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ORIGINAL RESEARCH

# THE DEVELOPMENT AND APPLICATION OF AN OBSERVATIONAL AUDIT TOOL FOR USE IN AUSTRALIAN FITNESS FACILITIES

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## ABSTRACT

**Introduction:** To ensure a minimal chance of injury, it is important for fitness facilities to provide users with a safe environment. The aim of this study was to pilot an observational audit tool (OAT) developed specifically for fitness facilities across Australia.

**Methods:** An OAT was designed, trialled and amended to ensure objective components. Audits were conducted at 11 regional and metropolitan fitness facilities across four Australian states. Face and content validity of the tool was assessed.

**Results:** The OAT was found to have high face and content validity. The median recorded temperature in each activity area was above the American College of Sports Medicine (ACSM) recommended level; however, the median illuminance of each area was below these levels. The median distance behind treadmills was found to be less than the minimum distance recommended by manufacturers. In the majority of facilities, walkways were clear of obstacles (eight facilities) and most floor surfaces were in good condition (ten facilities). Only five facilities were supervised at all times, and only six clearly displayed their rules and etiquette. Free weights equipment was observed laying on floors (not in dedicated storage areas) in seven facilities.

**Conclusions:** Fitness facility operators are advised to conduct regular risk assessments to ensure that rules and behaviour policies are easily seen and followed. It is desirable to have a systematic risk management program that is standardised throughout Australia to ensure the risk of injuries associated with poor risk management, as well as the likelihood of consequent legal liability, are reduced.

**Practical applications:** Observational safety audits that are regularly conducted in fitness facilities are an important tool that can help to identify potential injury-causing hazards so that they may be controlled.

**Keywords:** safety; risk management; injury; fitness centre; audit

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## INTRODUCTION

An audit is a "systematic, independent and documented verification process of objectively obtaining and evaluating evidence to determine whether specified criteria are met".[1] Audits are useful to maintain the integrity of regulatory systems, to ensure credible and robust regulation, and to improve compliance with these. Observational audits are a valuable and important activity that can be undertaken to assess the safety of any physical environment.[2] Observational audits can identify unsafe practices and point the way toward improvements.[2]

Observational audits are often conducted with the aid of a checklist or form. Questions or topics within them are designed to document the characteristics of an environment objectively, enabling the features of the environment to be observed consistently and recorded transparently. Observational audit tools have been used for a variety of applications, including documenting the use of non-sterile gloves in acute hospital settings,[3] assessing pilot performance,[4] and determining the safety of environments for sport and physical activity.[5]

By their nature, fitness facilities can contain numerous injury hazards. They house heavy equipment for the purpose of physical exercise, some of which is motorised, heavy free weights, pin-loaded weight machines, wet areas (such as showers), steps and stairs, and high-traffic areas such as group exercise areas. There are many opportunities for adverse incidents leading to injury to occur. Some examples include facility users falling (in the course of their exercise regime or walking throughout the facility), experiencing body contact with other users or with equipment, and misusing equipment.[6]

Safety is an important issue that needs to be considered by the operators and staff of a fitness facility and its users to ensure minimal risk of injury or adverse health effects.[7] A high proportion of fitness facility users surveyed in one Australian study believed that responsibility for their own safety lay with them rather than with facility management.[8] Three other studies, however, have identified that staff training in safety and risk management is vital to ensure minimal risk of injury.[7, 9, 10] It is in the best interests of fitness facilities, to implement a safe and well-maintained environment to ensure the safety of its users.[9, 11]

Australia currently has no nationwide standards or guidelines for setting up and operating fitness facilities. However, under the Work Health and Safety (WHS) legislation, fitness facilities have a duty to provide a safe and healthy environment for their users and employees.[12] These WHS regulations require employers to identify hazards and assess and control identified risks through process-based standards that rely on documentation requirements. There are general WHS codes of practice providing practical guidance to achieving WHS requirements (e.g. How to Manage Work Health and Safety Risks, Managing the Risk of Falls at Workplaces, First Aid in the Workplace).[12, 13] However there are no specific WHS codes of practice targeting WHS risks in the fitness industry.[14] When there is no regulation, ministerial notice or code of practice about a risk, the WHS framework requires a person to take reasonable precautions, and exercise proper diligence to manage exposure to risks in the best possible way.[9, 12] The various voluntary or mandatory state and territory fitness industry codes of practice across Australia only provide relatively limited guidance about health and safety risks. Accordingly, an observational health and safety audit tool designed specifically for fitness facilities and implemented in those facilities has the potential to help improve the physical environments. This, in turn, should help reduce the risk of injury or adverse health effects to people who use those facilities and hence also the legal liability risks to facility businesses associated with adverse events.

