

# Use of participant focus groups to identify barriers and facilitators to worksite exercise therapy adherence in randomized controlled trials involving firefighters

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**Background:** Firefighters are at increased risk for back injuries, which may be mitigated through exercise therapy to increase trunk muscle endurance. However, long-term adherence to exercise therapy is generally poor, limiting its potential benefits. Focus groups can be used to identify key barriers and facilitators to exercise adherence among study participants.

**Objective:** To explore barriers and facilitators to worksite exercise therapy adherence among firefighters to inform future randomized controlled trials (RCTs).

**Methods:** Participants enrolled in a previous RCT requiring twice-weekly worksite exercise therapy for 24 weeks were asked to take part in moderated focus group discussions centered on eight open-ended questions related to exercise adherence. Responses were analyzed qualitatively using a social ecological framework to identify key intrapersonal, interpersonal, and institutional barriers and potential facilitators to exercise adherence.

**Results:** A total of 27 participants were included in the four focus group discussions, representing 50% of those assigned to a worksite exercise therapy group in the previous RCT, in which only 67% of scheduled exercise therapy sessions were completed. Lack of self-motivation was cited as the key intrapersonal barrier to adherence, while lack of peer support was the key interpersonal barrier reported, and lack of time to exercise during work shifts was the key institutional barrier identified.

**Conclusion:** Focus group discussions identified both key barriers and potential facilitators to increase worksite exercise therapy adherence among firefighters. Future studies should consider educating and reminding participants about the benefits of exercise, providing individual and group incentives based on exercise adherence and performance, providing outside monitoring of exercise adherence, varying the exercise routine, encouraging group exercise and competition, and scheduling exercise during each work shift.

**Keywords:** exercise therapy, back injuries, self-motivation, peer support

## Introduction

Firefighters are required to perform a variety of rigorous physical activities, including responding to medical emergencies, motor vehicle and other accidents, lifting and carrying patients, as well as fighting fires in hazardous, varied, and stressful environments.<sup>1</sup> Such occupational demands place firefighters at a higher risk for developing musculoskeletal strains and injuries, including low back pain, which is the leading cause of early retirement from the fire service.<sup>2-4</sup> Back and core muscles are thought to play an important role in stabilizing the spine while performing rigorous physical activities, and the level of endurance in these trunk muscles has been found

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to be predictive of the future incidence of low back pain.<sup>5</sup> Endurance of back and core muscles may be assessed using standardized measures such as the prone static plank test and modified Biering-Sørensen test, and can be improved through supervised exercise therapy that slowly increases resistance and difficulty for targeted muscles.<sup>6,7</sup>

A recent randomized controlled trial (RCT) reported that firefighters who participated in a 24-week supervised worksite exercise therapy program (note: the term “exercise therapy” is used to denote exercise that is prescribed for a specific therapeutic purpose rather than recreational exercise) had significantly improved back and core muscular endurance at 6 months compared with those who continued to do their usual physical fitness routine.<sup>8,9</sup> However, adherence to the twice-weekly exercise therapy protocol over 24 weeks was suboptimal, as participants completed only 67.3% (mean 32.3) of the 48 sessions specified in the study protocol. Further, adherence to exercise therapy sessions decreased from 69.1% of sessions in weeks 1–12 to 65.6% in weeks 13–24, suggesting poor long-term adherence if this intervention were implemented by fire departments to reduce back injuries in firefighters.

Nevertheless, exercise therapy remains one of the most promising methods to reduce the burden of back injuries, given that more passive approaches such as ergonomic modifications, lumbar belts, and back schools have generally proven ineffective at preventing low back pain.<sup>10,11</sup> It is therefore necessary to identify and overcome obstacles to full adherence to worksite exercise therapy in firefighters, many of whom have low levels of physical activity despite the high physical demands imposed by their occupation.<sup>12</sup> Exploration of barriers and facilitators to exercise therapy adherence can be accomplished through qualitative analysis of moderated focus group discussions guided by open-ended questions related to those main themes.<sup>13</sup> Similar methodology was recently used in a study that reported adherence to exercise training among firefighters was strongly affected by personal motivation, which in turn was related to the influence of colleagues and management, as well as organizational factors such as availability of time, space, and equipment to exercise.<sup>14</sup> However, it is not currently known if similar preferences and beliefs are held by firefighters for long-term worksite exercise therapy targeting trunk muscles to improve endurance and reduce the incidence of future back injuries.

