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ORIGINAL ARTICLE

Knowledge and use of work-related musculoskeletal disorder (WRMSD) prevention techniques in the daily practice of final-year Australian sonography students: A cross-sectional study

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Abstract

Introduction: Work-related musculoskeletal disorders (WRMSD) commonly occur among student and qualified sonographers. While students may be educated about preventative techniques, transfer of this knowledge to practice may not occur. The aim of this study was to investigate the association between the theoretical knowledge final-year students had of some common WRMSD prevention techniques, and the use of these techniques on clinical placement.

Methods: A cross-sectional study via anonymous online survey was distributed to Australian sonography students from a single institution completing their final year of clinical placement.

Results: There were 31/81 participants equating to a response rate of 42%. Of the 12 sonography WRMSD prevention techniques selected to be part of this study, participants had theoretical knowledge of 11/12 (91.7%) prevention techniques. A significant association was established between the theoretical knowledge of, and the use of 8/11 (72.7%) prevention techniques. Ergonomic adjustment of equipment 29/31 (92.6%) and postural modifications 28/31 (90.3%) were the WRMSD prevention techniques implemented most frequently. No association was found between the theoretical knowledge and use of stretching prior to or between scanning patients, or the use of ergonomic aids for WRMSD prevention.

Conclusion: Students were found to have retained ergonomic knowledge, utilising both postural and equipment adjustments during clinical placement. Consistent implementation of WRMSD prevention techniques may reduce students' risk of developing a future WRMSD. Longitudinal research is suggested to ascertain if students continue to implement prevention techniques once qualified.

KEYWORDS

ergonomics, injury prevention, sonographer, student

1 | INTRODUCTION

Work-related musculoskeletal disorders (WRMSD) are painful soft-tissue conditions caused by the repetitive and often awkward nature of some workplace activities.^{1,2} The poor posture and prolonged static body positions sonographers adopt whilst scanning mean they are at risk of developing WRMSD of the shoulders, neck, back and upper extremities with the associated consequences ranging from mild pain to a career ending injury.²⁻¹¹ Despite significant improvements to the ergonomics of ultrasound equipment over the previous two decades, the prevalence of work-related pain among sonographers is currently reported at a rate above 90%.^{3-5,11,12} A high prevalence rate has similarly been reported among sonography students, which is of concern, given they are just beginning their professional career.^{13,14}

Ergonomic interventions involve the adjustment of a users' workspace and environment for the prevention of WRMSD, however, these can only be effective if utilised.¹⁵ Recommendations for WRMSD interventions, and for improvements in education of preventative measures are ample in the literature.^{8,9,16-19} Nevertheless, there is limited evidence to support the habitual use and lasting effectiveness of individual WRMSD prevention techniques, including ergonomically friendly scanning practices. Previous research found students did not make injury prevention a priority in their daily practice, but instead prioritised diagnostic image production above posture and ergonomics.² Similarly, WRMSD prevention workshops and multimedia presentations were reported as effective short-term interventions; however, participants often returned to previous detrimental habits within months.^{16,17} These findings emphasise the importance of sonographer-specific ergonomics education, the formation of safe scanning behaviours, and the need for the constant reinforcement of ergonomic practices within the student population.^{12,14,16,17}

Although sonography students may learn some WRMSD prevention techniques during their education, the nature of their work means they are at greater risk of developing a future WRMSD if they do not use these techniques effectively.^{12,16,17} The aim of this research was to investigate the theoretical knowledge of a subset of WRMSD prevention techniques that final-year sonography students possess, to investigate the students use of these techniques to prevent future WRMSD. This research will inform on how the injury prevention techniques selected for this study were implemented among this cohort of sonography students. It will also inform on the current ergonomics education students receive, with the aim to increase the use of WRMSD prevention techniques in the clinical practice of future sonography students.

