percentage of trainers compared to trainees rated characteristics of supervision as *very important* or



**Figure 1.** Reasons for Engaging in strength training unsupervised (% of respondents; *n*=125 trainees, *n*=148 trainers)

**Table 2.** Demographic Data

| Characteristic   | n=468       |
|--|-------------|
| Age  | 38 (29, 52) |
| Sex  |             |
| Male   | 314 (68%)   |
| Female   | 149 (32%)   |
| Race   |             |
| Asian  | 23 (5%)     |
| Black  | 5 (1.1%)    |
| Mixed  | 20 (4.3%)   |
| Other*   | 10 (2.2%)   |
| Prefer not to disclose   | 3 (0.7%)    |
| White  | 405 (87.9%) |
| Continent of Residence**   |             |
| Asia   | 18 (3.9%)   |
| Australia  | 18 (3.9%)   |
| Europe   | 106 (23.1%) |
| North America  | 315 (68.6%) |
| South America  | 2 (0.4%)    |
| Employment Status  |             |
| Employed (full-time)   | 283 (61.3%) |
| Employed (part-time)   | 45 (9.7%)   |
| Self-employed  | 103 (22.3%) |
| Unemployed   | 47 (10.2%)  |
| University level qualification in a topic related to physical activity, exercise, or sport                                       |             |
| Yes  | 218 (47.4%) |
| No   | 242 (52.6%) |
| No. of years of resistance training experience   |             |
| <1 year  | 16 (3.5%)   |
| 1-2 years  | 26 (5.6%)   |
| 2-5 years  | 82 (17.7%)  |
| 5-10 years   | 114 (24.7%) |
| 10-15 years  | 76 (16.5%)  |
| 15-20 years  | 42 (9.1%)   |
| 20+ years  | 107 (23.2%) |
| Primary reason to begin resistance training  |             |
| Sporting/athletic performance  | 127 (27.5%) |
| Aesthetics – muscular size, definition, leanness, etc. including competition   | 101 (21.9%) |
| Health improvements (including stress relief)  | 96 (20.8%)  |
| Muscular strength/physical function other than sports performance  | 69 (14.9%)  |
| Weight loss  | 35 (7.6%)   |
| Enjoyment  | 20 (4.3%)   |
| Ill health avoidance   | 12 (2.6%)   |
| Social/affiliation   | 2 (0.4%)    |
| Currently, or previously employed as a personal trainer and/or strength coach, prescribing strength training exercise to clients |             |
| Yes  | 236 (50.4%) |
| No   | 232 (49.6%) |

\* Participants reported Ashkenazi Jewish, Hispanic, Indian, Latin-American, Mediterranean, Mexican, and Middle Eastern

\*\*Participants were originally asked country of residence, of which 40 different countries were stated and it was decided to group them by continent

**Table 3.** Responses to training supervision.

| Question  | Trainers<br>(n=236) | Male =<br>182  | Female<br>= 52 | Trainees<br>(n=232) | Male =<br>135 | Female<br>= 97 |
|---|---------------------|----------------|----------------|---------------------|---------------|----------------|
| <i>Do you typically engage in strength training:</i>                                    |                     |                |                |                     |               |                |
| Alone, unsupervised   | 148<br>(62.7%)      | 125<br>(68.6%) | 22<br>(42.3%)  | 125<br>(53.9%)      | 91<br>(67.4%) | 32<br>(33.0%)  |
| Supervised by a personal trainer 1on1   | 53<br>(22.5%)       | 31<br>(17.0%)  | 21<br>(40.4%)  | 79<br>(34.1%)       | 25<br>(18.5%) | 53<br>(54.6%)  |
| Supervised by a coach in a group exercise (e.g., Cross-Fit, Boot Camp, Body Pump, etc.) | -                   | -              | -              | 15 (6.5%)           | 4 (3.0%)      | 9 (9.3%)       |
| With a training Partner   | 35<br>(14.8%)       | 8 (4.4%)       | 9 (17.3%)      | 13 (5.6%)           | 12 (9.0%)     | 3 (3.1%)       |

**Table 4.** Cross Tabulation of strength training experience (years) to a choice to engage in resistance exercise unsupervised due to experience/knowledge.

| Question  | Strength training experience (years) |           |            |            |             |             |            |
|---|--------------------------------------|-----------|------------|------------|-------------|-------------|------------|
|   | <1 year                              | 1-2 years | 2-5 years  | 5-10 years | 10-15 years | 15-20 years | 20+ years  |
| <i>Supervision is unnecessary because of my experience/knowledge:</i> |                                      |           |            |            |             |             |            |
| Least relevant  | 7.8% (4)                             | 9.8% (5)  | 27.5% (14) | 19.6% (10) | 9.8% (5)    | 7.8% (4)    | 17.6% (9)  |
| Somewhat relevant   | 1.7% (1)                             | 8.5% (5)  | 35.6% (21) | 16.9% (10) | 16.9% (10)  | 1.7% (1)    | 18.6% (11) |
| Most relevant   | 1.4% (2)                             | 0.7% (1)  | 8.2% (12)  | 24.7% (36) | 17.1% (25)  | 11.0% (16)  | 37.0% (54) |