The primary objective of this study was to explore potential barriers to full adherence to worksite exercise therapy among firefighters who had recently completed a RCT involving supervised exercise therapy to improve

trunk endurance. The secondary objective of this study was to suggest improvements or modifications to exercise therapy protocols to be used in future RCTs involving firefighters to minimize the impact of these barriers on adherence.

## Methods

### Participants

#### Previous RCT

Focus group participants were recruited from the 96 full-time, active-duty firefighters at Tampa Fire Rescue (Tampa, FL, USA) who had enrolled in a previous RCT conducted by our research group to evaluate the effects of 24 weeks of supervised worksite exercise therapy on back and core muscle endurance.<sup>8</sup> The RCT protocol required study participants to complete twice-weekly exercise sessions of approximately 10–15 minutes duration at their worksite and during their usual 24-hour work shifts. These sessions were scheduled ahead of time and supervised by a pool of ten peer fitness trainers (ie, firefighters with additional training in physical fitness and wellness), who often traveled from another fire station at Tampa Fire Rescue for this purpose. Participants in the RCT were eligible to receive up to US\$260 to complete the baseline and two follow-up study assessments outside of normal work hours, but were not compensated for completing the scheduled exercise therapy sessions; additional details are available elsewhere.<sup>8</sup>

#### Focus group

Only those 54 firefighters who were randomized to the supervised worksite exercise therapy group in the previous RCT were recruited for these focus group discussions. They were contacted by the study team by mail, telephone, and email on completing the 24-week RCT, and offered an incentive of US\$70 to attend one of the four planned focus group discussions outside of normal work hours. All firefighters provided informed consent prior to participating in the focus group discussions, which was reviewed and approved by the University of South Florida’s Institutional Review Board prior to enrollment.

### Procedures

Four focus group discussions were held within a 1-week period to maximize internal consistency. Three sessions were held for participants of lower ranks (eg, firefighters), while one session was held exclusively for those of higher ranks (eg, fire captains). These groups of participants were separated to minimize the potential effects of workplace hierarchy on providing open and honest feedback.<sup>13</sup> Each participant attended

only one focus group, which had a target enrollment of five to ten individuals. Focus group discussions were led by a moderator (JM) and assistant moderator (JN), who were both members of the research team that conducted the previous RCT. Participants in the focus groups were informed that the main purpose of these discussions was to provide feedback on their experience to help identify barriers and facilitators prior to implementing the worksite exercise therapy program more broadly in the fire service.

The focus group discussions were conducted using standardized methods, as described by Krueger and Casey.<sup>13</sup> Discussions were centered on the moderator asking participants to answer eight open-ended questions intended to uncover both barriers and facilitators to adherence for worksite exercise therapy – these questions are listed in Table 1. The moderator asked each question in the order provided, and allowed sufficient time for focus group participants to provide their answers. When discussion lagged, the moderator asked additional follow-up questions intended to encourage participants to clarify and elaborate on the answers provided and elicit further discussion. Although participants were frequently encouraged by the moderator to share their thoughts, not every participant answered each question, particularly when there was apparent agreement on previous answers given by others. Each focus group discussion lasted approximately 90 minutes.

## Analysis

Focus group discussions were recorded using digital recorders (DM-420 Digital Voice Recorder, Olympus Imaging America, Center Valley, PA, USA) and transcribed verbatim by an independent transcriptionist. The transcripts were then reviewed by the assistant moderator (JN) and compared with handwritten notes taken during the focus group discussions to correct any errors and overcome periodic difficulties in the quality of the audio recording. The corrected transcripts

were analyzed using a qualitative technique similar to that described by Krueger and Casey, in which individual answers to specific questions are separated from those questions and grouped into broader themes that may span several questions.<sup>13</sup> The electronic transcripts for each question were copied and pasted into a spreadsheet (Microsoft Excel 2010, Microsoft, Redmond, WA, USA), after which verbatim answers were repeatedly shortened to uncover the main underlying themes.