2 | METHODOLOGY

2.1 | Study design

An original 10 question survey instrument (Figure 1) was formulated for this quantitative cross-sectional study, and checked for appropriateness and clarity by an academic sonographer. The target population were final-year Australian sonography students. All

Questions:

1. Are you a final-year sonography student currently enrolled in MEDS20017 Medical Sonography Clinical Unit 4 for Term 2, 2021?
 - a) Yes
 - b) No
2. What is your gender?
 - a) Female
 - b) Male
 - c) Other
3. What is your age (in years)?
 - a) <18
 - b) 18-24
 - c) 25-29
 - d) 30-34
 - e) 35-39
 - f) ≥40

These questions relate to your knowledge of work-related musculoskeletal disorder (WRMSD) prevention techniques in both your university education and clinical training

4. Prior to clinical placement, had you received education and training on the importance of ergonomics, and interventions that may prevent the development of scanning pain and injuries?
 - a) Yes - theoretical techniques via educational lectures only, no practical training was delivered
 - b) Yes - education in both theory methods (in lectures) and practical methods (in labs) of injury prevention techniques and recommendations
 - c) No - training was not received prior to clinical placement
 5. If you received pre-clinical injury prevention education, what was the earliest stage of your university education at which this occurred?
 - a) First year
 - b) Second year
 - c) Third year
 - d) N/A - I did not receive pre-clinical injury prevention education
 6. Whilst on your clinical placement, have you been educated by your clinical supervisor on methods that aim to reduce pain and injury development whilst scanning?
 - a) Yes - I received practical education at the beginning of my placement and I receive constant feedback from supervisors regarding my ergonomics
 - b) Yes - I received education at the beginning of my placement; however, it has been left up to me to implement this education
 - c) No - this is assumed knowledge from my university course
 7. Which interventions/ techniques are you familiar with as WRMSD prevention techniques? Select all that apply.
 - a) Stretches and/or exercises prior to scanning
 - b) Stretching and/or exercises between patients
 - c) Pilates for core muscle development
 - d) Postural adjustments, ensuring back is straight and sonographer is as close as possible to patient
 - e) Use alternate hands whilst scanning
 - f) Reduce arm abduction to below 30° when scanning
 - g) The use of ergonomic aids such as a cable brace
 - h) Adjustment of equipment, including monitor screen, chair, and bed height
 - i) Ensuring assistance is available when moving patients
 - j) Sufficient breaks are taken throughout the day
 - k) A variety of scans are performed throughout the day
 - l) Personal risk assessment is performed by a risk assessment specialist
 8. Do you have any further comments or thoughts regarding your ergonomic education prior to, or on clinical placement? *This question is optional.*
- This question relates to your implementation of work-related musculoskeletal disorder (WRMSD) prevention techniques in the last 30 days of clinical training
9. Which injury prevention techniques have you routinely personally implemented in the last 30 days of clinical placement? Select all that apply.
 - a) Stretches and/or exercises prior to scanning
 - b) Stretching and/or exercises between patients
 - c) Pilates for core muscle development
 - d) Postural adjustments, ensuring back is straight and sonographer is as close as possible to patient
 - e) Use alternate hands whilst scanning
 - f) Reduce arm abduction to below 30° when scanning
 - g) The use of ergonomic aids such as a cable brace
 - h) Adjustment of equipment, including monitor screen, chair, and bed height
 - i) Ensuring assistance is available when moving patients
 - j) Sufficient breaks are taken throughout the day
 - k) A variety of scans are performed throughout the day
 - l) Personal risk assessment is performed by a risk assessment specialist
 10. Do you have any further thoughts or comments regarding your use of injury prevention techniques in the last 30 days? *This question is optional.*

FIGURE 1 Mixed method survey design (quantitative data and opened ended questions) developed for the identified target population

participants had completed a minimum of 1360 h of clinical placement. They also received generalised WRMSD education during the initial stages of their 4-year university course, however rather

than a dedicated theoretical unit to the topic, education was provided as part of multiple units. Sample size was calculated from a population of 81 students, as $n = 67$, using a confidence level of 95%.²⁰ CQUniversity Human Research Ethics Committee approval was obtained prior to data collection (approval number 2021-073).