**Table 5.** Experience of Training Partner.

| Question  | Trainees (n=15) | Trainers (n=35) |
|---|-----------------|-----------------|
| <i>Thinking about your typical training partner, what is their level of strength training experience?</i> |                 |                 |
| Qualified   | 6.7% (1)        | 37.1% (13)      |
| Unqualified, experience 0-6 months  | 6.7% (1)        | 5.7% (2)        |
| Unqualified, experience 6-12 months   | 26.7% (4)       | 2.9% (1)        |
| Unqualified, experience 12-24 months  | 20% (3)         | 14.3% (5)       |
| Unqualified, experience 24+ months  | 40% (6)         | 40% (14)        |

essential (trainers vs. trainees; technical = 89.4% vs. 81.9%, effort = 72.5% vs. 60.7%, programme design = 74.6% vs. 59.0%, motivational = 65.3% vs. 48.7%, accountability = 77.1% vs. 53.4%, and safety = 80.9% vs. 53.5%. See table 6 for full data). Exploratory analysis then considered the importance of supervision based on sex of trainee. Descriptively, our data showed that a greater percentage of females compared to males rated supervision very important or essential (51.5%, and 41.0%, respectively; see table 7).

Data for trainees based on the level of supervision with which they typically train revealed a greater percentage of participants who trained supervised 1-on-1 or in a group perceived supervision as essential (57.0% and 26.7%, respectively compared to 0.8% for persons who train unsupervised, and 6.7% for those who strength train with a training partner, see table 7). The same pattern was evident for other characteristics

of supervision and are presented as table S4 in supplementary material ([https://osf.io/qzrw8?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/qzrw8?view_only=80ab7a7d755d4571b39130abd9393cb1)).

Data for trainers based on whether they typically train clients 1-on-1, in a group, or using virtual supervision revealed A greater percentage of trainers who supervise resistance training 1-on-1 rated supervision as more important (i.e., *very important* or *essential*; 82.7%) compared to trainers who use group- or virtual- supervision (66.7% for both; see table 7). Data is also presented based on trainers' training method and characteristics of supervision in supplementary material (see table S5; [https://osf.io/qzrw8?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/qzrw8?view_only=80ab7a7d755d4571b39130abd9393cb1)).

#### *Importance of Supervision for Physiological and Psychological adaptations*

Participants were asked "Please rate the importance of supervision for these physiological adaptations



**Table 6.** Perceptions of importance of supervision between trainers and trainees (% of respondents from group; trainer=236, trainee=232).

| Question   | Group    | Response      |                    |                    |                |           |
|--|----------|---------------|--------------------|--------------------|----------------|-----------|
|  |          | Not important | Somewhat important | Modestly important | Very important | Essential |
| <i>How important do you perceive supervision to be for strength/resistance training?</i>                         |          |               |                    |                    |                |           |
| <i>Please rate the importance of supervision for these characteristics of strength/resistance training:</i>      |          |               |                    |                    |                |           |
| Technical - Correcting/maintaining client technique for exercise, providing feedback on performance.             | Trainers | 0.0%          | 2.1%               | 8.5%               | 33.9%          | 55.5%     |
|  | Trainees | 2.2%          | 3.9%               | 12.1%              | 44.0%          | 37.9%     |
| Effort - Increasing/maintaining sufficient effort level from the client to obtain desired adaptations.           | Trainers | 1.7%          | 6.8%               | 19.1%              | 39.0%          | 33.5%     |
|  | Trainees | 5.2%          | 14.2%              | 19.8%              | 28.4%          | 32.3%     |
| Programme Design - Designing training programmes and workouts including exercise choice, load, progression, etc. | Trainers | 2.5%          | 5.1%               | 17.8%              | 33.5%          | 41.1%     |
|  | Trainees | 6.9%          | 12.1%              | 22.0%              | 29.7%          | 29.3%     |
| Motivational - Providing encouragement to complete a workout, to promote enjoyment, etc.                         | Trainers | 1.7%          | 8.5%               | 24.6%              | 39.0%          | 26.3%     |
|  | Trainees | 11.2%         | 16.4%              | 23.7%              | 26.3%          | 22.4%     |
| Accountability - Promoting engagement and adherence.   | Trainers | 1.3%          | 3.8%               | 17.8%              | 41.1%          | 36.0%     |
|  | Trainees | 12.9%         | 15.1%              | 18.5%              | 29.3%          | 24.1%     |
| Safety - Spotting, technique correction to prevent injury, handing weights, etc.                                 | Trainers | 1.7%          | 7.2%               | 10.2%              | 25.0%          | 55.9%     |
|  | Trainees | 4.4%          | 13.3%              | 28.8%              | 26.5%          | 27.0%     |