The primary aim of this research was to develop and pilot an observational audit tool for use in Australian fitness facilities. A secondary aim was to pilot this tool to assess the health and safety conditions of 11 fitness facilities sampled across Australia.

# METHODS

## Observational audit tool development

The Australian Fitness Industry Risk Management (AFIRM) Project was designed to determine how Australian regulation currently controls risk management in the fitness industry.[15] As part of this project, it was considered important to observe and record information as to current safety practices, relating to the layout, operating procedures and conditions of a sample of fitness facilities.

The items in the observational audit tool (AFIRM-OAT) were developed based on peer-reviewed and grey literature,[14, 16-18] example audits of similar facility types,[19, 20] the American College of Sports Medicine`s (ACSM) fitness facility standards and guidelines[21-23] and Australian WHS and fitness industry codes of practice. This tool was designed to ensure that all major areas of typical fitness facilities were covered.

Based on the literature, 81 potential items were developed which were then divided into the main physical or operational areas of a fitness facility: environment, cardiovascular equipment, weight machines, free weights, group exercise studios, stretching areas, emergency situations and procedures. The audit tool was reviewed and checked by the co-authors, who come from diverse but complementary disciplines.

The AFIRM-OAT comprised a set of sequential questions enabling an auditor to record a binary response, a direct measurement (e.g. distance between equipment), or to select from several options. Depending on the question, multiple answers could be selected. For example, the question "is entry/exit to the facility suitable for disabled access" could only be answered with a yes or no response. At different locations around the facility (for example in the free weights area) temperature, humidity and levels of brightness required measuring with standard equipment, to a specified level of precision. Minimum gap measurements between common pieces of cardiovascular equipment (behind, front, left and right) were taken using the measuring tape. For the question "what is behind the treadmills (within 2 metres)" the response options included "free space", "railing", "other equipment" or "pillar".

The AFIRM-OAT then underwent review by a multidisciplinary panel of experts to ensure its content validity. This panel comprised expertise in injury prevention, legal liability, occupational health and safety, and sports science. The final paper-based AFIRM-OAT, which contained 81 items, was divided into the following sections:

- Environment
  - Entry to facility (3 items)
  - General facility environment (19 items)
- Cardiovascular/motorised equipment (19 items)
- Weight/selectorised machines (14 items)
- Free/plate-loaded weights (14 items)
- Emergency situations (8 items)
- Procedures (4 items).

The multidisciplinary panel of experts also revised some questions to ensure that they were well-aligned with the specific aims of the AFIRM project and key findings from its nationwide survey of the Australian fitness industry.[11] Surveyed fitness professionals indicated that they wished to be more informed of emergency situations and procedures, therefore 12 of the 81 items in the AFIRM-OAT were devoted to this. A copy of the AFIRM-OAT is available upon request from the authors. Ethics approval was granted by a recognised ethics committee.

## Conducting the audits

Equipment required to conduct these audits was intentionally kept to a minimum and included a measuring tape, a thermometer, hygrometer and light meter. Rather than using three separate meters, a multi-function environment meter (Digitech QM1594), which is capable of measuring temperature, humidity and light intensity, was used alongside the measuring tape. The same equipment was used for all audits.

Opportunistic sampling was used to recruit 11 fitness facilities to undergo observational audits. These were selected based on the research team's connections and location across Australia, however there were no conflicts of interest or other connections between auditors and facilities. These

11 facilities spanned seven Australian cities across New South Wales, Queensland, South Australia and Victoria. Given the geographical spread of the facilities, seven different research team members conducted the audits. All were trained and supervised by the same person on how to use the tool and equipment, to ensure its consistent use.

At the end of the study, written feedback from each auditor regarding the OAT and its use was also obtained, collated and summarised by the lead author in order to further refine the AFIRM-OAT where necessary for future studies.

### Analysis

All data collected were de-identified as to the specific facility. The AFIRM-OAT results were entered into SPSS, and descriptive frequencies were generated to determine the risk management status conditions of the eleven facilities.

## RESULTS

Feedback from the auditors demonstrated that the AFIRM-OAT was well set out, straightforward and easy to use. On this basis, it was considered to be adequate for the purpose of assessing the health and safety conditions of different areas of fitness facilities that were relevant to the AFIRM project. The items were considered to have met the project's objectives by providing the information that the tool was aiming to provide.

Physical measurements using the multi-function environment meter, (i.e. temperature, humidity and illuminance) were recorded for each of the activity areas (cardiovascular equipment, weight machines and free weights). Table 1 displays the minimum, maximum, mean, and median for each area and measurement, as well as the ACSM guidelines for comparison[22] given the absence of specified Australian guidelines.