An invitation containing a link to the survey was posted on the university online learning platform and was made available over a 4-week period during the participants' final year of clinical placement. Participation was voluntary, with anonymous data collected via the Qualtrics survey platform.²¹ Electronic informed consent was obtained prior to commencement of the survey, with an estimated completion time of less than 10 min. Survey questions reviewed participants' WRMSD education either from their university or on clinical placement. Some common WRMSD prevention techniques and interventions were collated from the literature for investigation; however this list was not exhaustive.^{8,9,16–19} Participants were asked about their knowledge and use of these techniques, with recall limited to 30 days, and the aim to reduce the level of recall bias.²² A

combination of multiple-choice and checkbox responses were used to generate categorical data with optional open-ended questions. Two open-ended questions were used to support the categorical data, but due to a low response rate were not used for the development of themes.

Demographic characteristics including the participants' university enrolment status, gender and age were collected. Participants not matching the inclusion criteria were unable to proceed with the survey.

2.2 | Analysis

Statistical analysis was performed using Microsoft® Excel® for Microsoft 365 MSO (Version 2109). Categorical survey data were presented as n (%), and graphically as bar charts. Chi-square analysis (or Fisher's exact test if cell size was <5) was performed to assess if the variables of reported knowledge and each WRMSD prevention technique were independent or associated. A significant association was assumed if $p \leq .05$.^{23,24}

3 | RESULTS

3.1 | Participant demographics

The response rate was 42% (34/81 invitations). All participants were final year sonography students undertaking clinical sonography placement. Three incomplete responses were discarded, resulting in a final sample size of $n = 31$. The majority, 27/31 (87.1%), of participants were female, and 4/31 (12.9%) were male. Over three-quarters (24/31, 77.4%) of participants were under 30 years of age (Figure 2).

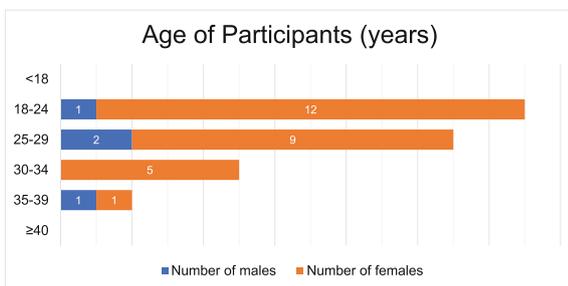


FIGURE 2 Chart demonstrating the number of participants in each age category

TABLE 1 The theoretical knowledge of and use of work-related musculoskeletal disorder prevention techniques

WRMSD prevention techniques	Theoretical knowledge of prevention technique n (%)	Use of prevention technique n (%)	p -value*
Stretching and/or exercises prior to scanning	26 (83.9%)	7 (22.6%)	.56
Stretching and/or exercises between patients	28 (90.3%)	16 (51.6%)	.10
Pilates for core muscle development	6 (19.4%)	4 (12.9%)	<.00
Postural adjustments, ensuring back is straight and sonographer is as close as possible to patient	29 (93.6%)	28 (90.3%)	<.00
Use alternate hands whilst scanning	5 (16.1%)	2 (6.5%)	<.05
Reduce arm abduction to below 30° when scanning	27 (87.1%)	23 (74.2%)	<.00
The use of ergonomic aids such as cable brace	24 (77.4%)	2 (6.5%)	.59
Adjustment of equipment, including monitor screen, chair, and bed height	29 (93.6%)	29 (93.6%)	<.00
Ensuring assistance is available when moving patients	16 (51.6%)	9 (29.0%)	<.00
Sufficient breaks are taken throughout the day	12 (38.7%)	7 (22.6%)	<.00
A variety of scans are performed throughout the day	17 (54.8%)	14 (45.2%)	<.00
Personal risk assessment is performed by a risk assessment specialist	0 (0.0%)	0 (0.0%)	-
Total	31 (100%)	31 (100%)	

Note: Parameters were assessed using Chi-square analysis and Fisher's exact test. Bolded results indicate significance.