**Table 7.** Perceptions of importance of supervision between male and female trainees.

| Question  | Group               | Response      |                    |                    |                |           |
|---|---------------------|---------------|--------------------|--------------------|----------------|-----------|
|   |                     | Not important | Somewhat important | Modestly important | Very important | Essential |
| <i>How important do you perceive supervision to be for strength/resistance training?</i>  | Males               | 9.1%          | 22.7%              | 26.5%              | 28.1%          | 12.9%     |
|   | Females             | 1.0%          | 10.3%              | 18.6%              | 28.0%          | 23.5%     |
| <i>How important do you perceive supervision to be for strength/resistance training? (Asked to trainees in view of their training method)</i> | Alone, Unsupervised | 9.6%          | 29.6%              | 35.2%              | 24.8%          | 0.8%      |
|   | Supervised; 1on1    | 0.0%          | 0.0%               | 3.8%               | 39.2%          | 57.0%     |
|   | Supervised; group   | 0.0%          | 0.0%               | 15.4%              | 69.2%          | 26.7%     |
|   | Training Partner    | 6.7%          | 20.0%              | 40.0%              | 26.7%          | 6.7%      |
| <i>How important is your supervision for strength/resistance training? (Asked to trainers in view of their training method)</i>               | 1on1 Supervision    | 0.0%          | 2.8%               | 14.5%              | 39.1%          | 43.6%     |
|   | Group Supervision   | 2.1%          | 4.2%               | 27.1%              | 41.7%          | 25%       |
|   | Virtual Supervision | 0.0%          | 0.0%               | 33.3%              | 55.6%          | 11.1%     |

to strength/resistance training.”. Trainers rated supervision more important (i.e., *very important* and *essential*) compared to trainees for all physiological adaptations ranges 38.5-78.0% for trainers vs. 23.7-63.4% for trainees). Both trainers and trainees reported their highest value for importance of supervision for injury prevention (78.0% and 63.4%, respectively). A similar theme was evident when asked “Please rate the importance of supervision for these psychological adaptations to strength/resistance training.” where all trainers rated supervision as more important than trainees for psychological adaptations (ranges 36.9-64.0% for trainers vs. 16.8-36.2% for trainees). Both groups reported the highest value for improved self-esteem (trainer = 64.0%, trainees = 36.2%). Full data are presented in supplementary material; table S6, [https://osf.io/qzrw8?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/qzrw8?view_only=80ab7a7d755d4571b39130abd9393cb1).

Secondary analysis for perceptions of physiological and psychological adaptations dividing trainees by their level of supervision (i.e., alone unsupervised;

supervised 1-on-1; supervised in a group; or with a training partner), and dividing trainers by their supervision method (i.e., 1-on-1, group, or virtual) was also considered. However, for brevity in text and since this was not a primary outcome data is presented in supplementary material; tables S7-S10, [https://osf.io/qzrw8?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/qzrw8?view_only=80ab7a7d755d4571b39130abd9393cb1).

### Resistance Types

Participants were asked about their use/prescription of different resistance types for resistance training, with an option to select all that apply. In rank order trainees selected: free weights (85.7%), resistance machines (79.2%), bodyweight (57.5%), cable machines (55.1%), resistance bands (43.8%). Trainers selected free weights (94.3%), bodyweight (83.7%), resistance machines (68.9%), cable machines (65.6%), and resistance bands (57.8%). Data are presented in supplementary material; table S11, [https://osf.io/qzrw8?view\\_](https://osf.io/qzrw8?view_)

only=80ab7a7d755d4571b39130abd9393cb1. When asked their perceptions of the importance of supervision for the resistance types, free weights was ranked highest; 85.6% of trainers and 65.8% of trainees rated supervision as very important or essential. Full data are presented in table S12, [https://osf.io/qzrw8?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/qzrw8?view_only=80ab7a7d755d4571b39130abd9393cb1).

supervised within a group, and finally, 72% of people who train alone unsupervised tracking workouts. Full data are presented in table S13 in supplementary material; [https://osf.io/2yk39?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/2yk39?view_only=80ab7a7d755d4571b39130abd9393cb1).

**Importance of supervision based on experience, age, and sex between trainees and trainers**

**Tracking and recording of workouts**

Trainees were asked “Do you record/track your workouts?” or “Does your trainer record/track your workouts?”. The highest percentages across supervision types was for exercises, load, sets and repetitions; with 96.2% of people who train supervised 1-on-1, 86.7% of people who train with a training partner, 76.9% of people who train

Participants were asked “For whom do you perceive supervision/having a training partner to be most important”. Similar values were reported for both trainees and trainers; 34.9% and 34.7%, respectively responded to Inexperienced persons looking to learn exercise technique and improve adherence, 6.9% and 5.1%, respectively responded to Experienced trainees looking to make continued adaptations, and 58.2% and 60.2%, respectively responded to Equal

**Table 8.** Variance in perceptions of importance of supervision based on experience, age, and sex between trainees and trainers.