All facilities had separated activity areas. Table 2 shows the descriptive statistics of the distances around common items of cardiovascular equipment.

Table 3 shows the number of facilities with observed negative risk management characteristics.

## DISCUSSION

Observational audits are a valuable tool for the assessment of health and safety risks in the physical environment of fitness facilities. It is known that injuries occur at fitness facilities[24] and, in light of the literature on injury causation,[6] we believe that many injuries could be prevented through the development of management techniques and procedures grounded in the data that can be generated by such audit tools. Having an

Table 1: The descriptive statistics for temperature, humidity and illuminance of each activity area across eleven fitness facilities and the ACSM guidelines.22

| | temperature (°C) | | | | humidity (%) | | | | illuminance (Lux) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | min | max | mean | median | min | max | mean | median | min | max | mean | median |
| cardiovascular equipment area | 21.6 | 26.0 | 23.4 ± 1.1 | 23.5 | 39.0 | 76.0 | 52.6 ± 9.6 | 51.0 | 12.0 | 807.0 | 164.1 ± 233.0 | 82.0 |
| weight machine area | 20.7 | 26.0 | 23.5 ± 1.4 | 23.5 | 40.0 | 66.0 | 52.0 ± 7.1 | 51.0 | 12.0 | 800.0 | 179.7 ± 227.5 | 120.0 |
| free weight area | 20.7 | 25.6 | 23.4 ± 1.5 | 23.6 | 41.0 | 64.0 | 52.1 ± 6.6 | 51.5 | 15.0 | 320.0 | 85.2 ± 90.9 | 65.5 |
| ACSM recommended | 68-72°F (20-22.2°C) | | | | ≤60% | | | | ≥50 foot candles (538.2Lux) | | | |

*Note. "min" and "max" are the minimum and maximum observed across all facilities. One facility did not have a free weights area.*

Table 2: The minimum, maximum, mean and median distances (to the nearest centimetre) around common pieces of cardiovascular equipment

| | | minimum (cm) | maximum (cm) | mean (cm) | median (cm) |
|---|---|---|---|---|---|
| Treadmills | behind | 45 | 172 | 105 ± 42 | 94 |
| | front | 3 | 156 | 74 ± 51 | 78 |
| | left | 4 | 140 | 25 ± 41 | 11 |
| | right | 3 | 31 | 12 ± 9 | 11 |
| Elliptical trainers | behind | 41 | 247 | 112 ± 66 | 104 |
| | front | 35 | 168 | 104 ± 48 | 102 |
| | left | 10 | 110 | 45 ± 35 | 30 |
| | right | 12 | 110 | 43 ± 36 | 27 |
| Rowing machines | behind | 106 | 800 | 218 ± 209 | 146 |
| | front | 24 | 147 | 70 ± 48 | 46 |
| | left | 27 | 80 | 54 ± 21 | 58 |
| | right | 27 | 93 | 59 ± 26 | 62 |
| Exercise bikes | behind | 39 | 800 | 202 ± 217 | 141 |
| | front | 20 | 153 | 67 ± 40 | 64 |
| | left | 21 | 72 | 44 ± 17 | 40 |
| | right | 29 | 65 | 43 ± 11 | 44 |
| Recumbent bikes | behind | 24 | 250 | 91 ± 64 | 81 |
| | front | 20 | 173 | 78 ± 49 | 71 |
| | left | 15 | 192 | 49 ± 52 | 33 |
| | right | 19 | 41 | 31 ± 7 | 32 |
| Stair climbers | behind | 56 | 194 | 104 ± 45 | 110 |
| | front | 10 | 781 | 188 ± 266 | 92 |
| | left | 7 | 195 | 42 ± 68 | 16 |
| | right | 7 | 93 | 31 ± 31 | 18 |
| Steppers | behind | 20 | 280 | 111 ± 84 | 89 |
| | front | 0 | 150 | 56 ± 51 | 62 |
| | left | 10 | 90 | 38 ± 28 | 31 |
| | right | 10 | 240 | 78 ± 72 | 64 |

observational audit tool specifically designed for fitness facilities would enable the safety of their physical environment to be improved, leading to reduced risk of injury or adverse health effects.