This analysis was performed independently by two investigators (JN and SD), who then discussed their interpretation until consensus was reached. A social ecological framework was used for this analysis, which views desired health behaviors such as adherence to worksite exercise therapy as influenced by a variety of intrapersonal (eg, knowledge, beliefs), interpersonal (eg, colleague behaviors and attitudes), institutional (eg, goals, policies), community (eg, networks of institutions), and public policy (eg, laws, regulations) factors.<sup>14,15</sup> This framework has previously been used to identify barriers and facilitators to general exercise in firefighters.<sup>14</sup> This analysis focused on key barriers and facilitators related to intrapersonal, interpersonal, and institutional factors, which may be more amenable to modification by investigators in future studies involving exercise therapy.

## Results

### Participants

Firefighters who were assigned to the exercise therapy group in the previous RCT had an age of  $37.6 \pm 9.8$  (mean  $\pm$  standard deviation [SD]), had worked  $11.3 \pm 9.3$  years as a firefighter, exercised  $3.2 \pm 1.2$  days/week, and had a body mass index of  $28.2 \pm 3.3$ ; 96.3% were male; no significant differences were found between those who did and did not participate in the focus group discussion in terms of age, years as a firefighter, exercise frequency, body mass index, or sex.<sup>8</sup> A total of 27 firefighters from the exercise therapy group in the previous RCT participated in focus group discussions, representing 50% of previous study participants.

### Adherence to exercise therapy

In the previous RCT of exercise therapy for back and core muscle endurance, participants were required to complete twice-weekly sessions for 24 weeks, a potential total of 2592 exercise therapy sessions. However, only 1745 study exercise sessions occurred, resulting in an overall adherence of 67.3%. Reasons reported by participants for missing scheduled exercise therapy sessions were noted by study personnel and are reported in Table 2. Nearly one-third (31.0%) of study exercise

**Table 1** Questions used in focus group discussions

1. What were your main reasons for participating in this study?
2. What would help motivate firefighters to participate in an exercise program?
3. What changes did you notice in your physical abilities after doing the exercises?
4. What did you like about the exercises?
5. What did you not like about the exercises?
6. What changes would you make to the exercises?
7. What would make it more practical for firefighters to perform exercises on duty?
8. What would help firefighters perform exercises over the long-term?

**Table 2** Reasons for missing study exercise therapy sessions

Reason	n	%
Leave (eg, vacation, personal, sick)	316	31.0
Unknown	182	17.9
Withdrew from study	129	12.7
Permanent transfer to control station	122	12.0
Temporary transfer to control station	103	10.1
Rest before planned study assessment	39	3.8
Out on call	33	3.2
Could not complete exercises (health reason)	30	2.9
Temporary restriction in full duty status	24	2.4
No exercise specialist available	12	1.2
Could not complete exercises (other reason)	9	0.9
Completing mandatory training	8	0.8
Not in fire station	8	0.8
Did not meet eligibility criteria	3	0.3
Total	1018	100

**Note:** n: number of exercise therapy sessions.

therapy sessions were missed because participants were on leave, while no reason was given for 17.9% of missed exercise therapy sessions; these two reasons alone accounted for nearly half (48.9%) of the incomplete adherence observed in the previous RCT. Since participants were randomized to the two study groups (exercise therapy and control) according to their usual fire station, those temporarily assigned to fire stations without the study exercise machine (ie, Roman chair) were not able to complete scheduled exercise therapy sessions.

### Answers to focus group questions

The open-ended questions used to guide the focus group discussions elicited a variety of responses from participants, and the qualitative analysis of those answers uncovered a variety of main themes for each question, which are outlined in Table 3, along with sample answers related to each of those themes (note: sample answers were edited slightly for clarity as they were often part of longer sentences). Some of the main themes identified in our analysis that recurred in the responses to numerous questions included establishing a schedule for exercise, providing incentives to exercise, supervision of exercise, and the importance of camaraderie to encourage exercise. Discussions related to overcoming the key intrapersonal, interpersonal, and institutional barriers to exercise therapy adherence are summarized further on in this article and in Table 4.