Abbreviations: n , number of students; WRMSD, work-related musculoskeletal disorder.

*A significant association was assumed if $p \leq .05$.

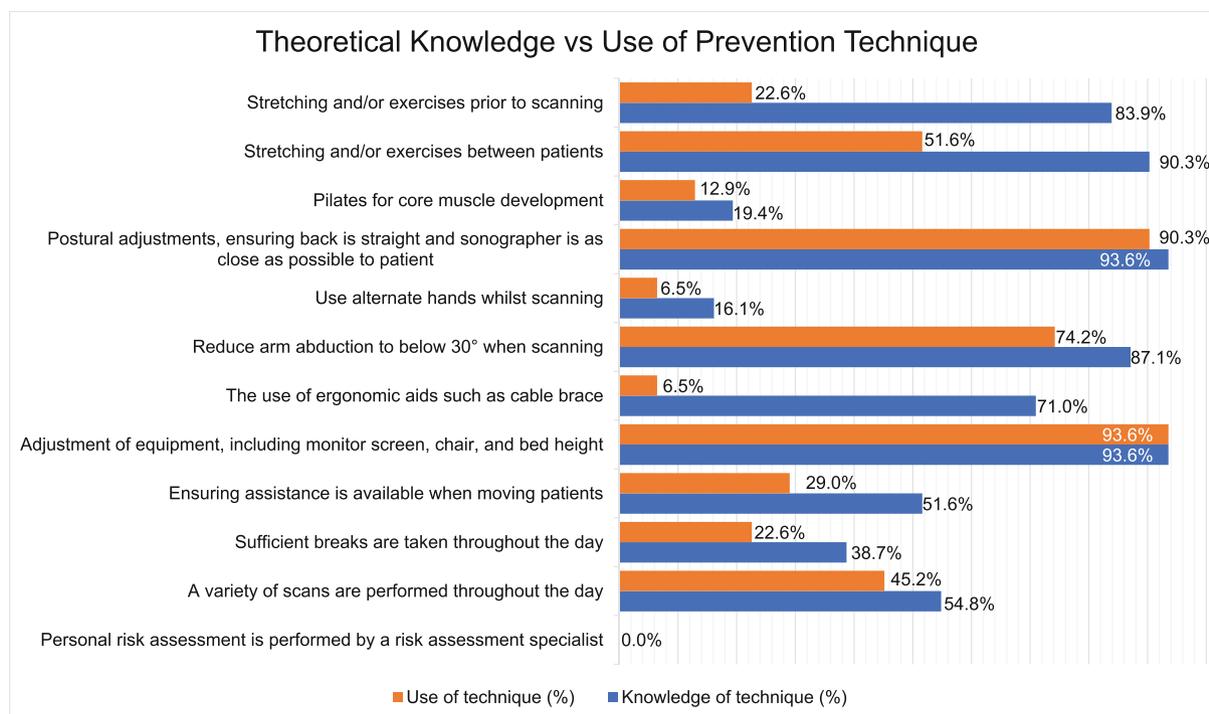


FIGURE 3 Chart demonstrating the participants' theoretical knowledge versus use of each work-related musculoskeletal disorder (WRMSD) intervention

3.2 | Education received regarding WRMSD prevention techniques

All participants indicated they had received some form of ergonomics education at university prior to commencing their clinical placement. Education by both theoretical and practical methods was reported by 26/31 (83.9%), whilst 5/31 (16.1%) reported having only received ergonomics education via theoretical lectures. Almost 65% of participants indicated education via theoretical lectures occurred during the second year of their university course.

Reportedly, 15/31 (46.4%) had received practical education from their supervisor at the beginning of their final year of clinical placement and received constant feedback throughout placement. A further 8/31 (25.8%) received education from their supervisor at the beginning of clinical placement but not during placement, and 8/31 (25.8%) received no education from their supervisor regarding ergonomics or injury prevention. When asked to provide any further comments, one participant stated that although they received no ergonomics training at the beginning of placement, their supervisor did correct them when they demonstrated poor ergonomics.