Table 3: Examples of AFIRM-OAT findings that demonstrate negative risk management characteristics and the number of facilities observed with each condition

| no. facilities with this condition | condition |
|---|---|
| 0 | Signs informing users to turn off equipment |
| 1 | Rips/tears/splinters/protruding nails in its floor |
| 1 | Cardiovascular machine was broken and not sign posted |
| 2 | Uneven floors (excluding defined steps and ramps) |
| 3 | Not suitable for movement of disabled throughout the facility |
| 3* | Non-functioning lights |
| 3* | No signs instructing users to put weights away after use |
| 3* | No appropriate storage for all equipment |
| 4 | No signs asking for users to wipe down weight machines after use |
| 5 | No sign enforcing the use of a towel |
| 5 | No rules or etiquette displayed |
| 6 | Facility floor unsupervised at all times |
| 6 | No visible evacuation plan |
| 6 | No signs asking for users to wipe down cardiovascular equipment |
| 6 | Not all weight machines had instructions on how to use them |
| 7* | Equipment lying on the floor (not in storage) |
| 8 | No emergency response plan displayed |
| 8 | Visible electrical cords or wiring (with no attempt to hide) |

*Note. * denotes that number given is from 10 facilities not the full 11 due to incomplete audits.*

The physical environment of the 11 fitness facilities audited in this study was assessed using the specifically developed AFIRM-OAT. The face validity of the AFIRM-OAT was evaluated during pilot testing, and found to be successful in covering the areas that it aimed to measure. Feedback from auditors was that the AFIRM-OAT was straightforward and easy to use. The questions were generally deemed to be clear and concise. The auditors felt that some questions with binary responses could be limiting, however. The consensus was that for many of the binary responses a 'not applicable' option should be added, as not all items were relevant to all facilities. For example, auditing a facility in relation to changes in elevation (e.g. ramps, stairs) and whether this change is clearly identifiable is not applicable when a facility is all on one level. For questions relating to supervision, many auditors felt that the level of supervision should be provided as opposed to only a yes/no that supervision is provided. They suggested that the supervision questions could be answered on a Likert scale, ranging from 'never' to 'always'. Without time guidelines for each option, and the time to observe the level of supervision, this could introduce an element of subjectivity that would require pre-application testing. Additionally, determining the degree of supervision may be limiting and not necessary for the OAT if its aim is to be used at all fitness facilities. For example, fitness facilities that never close are unsupervised the majority of the time, and therefore it is meaningless to require auditors to record this. Therefore, for future versions of the OAT the item related to supervision could be removed, and instead, individual fitness facilities could address their operational practices themselves, which includes supervision.

Overall, the trial results showed that the extent of observable risk management practices and the level of maintenance and upkeep varied considerably among facilities. As noted above, currently, there are no Australian standards or guidelines specifically for the physical environment of a fitness facility (aside from the WHS

framework), therefore international standards and guidelines and recommendations from those who work in the industry can be used for comparison of results.

Accordingly, given the lack of specific Australian standards or guidelines for the temperature, humidity and illumination of facilities, measurements were compared with ACSM guidelines.[22] Observed temperatures were higher than recommended in all activity areas. This could be due to insufficient air conditioning or air circulation in the observed facilities. It is possible that given Australia is an overall warmer climate than the United States, the population is capable of tolerating warmer ambient temperatures for physical activity and temperatures can be marginally higher. No studies were found comparing these, however Australia recommends particular levels of caution at overall higher temperatures than the United States. The mean humidity for each activity area was within the ACSM's guidelines. Sports Medicine Australia has published 'Hot Weather Guidelines' that provide information on adverse health effects should overheating occur due to high temperature and humidity (such as dizziness, nausea and loss of consciousness).[25] These effects could be particularly dangerous should the facility user be lifting weights or using motorised equipment when overheating occurs. Given that the ACSM guidelines provided the recommended illumination in foot candles (≥50 foot candles), this was converted to the SI unit of Lux (538.2 Lux). Illumination in all areas was on average much lower than the ACSM recommended level. This could be due to poor facility set-up by management (e.g. equipment obstructing lights), all lights may not have been switched on, or lights may not have been fully functional. Poor lighting could not only strain eyes, but make it more difficult to see and avoid hazards. Our auditing identified that illumination was generally lower in the free weights area than both the cardiovascular equipment and weight machine areas, which were bright enough at some facilities. Considering that exercise with free weights is technique-based,[26] illumination should be higher in these areas to enable participants to see sufficient detail. For all measurements, there were facilities that did not meet the recommended ACSM levels.[22]