### Overcoming the key intrapersonal barrier to exercise therapy adherence

The key intrapersonal barrier to completing study exercise therapy sessions was a lack of self-motivation. When asked about their initial motivation to enroll in the previous

RCT, participants cited six general factors: (1) a desire to exercise, (2) interest in exercises related to low back pain, (3) the opportunity to receive exercise supervision, (4) to foster group cohesiveness and competitiveness, (5) to receive financial incentives, and (6) for perceived health and physical fitness benefits. This understanding of the reasons underpinning the motivation to exercise could be incorporated into future studies to increase adherence to exercise therapy. Suggestions to increase exercise adherence in future studies that were made by focus group participants included providing education and periodic reminders about the specific health benefits of exercise; emphasizing the link between exercise, physical fitness, and job performance; providing individual incentives for exercise adherence and performance; and periodically changing the study exercise routine.

### Overcoming the key interpersonal barrier to exercise therapy adherence

The key interpersonal barrier to completing study exercise therapy sessions was a perceived lack of peer support to engage in these exercises from other crew members, other shifts within the fire station, other fire stations, fire service management, and peer fitness trainers supervising the exercise therapy sessions. Given the importance of group cohesiveness within fire stations, firefighters indicated they were much more likely to engage in study exercise therapy sessions when their colleagues also did so. Some of the underlying themes related to peer support identified in the focus group discussions included the importance of camaraderie and competitiveness to encourage exercise adherence. Suggestions to increase exercise adherence in future studies included pairing firefighters with exercise buddies to foster mutual support and accountability; providing outside monitoring, supervision, and encouragement of adherence to the exercise program; providing group incentives for adherence to exercise; creating exercise competitions within and between fire stations; clear and public endorsement of exercise by management; and encouraging management to exercise alongside other firefighters.

### Overcoming the key institutional barrier to exercise therapy adherence

The key interpersonal barrier to completing study exercise therapy sessions was having insufficient time to exercise during work shifts. One of the specific reasons cited for not having time to exercise was the necessity to respond to emergency calls while exercising. Emergency calls are difficult to predict

**Table 3** Main themes and sample answers to focus group questions**1. What were your main reasons for participating in this study?**

Camaraderie	"... tight-knit crew and the whole crew decided to do it." "... it was competitive. I try to be better than them and they try to be better than me ..."
Curiosity	"... curious in the machine ... the angles ... how that would affect the back." "... curious about this specific exercise ... it was a different sort of exercise ..."
Health benefits	"... wanted to strengthen my lower back ..." "... the vast majority of injuries are back injuries ... and anything that would lessen that for firefighters ... I would have an interest in."
Incentives	"The money." "... getting paid to exercise, like a professional athlete ..."
Supervision	"... having someone come to you, kind of like your personal trainer ..." "... somebody came in ... like having a personal trainer ..."

**2. What would help motivate firefighters to participate in an exercise program?**

Administration	"... give 30 minutes a shift out of service to work out ..."
Camaraderie	"... as a group activity, I think more people would participate ..."
Convenience	"... a routine short enough it can be accomplished in a reasonable amount of time."
Progress	"Showing results ... especially results from coworkers ... Show what they started with and what they finished up with."
Incentives	"A lot of people are big on incentives ... doesn't have to be monetary ..." "... if you have an incentive, then you will get extra guys ..."
Mandates	"If you force someone to do something, then that works too." "... mandatory is the only way you're going to really get everybody to do it."
Supervision	"... what kept me working out during this research study was that the trainer would come by the station. I knew he was coming ... it was scheduled."

**3. What changes did you notice in your physical abilities after doing the exercises?**

Less pain	"... sleeping on my stomach, I would wake up with some lower back pain. While I was doing the study and after, it has been pretty much gone for the most part."
Confidence	"... my confidence level was higher in my back ... So, now when I do go pick up a patient, I'm like, ah, well, my back's good. I don't have to worry as much."
No changes	"I did not notice any improvement."
Other activities	"... it helped with deadlifts, squats, and any kind of standing exercise that I did." "... it seemed to make a difference with the sit-ups or leg lifts." "... I could do a couple more things that I could not do on the volleyball court ..." "... felt like I had better balance on my skates, and a better pushing-off ability." "... noticed the lower part of my back felt stronger when lifting things ..." "I felt stronger in the core."