3.3 | Knowledge and use of WRMSD prevention techniques

Participants reported knowledge of the majority, 11/12 (91.7%), of the 12 selected WRMSD prevention techniques (Table 1), however the degree to which participants were aware of each technique varied. No participant reported knowledge of a 'personal risk

assessment' as a method to prevent WRMSDs. Table 1 indicates a significant association between the 'knowledge' and 'use' of eight of the 11 WRMSD prevention techniques. A comparison of the participants' knowledge versus their use of these prevention techniques are shown in Figure 3. Almost all participants (93.6%, $n = 29$) reported awareness of the need to adjust both equipment and posture. No association was indicated between the knowledge and use of stretching and exercises either prior to ($p = .56$), or between scans ($p = .10$). No association was indicated between the knowledge and use of an ergonomic aid, such as a cable brace ($p = .59$).

4 | DISCUSSION

This research is the first to investigate a subset of WRMSD prevention techniques final year student sonographers have theoretical knowledge of, and the techniques they consistently use. The three most regularly utilised techniques for injury prevention in this study were the adjustment of equipment, maintaining straight-back posture, and reducing arm abduction angle. Despite a high percentage of participants having reported knowledge of stretching, exercises and ergonomic aids, the actual use of these techniques was lacking. The findings diverge from earlier research of the injury prevention strategies implemented by sonographers, where previous research found both student and qualified sonographers to be ignorant of many WRMSD prevention techniques.^{2,13} Compared to earlier studies where the participants were qualified for variable or unspecified years, the participants of this study, still at an educational institute, displayed an overall better recognition and use of techniques aimed to keep

sonographers safe.^{2,13} Time interval from formal education may explain the greater recall of prevention techniques in the current study.

Risk reduction of WRMSD relies on the habitual use of ergonomic scanning practices by both students and qualified sonographers.^{10,25} The role initial ergonomics education plays in the development of these habitual practices is significant.^{7,25} Our results, as well as those of other recent studies indicate both theoretical and practical methods of ergonomics education have become routine in many sonographic training courses.^{13,16} This is encouraging for early career sonographers, given the high prevalence of pain reported among both student and qualified sonographers.^{11,12} Our results are in contrast to those of Scholl and Salisbury,² reporting two-thirds of participants had not received ergonomics education during their sonographic education programs. In the same study, the median number of scanning experience years for qualified sonographers in their study was 21, so many were likely to have developed scanning habits at a time when ergonomic practices were not regularly considered and possibly not a part of sonography education curriculum.² Some prevention techniques listed in our survey scored very low for recognition, which could have reflected a lack of education provided about these particular techniques. Students who reported to be aware of these techniques may have read about them independently of their university or clinical education.

In contrast, Bonnutto et al.¹³ reported participants had been sufficiently educated on sonographer ergonomics whilst at university however, up to 95% did not consistently adhere to ergonomic recommendations. In addition, the individual ergonomic recommendations were not specified, rather an overall adherence was investigated.¹³ Thus, the failure to adhere to guidelines was not linked to any one prevention technique.¹³ A similar lack of focus on the specific prevention techniques routinely implemented by sonography students has been demonstrated in other studies.^{15–17,26} The use of a specialist for personal risk assessment and Pilates may be techniques workplaces could support to reduce WRMSD. Further education around the use of scanning with the alternative hand at university and support of this preventative measure in the workplace may be needed.

Ergonomic aids such as a cable brace or vertical arm support device have previously been recommended for use by sonographers.^{10,27} Although participants in this study recognised the use of ergonomic aids as WRMSD prevention techniques, very few (6.5%) incorporated them into their daily practice. Low response to this question may have been partly due to the wording, which specifically asked about use of a cable brace, and did not mention other aids such as an arm support cushion. Previous studies obtained similar results, indicating they are not regularly used despite being widely available and relatively cost effective.^{2,15} Although used to lessen the burden on the arm due to a heavy transducer cable, these aids are more useful during certain scans; for example, breast work, which involves the sonographer sitting in one position for an extended period. The survey did not explore the scan types performed by the participants, so it is unknown whether they were performing scans that would have benefited more from use of these aids. Additionally, as some

sonographers work out of multiple different examination rooms depending on room availability, they may not have their own aid available at all times.^{15,17} These reasons may explain why the reported use of ergonomic aids were low, despite many participants having recognised their use for WRMSD prevention.