| Question   | Trainees (n=232)           | Trainers (n=236)                           |
|--|----------------------------|--|
| <i>For whom do you perceive supervision/having a training partner* to be most important:</i>                                       |                            |  |
| Inexperienced persons looking to learn exercise technique and improve adherence  | 34.9                       | 34.7                                       |
| Experienced trainees looking to make continued adaptations   | 6.9                        | 5.1  |
| Equal between the above options  | 58.2                       | 60.2                                       |
| <i>Do you perceive that supervision should differ between males and females, and if so, how?</i>                                   |                            |  |
| No   | 78.1                       | 84.3                                       |
| Yes  | 21.9                       | 15.7                                       |
|  | Technical - 0.9%           | Technical - 13.7%                          |
|  | Programme design - 86.4%   | Programme design - 19.1%                   |
|  | Effort - 27.3%             | Effort - 2.3%                              |
|  | Safety - 0.0%              | Safety - 12.9%                             |
|  | Accountability - 0.0%      | Accountability - 0.0%                      |
|  | Motivation - 13.6%         | Motivation - 4.5%                          |
|  |                            | Other, e.g., level & communication - 33.6% |
| <i>Do you perceive that supervision should differ based on age, e.g., children, adolescents, adults, older adults, if so, how?</i> |                            |  |
| No   | 34.7                       | 44.1                                       |
| Yes  | 63.3                       | 55.9                                       |
|  | Technical - 30.3%          | Technical - 13.7%                          |
|  | Programme design - 15.7%   | Programme design - 19.1%                   |
|  | Effort - 0.3%              | Effort - 2.3%                              |
|  | Safety - 32.6%             | Safety - 12.9%                             |
|  | Accountability - 0.1%      | Accountability - 0.0%                      |
|  | Motivation - 10.1%         | Motivation - 4.5%                          |
|  | Other - 0.7%               | Other, e.g., level & communication - 33.6% |
| <i>Do you perceive that supervision should differ based on trainee experience, if so, how?</i>                                     |                            |  |
| No   | 33.3                       | 30.1                                       |
| Yes  | 66.7*                      | 69.9*                                      |
|  | Technical - 32.9%          | Technical - 26.0%                          |
|  | Programme design - 17.8%   | Programme design - 12.3%                   |
|  | Effort - 5.5%              | Effort - 10.5%                             |
|  | Safety - 7.5%              | Safety - 2.5%                              |
|  | Accountability - 1.3%      | Accountability - 0.6%                      |
|  | Motivation - 4.1%          | Motivation - 3.7%                          |
|  | *Other e.g., level - 32.2% | *Other e.g., level & terminology - 44.4%   |

\* In general, where people suggested a difference in supervision, a majority of comments amounted to “more” supervision for less experienced trainees, however, some comments from trainers suggested that they needed to unteach bad habits to experienced trainees. Further, in general comments suggested that less experienced trainees needed more technical supervision, whereas more experienced trainees needed more focus on supervision of effort level and programme design.

between the above options. Full data are presented in table 8.

Participants were asked “Do you perceive that supervision should differ between males and females, and if so, how?”. 78.1% of trainees, and 84.3% of trainers responded *No*. The qualitative responses to *Yes* were apportioned based on the characteristics of supervision previously discussed and are presented in table 8. In addition to the characteristics identified, our coding revealed that 16.2% of trainers responded that personal space should differ between supervising males and females.

Participants were asked “Do you perceive that supervision should differ based on age, e.g., children, adolescents, adults, older adults, if so, how?”. A *Yes* response was given by 63.3% of trainees and 55.9% of trainers. Once again, positive qualitative comments were coded based on the characteristics of supervision and are presented in table 8. Our coding revealed, 33.6% of trainers responded *Other*, with narrative comments mostly pertaining to level of supervision and communication (e.g., that younger persons require a greater level of supervision – though it was not specific which characteristic this related to).

Participants were asked “Do you perceive that supervision should differ based on trainee experience, if so, how?”. A similar number of *Yes* responses were noted for both trainees (66.7%) and trainers (69.9%). Open text answers were coded based on supervision characteristics and are presented in table 8. Finally, 32.2% of trainees, and 44.4% of trainers responded answers which did not fall into the identified characteristics. These comments generally pertained to the level of supervision. Many comments suggested “*more*” supervision for less experienced trainees was needed; however, some comments from trainers suggested a need to “*unteach*” bad habits to experienced trainees. Further, a number of comments suggested less experienced trainees needed more *technical*

supervision, whereas more experienced trainees needed more focus on supervision of *effort* and *programme design*.

### Injury

Both trainees and trainers were asked whether they had been injured whilst training. The largest proportion of people who reported never having been injured resistance training came from persons training supervised 1-on-1 (trainees = 70.9%, trainers = 71.7%). The majority of persons training alone unsupervised reported occasionally having been injured (trainees = 62.4%, trainers = 54.7%), and finally the highest percentage of people reporting having been occasionally injured (80.0%) was trainees resistance training with a training partner. Full data are presented in table 9.

### Cost

A final question asked about cost of resistance training (mean values are reported). Trainees who train unsupervised were asked how much they would be willing to pay (per session) for supervision. Responses were as follows: alone unsupervised = £26.71, and training partner £17.22. Trainees who train supervised were asked how much they currently pay (per session), responses were 1-on-1 = £44.61, and group = £32.26. Finally, trainers were asked how much they currently charge (per session), responses were £55.84 for 1-on-1 supervision, £44.98 for group supervision and £48.86 for virtual supervision. Full data are available as table S3 in the supplementary material; [https://osf.io/2yk39?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/2yk39?view_only=80ab7a7d755d4571b39130abd9393cb1).