**4. What did you like about the exercises?**

Back muscles	"... the concentration of that one area ... the back itself ..." "... focused right on your erector spinae. ... I liked it."
Competitiveness	"... I wanted to compete." "I like that it was a challenge ... physically and mentally."
Simplicity	"... the simplicity of the exercises was what appealed to most people ... you did it and walked away ... do not have to haul around a lot of equipment or anything."

**5. What did you not like about the exercises?**

Difficulty	"I don't know if it was pain or strain, but you hit a plateau and you can't do any more." "... difficult to keep the form the way that you tell us to do it ... without getting exhausted."
Schedule	"... the timing ... exercises would fall when I wanted to sit down and eat breakfast before I get the next call." "Sometimes the trainer could come right after we were done eating."

**6. What changes would you make to the exercises?**

Progression	"... too many repetitions to move to the next position/angle. If you lower them down a little bit ..."
Technique	"... when you twisted your toes in ... it put a lot more pressure on your knees ... Maybe keep them parallel and you can concentrate more on your back."
Pacing	"If I did it at my own pace ... not fast, but faster ..."
Exercise variety	"Mix it up a little bit, instead of doing the same thing ... maybe every now and then throw in a different exercise."
Schedule	"... have a set time frame when the trainer is going to be there, that would help a lot. We could structure our days a little bit easier. Set a schedule."

**7. What would make it more practical for firefighters to perform exercises on duty?**

Schedule	"... have the chief schedule it and tell you in the morning, hey, you guys go ahead after lunch from 1:30 to 2:00, take that half hour and work out."
Supervision	"Having someone come by the station ... keep you in the routine." "... maybe we could somehow broaden the peer fitness instructors ... have one assigned to every station on every shift ..."

(Continued)

**Table 3** (Continued)**8. What would help firefighters perform exercises over the long-term?**

Incentives	“Incentives – just incentives of some kind.”
	“... maybe set benchmarks ... For the incentive you have to do this many things ...”
Schedule	“... set a time.”
	“Be there every shift at a certain time. This is when we are going to work out.”

and fluctuate in frequency over time. On further discussion, focus group participants acknowledged that responding to emergency calls did not consistently prohibit adherence to study exercise therapy sessions, but occasionally interrupted them, after which it was difficult or inconvenient to resume them later due to meals, sleep, and other planned work activities. Other underlying themes identified in focus group discussions that were related to having insufficient time to exercise during work shifts included the importance of making exercises both convenient and simple to encourage adherence. Suggestions to increase exercise adherence in future studies included scheduling regular time for exercise in every shift, with scheduled back-up time slots if cancelled or interrupted; exercising as groups rather than individuals; planning meals around scheduled exercise time; taking turns covering emergency calls while others exercise; planning more frequent, shorter exercise sessions; and accepting that exercise sessions may be interrupted and resumed without harm.

## Discussion

The exercise therapy protocol in the previous RCT required participants to complete twice-weekly sessions for 24 weeks to increase and maintain gains in muscular endurance in back

and core muscles, which was intended to reduce their risk of future back injuries.<sup>8</sup> However, participants completed, on average, only 67% of the desired 48 study exercise therapy sessions. Although statistically significant gains were observed in back and core endurance in study participants, this suboptimal adherence may have tempered the potential benefits of exercise therapy.<sup>8</sup> Given that firefighters have challenging physical demands, a high prevalence of obesity, generally low levels of physical activity, and a potential increased risk of cardiovascular disease, all of which may benefit from increased adherence to exercise therapy, it is important to understand barriers and facilitators to exercise in this population.<sup>1,9,14</sup>

The key barriers to exercise therapy adherence identified in focus group discussions were related to lack of self-motivation, insufficient peer support to exercise, and making time to exercise during each work shift. Similar barriers have been reported in previous studies examining adherence to exercise in other settings. For example, focus group discussions were held with patients with type 2 diabetes mellitus who had previously participated in a study involving supervised exercise therapy to explore barriers and facilitators to continuing exercise adherence after the study