The minimum distance behind a treadmill was 45cm. Therefore, if a user is thrown off the back due to a fall or inability to keep up it could result in severe injury,[6] including death,[27] especially if there is contact with other equipment or a wall. Treadmill use/misuse is often reported to result in one of the highest level of injuries of all equipment in fitness facilities.[6] An unpublished study by Sekendiz et al[28] used the data from this AFIRM-OAT to compare Australian practices with international industry standards and manufacturer guidelines for treadmill clearances (which differ depending on the manufacturer), and found that none of the 11 audited facilities complied with all of these. Failure to comply with industry standards and manufacturer guidelines could be due to: (a) the insufficient size of the facility compared to the number of users and the amount of equipment it contains to meet demand; (b) poor layout of the facility; (c) a lack of awareness about the risk of treadmill injuries; or (d) a lack of published industry standards in Australia.[28] However, manufacturers' guidelines can still be used by courts to determine standards of fitness facility layout design and use. Failure to comply with these guidelines can lead to breaches of WHS requirements and successful liability claims by injured patrons for breach of a duty of care. The large variation in distances behind treadmills and around other pieces of equipment, as well as the variation in the recommended treadmill manufacturer guidelines, highlights the need for future research into safe equipment clearances.

Attention should also be given to the items where more than half of the facilities failed to exhibit each condition (see Table 3). Lack of supervision in a facility can lead to heightened injury risk,[9] particularly if patrons engage in dangerous training practices when qualified fitness professionals are not available to advise or to assist. A lack of visible emergency response and evacuation plans, especially with no staff available to assist, could lead to adverse events. Objects lying on the floor and not in storage could signify poor

housekeeping practices or poor safety culture in the facility, which reflects negatively on users and management. It is important that fitness facilities both display and enforce safety practices and rules. These findings further justify the need to develop Australian standards and guidelines to improve the safety of fitness facilities for both staff members and users.

The main factors that limited the scope of this pilot testing of the AFIRM-OAT were time and budget. The AFIRM project was only able to transport one trained auditor to each of the 11 facilities. Moreover, this pilot application of the AFIRM-OAT was not able to assess inter-rater reliability (degree of agreement between auditors) of the tool. Nonetheless, its application across the country gives us some confidence as to its broad usefulness and relevance across the fitness sector.

Information regarding the type and size (based on membership and floor space) of the audited facilities was not recorded within the AFIRM-OAT. It is possible that these factors could help to explain the sometimes large variation in results. It will be important to record this information in future versions of the AFIRM-OAT.

For future application of the AFIRM-OAT within fitness facilities by their local staff, there is a need for development of a training manual. Providing an extensive accompanying manual to the AFIRM-OAT would be a good reference resource for those trained to conduct audits, as well as provide the information required for a non-trained person should they need to conduct an audit. On the basis of this study, an example of the content areas that would need to be included in such a manual is:

- an introduction to why the observational audits should be performed
- what the OAT aims to do
- equipment required to conduct the audit
- definitions of equipment (including pictures of each piece so that there is no confusion if different manufacturers refer to the same equipment under different names)
- instructions on how to take measurements
- definitions of terms used in questions
- Australian codes of practice (as the OAT was designed for use in Australian facilities)
- International standards (for comparison, and since these are more extensive)
- question justification
- references
- examples of hazards
- examples of signage

Until Australian fitness facility standards and guidelines for their environment and operation are developed, that are relevant to the Australian context, reference points to international standards should be provided in the AFIRM-OAT manual alongside relevant questions to determine if fitness facilities are meeting minimum industry standards or recommendations for safe operation. Therefore, the AFIRM-OAT could serve as both an observational audit tool to assess the equipment and environment, as well as a risk assessment form that provides control measures to minimise the risks. More extensive research into the application of the AFIRM-OAT and its reference manual is required. This should include inter-rater reliability studies to determine the objectivity of the tool, as well as its usability among untrained fitness facility operators, as well as the potential to include a scoring system to determine a facility's degree of compliance.

## CONCLUSION

The AFIRM-OAT risk management audit tool successfully evaluated the health and safety of the physical environment of fitness facilities, and highlighted areas of the fitness facilities that required improvement. Observational audits to identify hazards should be conducted regularly by fitness facilities. Australia-wide processes and guidelines need to be developed specific to the Australian fitness industry, so that the results of the observational audits may be compared with standards for a high quality of risk management in fitness facilities in the Australian context.

## PRACTICAL APPLICATION

- Australia has no standards and guidelines specific to fitness facilities for setting up and operating their businesses, this study highlights the need for their development
- An observational audit tool specific to the fitness industry that is capable of identifying hazards or other areas of fitness facilities that require improvement can help managers implement more stringent risk management policies
- Having more robust risk management strategies, such as an observational audit tool, will help to ensure that the risk of injury or adverse health outcomes is minimal

## CONFLICTS

The authors declare that there are no conflicting interests.

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