## DISCUSSION

This survey is the first empirical research to probe the motivations and characteristics of supervised resistance training, and to specifically to compare trainer and trainee perceptions. As such, we hope our work serves to create a foundation for future

**Table 9.** Injury reporting based on trainee and trainer supervision.

|              | Trainee                     |                        |                         |                         | Trainer                     |                        |                         |
|--------------|-----------------------------|------------------------|-------------------------|-------------------------|-----------------------------|------------------------|-------------------------|
|              | Alone, unsupervised (n=125) | Supervised 1on1 (n=79) | Supervised Group (n=13) | Training Partner (n=15) | Alone, unsupervised (n=148) | Supervised 1on1 (n=53) | Training Partner (n=35) |
| Never        | 36%                         | 70.9%                  | 46.2%                   | 20.0%                   | 44.6%                       | 71.7%                  | 51.4%                   |
| Occasionally | 62.4%                       | 27.8%                  | 53.8%                   | 80.0%                   | 54.7%                       | 24.5%                  | 45.7%                   |
| Frequently   | 1.6%                        | 1.3%                   | -                       | -                       | 0.7%                        | 3.8%                   | 2.9%                    |

research seeking to better understand the purposes of supervision, and perhaps promote greater adherence and participation in resistance training as well as optimise training-related adaptations. Whilst the data can only be considered in view of the demographics of the respondents, we believe the insight may generalise to some extent and hopefully prove valuable in understanding this field. Further, whilst the length of the survey allowed considerable data to be collected and analysed, this discussion focuses on the sections we believe are most important for better understanding the research topic.

Our primary comparisons were between trainees and those employed as personal trainers/strength coaches. The data suggest that while most trainers supervise resistance training 1-on-1 (75.8%), trainers are more likely to train alone unsupervised compared to trainees (62.7% vs. 53.9%, respectively – table 3). This disparity seems to be due to the perception that supervision is unnecessary when one has a high degree of knowledge/experience – as trainers and trainees who trained unsupervised stated this as their most relevant reason for not engaging in supervised resistance training (64% and 48.3%, respectively – see figure 1). While speculative, as this was a cross sectional analysis, it seems reasonable that perceiving a need for supervision might diminish with experience, as supported by higher response rates that supervision is unnecessary with greater experience (see table 4). Notably, it is possible that this relationship might not hold true among competitive strength and/or physique athletes who, independent of training experience, might view supervision differently (more akin to sport coaching) and therefore choose to utilise supervision/coaching to optimise their performance.

In addition to supervised and unsupervised, a further option was for participants to select that they typically engage in resistance training with a training partner. More trainers responded positively to this compared to trainees (14.8% vs. 5.6%, respectively – table 3). Further, 37.1% of trainers and 6.7% of trainees responded that their training partner had a recognised, industry-specific qualification/certification in resistance training. It seems plausible that a personal trainer would have access to other qualified trainers and likely spend more time around training facilities compared to trainees. Therefore, these people might engage in resistance training together out of convenience, collegiality, or a desire for supervision.

Finally, whilst it was not a primary research question, the impact of respondent sex was considered. For both trainees and trainers, males were more likely to train alone unsupervised, whereas females were more likely to train with supervision. Interestingly, male trainees were more likely to train with a partner compared to female trainees, while female trainers were more likely to train with a partner than male trainers (see table 3). The survey did not ask the sex of respondents' trainers or training partners; however, compared to male trainees, female trainees have reported more confidence in personal trainers in prior research (Fisher, et al. 2013). Indeed, our data supports the notion that females may have more positive views of personal trainers, as 51.5% of females compared to 41.6% of males rated supervision as very important or essential (see table 7b). The psychosocial reasons for this phenomenon warrant further investigation.

### *Importance of supervision*

A greater number of trainers (78.9%) expressed perceptions that supervision was very important or essential compared to trainees (53.4%; table 7). The same was true for all characteristics of supervision (e.g., technical, effort, programme design, motivational, accountability, and safety). It seems reasonable that a person should have confidence in what they do, and more so when this position is supported by research (e.g., Fisher, et al. 2022). However, we might also consider that there is an element of self-justification. For example, a trainer might be unlikely to promote unsupervised training as it could ultimately result in losing clients and income. Notably, both trainers and trainees rated technical supervision as most important (89.4% vs. 81.9%, respectively), which could be related to the reported high use of free weights (which arguably require greater technical proficiency) by both groups (94.3% and 85.7%, respectively; see table 9 for full details of use of different resistance types).

Both trainers and trainees rated motivational supervision least important (65.3% vs. 48.7%, respectively). Further, the largest differences (e.g., trainee value minus trainer value) between trainers and trainees were seen in safety (27.4%) and accountability (23.7%) – with trainers reporting both as more important. It seems trainers place greater importance on their role in promoting adherence and safety to resistance training compared to trainees. We propose that the training experience of the participants in the present study (>90% of respondents had >2 years), might not represent the



average experience of a personal training client and thus might be a cause of these disparities. That is to say that more experienced trainee's adherence likely waivers less, and they believe their training to be sufficiently safe. Future research is needed to reveal whether or not untrained persons or trainees with less experience place greater importance on the accountability and safety characteristics of supervision.