The use of height adjustable equipment—such as the examination couch, keyboard, screen monitor and chair—were equally familiar to the participants and reported as consistently used reportedly by a high number. Although reassuring, in a comparison of adjustable equipment use versus the prevalence of scan pain, Bagley et al.¹⁵ reported only the use of a swivel keyboard had significantly reduced the prevalence of pain among their participants. The poor ergonomic design of some equipment has previously forced sonographers to adopt hazardous techniques, and has resulted in the design and manufacture of ergonomically friendly equipment.^{7,10,11,28,29} Only the consistent use of height adjustable equipment as described above were investigated in the current study, rather than how effective it was for the prevention of pain. Future research could investigate if equipment design developments over recent years have resulted in a reduction in the incidence of scan pain.

Other prevention techniques reported as frequently used by participants included postural modifications ($n = 28$), and the reduction of arm abduction angle below 30° ($n = 23$). When the scanning arm is abducted beyond 30° from the body, a neutral posture is lost as the body shifts to maintain balance.^{9,10} This may result in the reduction of blood flow through the shoulder and arm, as well as pain and injury due to subacromial bursitis.^{6,28} Quality control studies assessing the regular implementation of these specific techniques, may result in a reduced risk of developing pain in the future.

Almost 50% of participants reported they had received constant feedback on their ergonomics whilst at placement suggesting the feedback students received had led to the formation of healthy scanning habits. Ongoing supervisor education should be encouraged to support student ergonomic practice. Further longitudinal research could follow students after they become qualified sonographers, to ascertain if these behaviours continue when a supervisor is no longer providing feedback.

Our study demonstrates a significant association between ergonomic education and knowledge of prevention techniques; however, three widely reported prevention techniques were not well recognised by the participants of this study.^{1,3,7,16,18,30} These included varying the scans performed, taking sufficient breaks between patients, and the use of assistance when moving patients. Only 39%–55% of participants reported they were aware of these techniques, and only 23%–45% reported to used them regularly. Scholl and Salisbury² linked a busy environment where the culture was to forgo breaks, as well as patient limitations such as obesity and patients who were immobile to a failure to use these techniques. The results from our study may have been impacted by the participants limited ability to control the scans they performed, or the breaks they took, however, this does not explain the poor recognition of these techniques.

Mind–body techniques including meditation, stretches, yoga and Pilates have previously been explored for the prevention or alleviation

of musculoskeletal pain.^{16,18,19,26} Although 84%–90% of participants demonstrated familiarity with stretches before and following scanning, no association was established between their knowledge and use. Although a significant association was suggested between the knowledge and use of Pilates, the numbers were small and may not be representative. Mind–body techniques often increase in usage following participation in awareness workshops, but generally decrease again within months.^{16–18} This highlights the ongoing need to reinforce the benefits of techniques through professional development. Although the use of risk assessments by professionals such as occupational therapists have previously been suggested, no participant in this study recognised this technique.¹⁶ Risk assessments may not be considered by students, who are instead focused on scanning skills. Alternatively, until injury occurs, this technique is not considered. Research on early intervention by providing professional risk assessments on long term outcomes for students would be worthwhile.

The issue of pain and WRMSDs among sonographers is complex, with an abundance of research performed on the issue.^{3–5,11–14} Further longitudinal research following students into their careers will establish if WRMSD prevention technique use is maintained or if workload demands that may lead to poor ergonomics are prioritised.