**Table 4** Key barriers and potential facilitators to exercise therapy adherence identified in focus group discussions

Aspect	Key barrier	Potential facilitators
Intrapersonal	Lack of self-motivation to exercise	<ul style="list-style-type: none"> <li>• Education and periodic reminders about the specific health benefits of exercise</li> <li>• Emphasizing the link between exercise, physical fitness, and job performance</li> <li>• Providing individual incentives for exercise adherence and performance</li> <li>• Periodically changing the exercise routine</li> </ul>
Interpersonal	Lack of peer support to exercise	<ul style="list-style-type: none"> <li>• Pairing firefighters with exercise buddies to foster mutual support and accountability</li> <li>• Providing outside monitoring, supervision, and encouragement of adherence to exercise program</li> <li>• Providing group incentives for adherence to exercise</li> <li>• Creating exercise competitions within and between fire stations</li> <li>• Clear and public endorsement of exercise by management</li> <li>• Encouraging management to exercise alongside other firefighters</li> </ul>
Institutional	Lack of time to exercise during work shifts	<ul style="list-style-type: none"> <li>• Scheduling regular time for exercise in every shift, with scheduled back-up time slots if cancelled or interrupted</li> <li>• Exercising as groups rather than individuals</li> <li>• Planning meals around scheduled exercise time</li> <li>• Taking turns covering emergency calls while others exercise</li> <li>• Planning more frequent, shorter exercise sessions</li> <li>• Accepting that exercise sessions may be interrupted and resumed without harm</li> </ul>

was completed.<sup>16</sup> The main themes identified were that it was challenging to sustain motivation to exercise despite knowing the health benefits of exercise, making it difficult to transition from supervised to independent exercise. Participants in that study suggested that researchers consider providing follow-up after the supervision ends to maintain the benefits achieved.

These findings are consistent with those reported in a previous study using focus group discussions to uncover barriers and facilitators to worksite physical training (ie, exercise) in firefighters.<sup>14</sup> Motivation was the most important intrapersonal factor influencing exercise adherence, while crew dependability, cohesiveness, and group norms (ie, usual or expected beliefs and behaviors regarding exercise) were important interpersonal factors. Institutional barriers to exercise adherence included having to respond to emergency calls and other work activities, and having insufficient or inadequate space and equipment to exercise in fire stations; the required annual fitness testing was identified as an institutional facilitator to exercise, providing motivation and incentives to exercise regularly. This suggests that the barriers to worksite exercise reported by firefighters may be somewhat constant and do not vary based on the type of exercise (eg, general physical training, back endurance exercises). It is unclear if proposed facilitators for one type of exercise could also enhance participation for others.

Perceived barriers can interfere with healthy behaviors such as exercise by highlighting their disadvantages until they are perceived to outweigh their benefits, rationalizing one's decision to not engage in them.<sup>14,17</sup> Health promotion programs must therefore anticipate and mitigate potential barriers to increase exercise participation, frequency, intensity, and duration of exercise.<sup>17-19</sup> A study of worksite fitness center use reported that the most common barriers to exercise were insufficient time, lack of motivation, negative attitude about exercise, internal factors (eg, embarrassment), and external factors (eg, high cost).<sup>17</sup> It also found that while reducing external barriers could increase initial exercise participation, overcoming internal barriers was necessary to enhance long-term adherence. Proposed facilitators included helping with goal-setting related to exercise adherence and performance, public recognition for achieving goals, expressing managerial support for exercise, and external monitoring of adherence.<sup>18,20</sup>

Because participating in an exercise therapy program is a voluntary decision that requires a substantial time commitment, self-motivation is necessary to initiate and sustain this effort. Since approximately 50% of those who start a new exercise program will discontinue it within 6-12 months, lack of motivation to continue exercising is a

common barrier to long-term adherence.<sup>16,18,21,22</sup> The health belief model is based on the principle that healthy behaviors are determined by health beliefs, which are in turn related to the perceived seriousness of disease(s) that can be mitigated by healthy behaviors, individual susceptibility to disease(s), the perceived benefits of engaging in healthy behavior, and potential barriers to healthy behaviors.<sup>20</sup> To change to healthy behaviors, the perceived benefits of the new actions must outweigh their perceived costs, which can be influenced by providing financial or other incentives (ie, benefits) to help offset the time spent exercising (ie, costs).<sup>19,23</sup>