The importance of supervision also differed based on the medium of trainee supervision. Persons engaging in supervised strength training (1-on-1 and group) responded that supervision was more important compared to those who train alone or with a training partner. The same was also true for characteristics of supervision (e.g., technical, effort, programme design, motivational, accountability, and safety – see table 7). A person training with supervision might perceive it as more important for several reasons. For example, previously unsupervised trainees who now train supervised might be making a fair and honest comparison. Furthermore, many trainers might promote their services by highlighting potential benefits of supervised compared to unsupervised training, thus influencing those who pay for supervision. However, a confirmation bias or endowment effect in those paying for supervision could also be occurring. That is to say that respondents who invest in supervision, when asked its value, might report a higher perceived importance compared to others to confirm their pre-existing opinions which initially led to the purchase. On average, unsupervised trainees responded they would be willing to pay £26.71 per session, while those who train supervised 1on1 pay 67% higher more (£44.61 per session; table S14). Whilst the data for those currently not paying for supervised strength training is based on perceptions of what they would be willing to pay, and the values for those who do pay for supervised strength training might be based on recall – the value disparities may lend some support to the possibility of confirmation bias among supervised trainees.

Since having a training partner might represent an unquantifiable degree of supervision, it is interesting to consider the perceptions of those who selected that they train with a training partner on the importance of supervision. The characteristics of effort (60%) and programme design (86.6%) were negatively ranked (i.e., a greater percentage of participants selected not important, or somewhat important, compared to very important or essential) by most who train with a training partner (table S4). It seems reasonable that

even though a training partner is present, they play little or no role in exercise programming. However, that 60% of respondents also felt effort was not an important attribute of supervision is surprising. Those training with a training partner presumably believe that they benefit from doing so, and thus, these responses might suggest that those with training partners don't view their partner as a supervisor. Indeed, it has been suggested that trained persons might benefit by training with a high intensity of effort to continue making adaptations (Grgic, et al., 2021). As such, one might hypothesise that a benefit of a training partner would be to enhance effort; however, our data may not be equipped to ascertain whether trainees report this experience.

A final analysis of the importance of supervision was performed on trainers based on their supervision type (1-on-1, group, and virtual). Trainers who supervise resistance training 1-on-1 rated the overall importance and all characteristics of supervision as more important compared to persons supervising resistance training in a group or virtually (table S5). However, the contemporary area of virtual supervision produced some interesting findings; 100% of trainers using a virtual platform rated supervision as very important or essential for accountability of training, while the lowest values were noted for programme design and safety. It might be that personal trainers using a virtual platform often see clients in their home environment and perceive that the person would not be comfortable in a gym environment, or that their scheduling is of greater importance to maintain engagement and adherence. Further, personal trainers using a virtual platform might feel somewhat powerless in their ability to provide/maintain a safe environment, as well as in programme design due to the limited exercise selection in most at-home training environments.

### *Importance of supervision for physiological and psychological adaptations*

Trainers, compared to trainees, rated supervision as more important for all physiological and psychological adaptations (table S6). Notably, the highest values (very important and essential) reported by both trainers and trainees were for injury prevention (physiological; trainers = 78.0%, trainees = 63.4%) and improved self-esteem (psychological; trainers = 74.0%, trainees = 36.2%), suggesting perceptions that supervision might have a greater capacity to influence these compared to other adaptations. The recognition of importance of supervision for injury prevention, aligns with



a growing body of literature to support the use of resistance training for injury prevention in older adults (Skelton and Beyer, 2003) and athletes (Beato, et al. 2021; Mendonça, et al. 2021). Giving further support to this notion, 27.5% of respondents reported that they started resistance training as a product of sporting/athletic performance, and a further 20.8% for health improvements. Furthermore, the median age of respondents for this survey is 38 years (table 2) and as mentioned earlier, the respondents had a relatively high experience with resistance training. Thus, the present participants might represent a group of people attuned to the risk of physical injury and, because of this, place importance both on the benefits of resistance training, and on supervision to reduce injury risks. The other characteristic of importance to respondents; self-esteem, might be more immediate and recognisable from supervised resistance training. That is to say, that a person can feel good immediately after resistance training, and potentially as a product of the comments of a supervisor. A body of literature exists highlighting the improvements in self-esteem as a result of supervised exercise (McAuley, et al. 2000; García-Martínez, et al. 2012) and specifically resistance training (Tsutsumi, et al. 1998). In addition, it seems reasonable to connect the positive nature of supervision with improvements in self-esteem.

### Resistance Types

Participants were asked about their use and prescription of different resistance types. In general, data was similar for all trainees and trainers, with descending values from free weights, resistance machines, cable machines, resistance bands, medicine balls, PowerBags, ViPRs, etc. Notably, both trainers and trainees reported the highest use for free weights which likely aligns to access and perhaps cost of free weights, as well as perception of effectiveness, compared to resistance machines. When asked after the importance of supervision for resistance types, the highest values for very important and essential were for free weights for both trainers and trainees. It is possible that all respondents rated supervision most important for free weights due to the technical requirements of free weight training given their multi-planar nature and the potential for incorrect technique (see table S12).