4.1 | Limitations

The response rate was greater than 40%, which remains consistent with other similarly related survey studies; however, as the desired sample size of 67 was not attained in this study, the overall reliability and validity of the research is impacted.^{13,15,20} Future studies could also include cardiac sonography students in order to achieve the sample size. Almost 90% of participants in this study were female, which is not unexpected given 80% of registered sonographers in Australia are female.³¹ Another limitation of this research is the survey questions created for this research had not been previously validated, and therefore the clarity of the questions had not been tested. The potential for responder bias exists due to participants who may have been motivated to participate by a personal history of work-related pain or injury.²² This may have led to the overrepresentation of participants who knew of and used these prevention techniques.²² Survey data is limited by the risk of over- or under-reporting the knowledge and use of techniques; however, through the use of an anonymous survey and a 30-day recall period, this limitation was minimised. It is also possible the participants simply did not recall when given feedback from clinical supervisors. Future research should investigate the amount of ergonomic guidance sonographer supervisors give their students. As with all cross-sectional research, this study only represented a subset of student sonographers at one point in time, with the potential for different data to be obtained from surveying different cohorts enrolled at different universities. The injury prevention techniques listed in the survey are also only a subset of what is available, with many other prevention techniques such as the use of anti-fatigue mats, correct probe grip pressure, and a neutral wrist position not mentioned.¹ Future research should include a more in-depth review of student adjustments of equipment and other various ergonomic techniques not mention this research.

5 | CONCLUSION

This study has demonstrated students educated around injury prevention will retain knowledge of some key WRMSD prevention techniques. Further to this, they will implement some of those techniques during practical scanning at the commencement of their career. Select prevention techniques consistently used by most participants surveyed included the adjustment of both ergonomic equipment and posture, including the examination couch, keyboard, screen monitor and chair, as well as the reduction of arm abduction angle. Other prevention techniques recognised, but not consistently used by students included the use of ergonomic aids and stretching or exercises before and after scanning.

Through exploration of sonography students' use of WRMSD prevention techniques on clinical placement, both university academic staff and clinical educators can assess whether the education they provide is likely to be successful in the formation of long-term healthy scanning habits. Clinical supervisors should also be encouraged to provide regular feedback on the students' ergonomic habits whilst on clinical placement. This study may form the basis for future longitudinal research into the effectiveness of specific prevention techniques among students, as well as research into the WRMSD prevention practices routinely used by newly qualified sonographers. Future research is encouraged to focus on the effectiveness of specific preventative techniques, and to investigate if students are more likely to make ergonomic adjustments for specific ultrasound examination types to reduce the high prevalence of WRMSD among sonographers and prevent injury to students.

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CONFLICT OF INTEREST

Kerry Thoires, Ann E. Quinton, and Narelle Kennedy are Editorial Board members of *Sonography* and co-authors of this article. To minimise bias, they will be excluded from all editorial decision-making related to the acceptance of this article for publication.

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QUESTIONNAIRE

A19(25) Part 1 of 2

Knowledge and use of work-related musculoskeletal disorder (WRMSD) prevention techniques in the daily practice of final-year Australian sonography students: A cross-sectional study

INSTRUCTIONS

- Read through the article and answer the multiple-choice questions provided below.
- **Some questions may have more than one correct answer;** in which case you must mark **all** the correct answers.

Introduction

Question 1: Question 1: According to the article, what is the current reported status of work-related pain among sonographers?

- A:** Majority experience occasional discomfort
- B:** Most experience pain after 10 years of practice
- C:** Reported at a rate above 90%
- D:** Primarily affects those with poor technique

Question 2: There is ample evidence to support the habitual use and lasting effectiveness of individual WRMSD prevention techniques, including ergonomically friendly scanning practices. Is this statement **TRUE**?

- A:** YES
- B:** NO

Methodology

Question 3: What was the minimum number of clinical placement hours completed by the study participants?

- A:** 1160 hours
- B:** 1260 hours
- C:** 1360 hours
- D:** 1460 hours

Question 4: How did most participants receive their ergonomics education?