However, previous studies on financial incentives to increase exercise adherence have reported mixed findings, and some have suggested that such incentives are most commonly disbursed to those who exercise already, and are thus insufficient to entice non-exercisers to change their behavior.<sup>19</sup> A systematic review of financial incentives for weight loss interventions – which often involve exercise therapy – reported mixed results, suggesting that such incentives achieved mostly modest, short-term effects.<sup>24</sup> The review also noted that incentives based on changing exercise behavior (eg, increasing frequency of exercise) had a greater impact than those based solely on outcomes (eg, weight loss achieved), and that incentives for group performance were more effective than those aimed at individuals. Other factors that may influence exercise adherence include the variety of exercises, external supervision of exercise, participating in group exercise, and management support of exercise initiatives.

A study in which participants were randomized to a high-variety exercise program with ten different pieces of equipment performed 44% more repetitions, spent 18% more time exercising, and had 14% higher levels of enjoyment than those assigned to the low-variety group that used only two pieces of equipment.<sup>25</sup> Previous studies have also reported that the benefits of supervised exercise may be related to greater levels of external motivation, verbal encouragement, social support, increased competitiveness when performing in front of someone else, peer pressure, and faster progression through different levels of resistance when dictated by someone else.<sup>26,27</sup> These findings are consistent with those of previous studies exploring why individuals hired personal trainers to supervise exercise, which reported that motivational skills and empathy were more appreciated than pure technical knowledge related to exercise.<sup>16,28</sup>

Firefighters often develop strong bonds with their crew members, with whom they spend extended periods, often rotating through 24-hour shifts and 48-hour periods of rest.<sup>3,29</sup> The tight-knit structure of crews working the same

shift encourages high levels of cohesiveness, and firefighters often schedule activities as a group, which previous studies have suggested provide a natural setting for team-based exercise programs.<sup>3,14</sup> Facilitators to exercise adherence may include pairing firefighters with “exercise buddies” to foster mutual support and accountability.<sup>14</sup> Since firefighters function within hierarchical organizations, management may influence healthy behaviors such as exercise, and should therefore be encouraged to exercise alongside firefighters of lower rank.<sup>14</sup>

## Study limitations

There are limitations to this study that may hinder the validity and generalizability of its findings. One of the main objectives of focus group discussions is to identify important or recurring themes in a specific group of individuals that may not be otherwise apparent to those outside that group.<sup>14</sup> This can be accomplished by having a moderator ask open-ended questions designed to elicit responses related to the themes of interest and encouraging participants to share their opinions openly. Such discussions continue until the moderator believes that a point of saturation has been reached on a given topic, after which it is unlikely that new themes will be uncovered. Findings from focus group discussions are therefore intended to be qualitative in nature, rather than tabulated and quantified as with surveys.

The qualitative analysis of transcripts from focus group discussions can potentially be influenced by the investigators’ personal biases. Steps were taken to minimize this possibility by having two investigators complete their qualitative analyses independently prior to reaching consensus on important themes and key barriers.

Participation in both the previous RCT and in the focus group discussions was voluntary, making it possible that the opinions expressed were not representative of firefighters at Tampa Fire Rescue.

In addition, the barriers and potential facilitators related to adherence to worksite exercise therapy for back and core muscle endurance uncovered in focus group discussions with firefighters may not be generalizable to other study populations, settings, or forms of exercise therapy.

## Conclusion

Focus group discussions were held with firefighters who had participated in a RCT involving worksite exercise therapy for back and core muscle endurance to reduce the risk of back injuries. A qualitative analysis of participant feedback uncovered key intrapersonal, interpersonal, and institutional

barriers to complete exercise therapy adherence, including lack of self-motivation to exercise, lack of support to exercise from colleagues, and lack of time to exercise during work shifts. Numerous potential facilitators were suggested to improve adherence to exercise therapy in future studies. Additional research is required to determine if implementing one or more of the proposed facilitators will successfully increase adherence to exercise therapy and in turn improve the gains achieved in back and core muscle endurance to reduce back injuries. Although the barriers and facilitators identified in focus group discussions were specific to firefighters, the underlying themes may also be helpful to investigators designing exercise therapy protocols for other settings and populations.

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## Disclosure

The authors attest that they do not have any conflicts of interest, financial or otherwise, related to the subject matter discussed in this work.

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