### Variance in perceptions of importance of supervision based on experience, age, and sex

Open answer questions with qualitative responses were asked, the first of these questions; “Do you

perceive that supervision should differ between males and females, and if so, how?”. Most participants did not believe supervision should differ based on sex (trainees = 78.1%, trainers 84.3%). For participants who responded that supervision should differ, 86.4% of trainees suggested that it should differ based on programme design, and 27.3% of trainees suggested it should differ based on effort. In contrast, only 29.7% of trainers responded that supervision should differ in programme design, and 32.4% of trainers suggested it should differ based on motivation (e.g., encouragement and enjoyment). It was not always clear whether participants felt supervision should encourage more or less effort or provide more or less motivation for enjoyment for males or females. Finally, 16.2% of trainers that selected yes – that supervision should differ between males and females and provided “other” as a reason for a difference in supervision and noted trainers should consider personal space and being less “hands on” with female trainees. For example, statements included “...you have to respect a female’s body space more being male...”, “Approach differs between the sexes for how physical I can be in helping clients...”, “As a male coach, I’m much less hands on with female high school athletes than males.”, “I touch males, but I wouldn’t touch females.”, “As a trainer you need to have approval from the person in front so when you spot someone or correct [them] you need to give personal space and if you must touch [a] joint or [the] body of the trainee you need to make sure it’s ok. With women’s it can be more sensitive.” These qualitative answers relate to the field of proxemics, which typically identifies four domains; public distance (>360cm), social distance (120-360cm), personal distance (45-125cm), and intimate distance (<40cm, further subdivided in to proximate <15cm, and extended 15-40cm; Marcos & Mateo, 2020; Bruno & Muzzolini, 2013). Whilst some research exists in the field of proxemics and sports/coaching (i.e., Marcos & Mateo, 2020), there seems to be nothing considering the area of personal training/strength coaching. Cross tabulating the results for sex and employment status revealed that while the general demographic of total participants was 68% male, the percentage of males who were personal trainer/strength coaches was 77.1%. Personal training often requires encroachment into personal space, intimate distances, and even physical contact, particularly if using manually applied resistance. Of course, personal space would differ considerably across mediums (for example in virtual environments) as well as cultural backgrounds. Whilst our data do not clarify the details reasoning the perceptions,

we might consider that possible interpretations of sexual harassment or potential intimidation cause male personal trainers to rightfully be cognizant of space boundaries and proxemics with their female clients.

A further open text question asked, “*Do you perceive that supervision should differ based on age, e.g., children, adolescents, adults, older adults, if so, how?*”. The majority of trainees (63.3%) and trainers (55.9%) responded *yes*. Trainees prioritised differences in technical (30.3%), safety (32.6%), and programme design (15.7%) characteristics of supervision. Trainers recognised the same characteristics but to a lesser extent (technical = 13.7%, safety = 12.9%, programme design 19.1%). Furthermore, 33.6% of trainers provided additional comments relating to the level and amount of supervision. In general, qualitative comments included a focus towards extremes of children; “*adolescents need far more supervision, if you take your eyes off for a second, they will be doing the movement completely wrong*”, “*Yes, adolescents require additional supervision*”, “*Yes. Much more instruction for youth*”, and also older adults; “*Typically greater supervision with older clients*”, “*Older adults may need more supervision*”, “*More supervision needed in older adults*”. From this data it would be fair to argue that repetition of coaching cues, demonstrations, positive feedback, etc., probably occur far more frequently with children and older adults, although we cannot assume exactly what is meant by “*more supervision*”. However, a couple of qualitative responses to this question clarified: “*I think this varies more on training age more than biological age*”, and “*Age per se does not influence the level/approach. Training level/years, yes*”. Thus, there seems a reasonable assumption that children have less experience in resistance training and need greater reinforcement of coaching, and the same might be assumed of older adults.

Finally, participants were asked “*Do you perceive that supervision should differ based on trainee experience, if so, how?*”. Once again, a majority of trainees (66.7%) and trainers (69.9%) responded that supervision should differ. Similar to the previous question, and likely connecting the perception that biological age and training age require similar adaptations in supervision, trainees and trainers indicated technical (32.9%, and 26.0%, respectively) and programme design (17.8%, and 12.3%, respectively) as characteristics of supervision which should differ. Further, 32.2% of trainees and 44.4% of trainers selected “*other*”,

and in their qualitative comments stated that the level and terminology of supervision should differ. Qualitative comments supporting this interpretation included: “*Yes, by the way I can explain what I’m asking them to do. An inexperienced trainee will need more coaching*”, “*Typically greater supervision with newer/less experienced clients*”, “*Yes, beginner trainees require more supervision in some respects*”, “*More experienced trainers probably require less supervision*”, “*Yes. Newer clients (generally) need more direct supervision and guidance*”. Some comments also lend credence to a discussion of supervision for the value of educating the trainee: “*Beginners need more supervision to learn the movements, but advanced trainees have less room for error*”, “*Person to person. Probably more supervision/education for the experienced lifter*”, “*Yes. Less experienced trainees usually take longer to demonstrate independence with various exercises and program compliance*”, (see table 8). Certainly, supervised resistance training might not be sustainable from a scheduling or expense perspective for some people, and as such engaging in supervised resistance training might serve the role of initially helping to teach trainees how to safely engage in exercise so they can be self-sufficient from that point onward.

### Injury

As a whole, 49.6% of respondents selected that they had *never* been injured whilst training, 48.9% of respondents selected *occasionally*, and 1.5% of respondents selected *frequently*. The highest percentage of responses for *never* were from persons training supervised 1-on-1 (trainees = 70.9%, trainers = 71.7%). The highest percentage of values for *occasionally* were from persons training alone unsupervised (trainees = 62.4%, trainers = 54.7%) and persons resistance training with a training partner (trainees = 80.0%, trainers = 45.7%). Full data are presented in table 9.

A follow-up question asked that if they had answered “*yes*”, to provide details. In total there were 240 qualitative responses that varied in detail. Where respondents highlighted a joint/region of the body, the back followed by the shoulder were the most commonly injured regions. Lower incidence rates were noted for knee, biceps, and chest. The most frequent exercise named as having been the cause of an injury was the deadlift, with lesser but notable values for squats and bench press. Many respondents attributed their injury to improper form/technique (see supplementary material Qualitative comments

relating to injuries: [https://osf.io/6rbme?view\\_only=80ab7a7d755d4571b39130abd9393cb1](https://osf.io/6rbme?view_only=80ab7a7d755d4571b39130abd9393cb1)). One participant detailed an injury and probable cause but continued to express that they did not need supervision because of their knowledge/experience but that others should be supervised: *"Sometimes I went too heavy being an idiot and had tendonitis in my bicep. ... I don't believe supervision is for myself because I have been studying training since the 80s... the majority of people that I see definitely need help with supervision"*. This seemingly displays something of an optimism or overconfidence bias - that supervision is for other people with less knowledge/experience. Complacency and almost expectancy about being injured while resistance training was also displayed: *"Nothing major, the normal back tweak, shoulder pain, etc. type thing", "the usual aches and pains", "small tweaks and chronic pain", "minor bumps, fingers trapped between plates, occasional mild overuse injuries"*. Finally, most comments reported that injuries were self-managed with rest and time away from training, and/or adaptation of exercises or training programmes.

The academic literature reviewing injury rates in resistance training are generally low in relation to other activities (e.g., compared to team sports; Keogh and Winwood, 2017) but support the relatively high prevalence of back injury (followed by shoulder and knee; Butragueño, et al. 2014), as well as suggesting that injuries are dominantly caused by the use of free weights (potentially >90% of injuries; Lavalley & Balam, 2010) compared to other resistance types. We previously identified a high perceived importance of technical supervision and suggested a link to the prevalent use of free-weights with multi-planar capabilities. However, this is also likely the cause of the high injury rate with this resistance type compared to, for example, resistance machines (Lavalley & Balam, 2010) which typically can only move in a fixed plane and prevent the occurrence of crushing injuries. Previous publications support the notion that supervision, education, and emphasis on proper technique, are sound injury prevention methods (Mazur, et al. 1993; Haupt, 2001) and that a lack of supervision places a young person engaging in resistance training at a higher risk of injury (Lavalley & Balam, 2010). Therefore, prior data provide support for the comments from our survey suggesting greater importance of supervision for younger/inexperienced trainees.

## LIMITATIONS

The present data is a product of participant interpretation of questions and honest responses. Further, variance might exist based on geography. For example, while the cost of supervised resistance training is discussed, it might vary both within and between countries. However, it is beyond the remit of this project to consider any variance in responses based on location. Finally, an important consideration within supervision of resistance training might be that of the Hawthorne effect. This describes the effect that the awareness of being observed can positively influence an outcome (Parson, 1974). In that sense, while we have identified characteristics of supervision, there might simply be an effect by the observation of a supervisor irrespective of their intent to focus upon technical coaching, safety, programme design, etc. However, our recognition of this does not change that this survey considered the perceptions of supervision by trainers and trainees.

## CONCLUSIONS

In summary, trainers perceived supervision as more important than trainees across the characteristics and variables measured herein. Further, females appeared to rate supervision in resistance training as more important than males, and trainees who engage in supervised resistance training reported supervision to be more important compared to other trainees. Persons engaging in resistance training with a training partner reported the lowest values for importance of supervision, which might indicate they perceive a partner and supervisor differently. Trainers who train clients 1-on-1 rated supervision more important compared to those supervising group resistance training or using a virtual platform. Finally, technical coaching appeared to be the most important characteristic of supervision.

Given trainees and trainers perceive the importance of supervision differently, future research might consider whether self-justification as a personal trainer or strength coach, or whether a lack of education and knowledge about the potential value of training supervision drives these disparities. Additionally, future research should consider some potential indirect benefits of working with a personal trainer or coach which were not captured in this survey, such as personal training sessions serving as opportunities for clients to discuss health and fitness topics with trainers, which might be important given the prevalence of health and fitness misinformation.



Finally, considering that injury rates were lowest among 1-on-1 supervised trainees, future research should examine the value of supervision for injury prevention.

While these data are only representative of the participants sampled, who were mostly experienced trainees, we believe our findings provide insight for both trainers and trainees which might serve to strengthen their relationship by aligning goals, expectations, and clarifying roles in supervised resistance training. Further, these data might prompt future research as to how to engage more people with resistance training.

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## IRB APPROVAL

Approval was granted by Health, Exercise and Sport Science ethics committee of Solent University, Southampton, UK.

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## COMPETING INTERESTS

JPF provides consultancy services to resistance training organizations which typically employ supervised resistance training. ERH acts as a coach for strength and physique athletes, acts as a consultant to trainers and coaches, and acts as a science communicator for athletes and coaches in the fitness industry. BJS serves on the scientific advisory board of Tonal Corporation, a manufacturer of fitness equipment. The remaining authors declare that they have no competing interests.

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