- A:** As specialised education through a dedicated theoretical unit
- B:** Only through specialised practical demonstrations
- C:** Through online self-guided modules
- D:** Only generalised education as part of multiple units, including theoretical and practical units

Results

Question 5: What percentage of participants indicated they received practical education from their supervisor during clinical placement in their final year as well as constant feedback throughout placement?

- A:** 46.4%
- B:** 64.4%
- C:** 25.8%
- D:** 16.1%

Discussion

Question 6: Which prevention techniques were lacking in actual use by participants?

- A:** Equipment adjustment
- B:** Maintaining straight-back posture
- C:** Stretching, exercises and ergonomic aids
- D:** Reducing arm abduction angle

Question 7: Which one of the following aids, used for WRMSD prevention, were reported by a high number of participants as being consistently used?

- A:** Cable brace
- B:** Height adjustable equipment such as examination couch, keyboard, screen monitor and chair
- C:** Vertical arm support device
- D:** Arm support cushion

Question 8: At what angle does arm abduction of the scanning arm begin to cause a loss of neutral posture?

- A:** Above 15 degrees
- B:** Above 20 degrees
- C:** Above 25 degrees
- D:** Above 30 degrees

Question 9: Which one of the following widely reported prevention techniques were not well recognised by the participants and only 23%-45% reported to use them regularly?

- A:** Varying the scans performed, taking sufficient breaks between patients and using assistance when moving patients
- B:** Taking short breaks between patients and not using assistance when moving patients
- C:** Keeping scans in the same order

Question 10: What percentage of participants were aware of stretching techniques before and after scanning?

- A:** 74-80%
- B:** 84-90%
- C:** 91-95%
- D:** 95-100%

THE END

QUESTIONNAIRE

A19(25) Part 2 of 2

Knowledge and use of work-related musculoskeletal disorder (WRMSD) prevention techniques in the daily practice of final-year Australian sonography students: A cross-sectional study

INSTRUCTIONS

- Read through the article and answer the multiple-choice questions provided below.
- **Some questions may have more than one correct answer;** in which case you must mark **all** the correct answers.

Question 1: The fact that mind-body techniques, including yoga, stretches and meditation often increase in usage following participation in workshops but generally decrease again within months, highlights the ongoing need to reinforce the benefits of these techniques through professional development. Is this statement **TRUE** or **FALSE**?

- A: TRUE
- B: FALSE

Limitations

Question 2: How did the response rate of this study compare to similar survey studies?

- A: It was significantly higher
- B: It was significantly lower
- C: It remained consistent
- D: It varied widely by demographic

Question 3: What was the desired sample size for the study?

- A: 50
- B: 57
- C: 60
- D: 67

Question 4: What was the predominant gender among study participants?

- A: Equal male and female representation
- B: Slightly more males than females
- C: Majority of female participants
- D: Exclusively female

Question 5: Through the use of an anonymous survey and a day recall period, the risk of over- or under-reporting was minimised?

- A: 15 days
- B: 30 days
- C: 45 days
- D: 60 days

Question 6: Which of the following prevention techniques were not listed in the survey?

- A: Anti-fatigue mats
- B: Correct probe grip pressure
- C: Cable brace
- D: Neutral wrist position

Question 7: Is it **TRUE** that the issue of pain and WRMSDs is complex with an abundance of research performed on the issue?

- A: YES
- B: NO

Conclusion

Question 8: The study demonstrated that students educated around injury prevention will do which of the following?

- A: Retain all the key WRMSD prevention techniques and implement all of them during their career
- B: Retain none of the key WRMSD prevention techniques and implement none of them during their career
- C: Retain some of the key WRMSD prevention techniques and implement some of them during practical scanning at the commencement of their career.
- D: Retain most of the key WRMSD prevention techniques and implement almost all of them during practical scanning throughout their career

Question 9: Which of the following prevention techniques were reported as being consistently used by most participants?

- A: Stretching and exercises
- B: Taking regular breaks
- C: Using ergonomic aids
- D: Using ergonomic aids

Question 10: Future research is encouraged to do which of the following?

- A:** Focus on the effectiveness of specific preventative techniques
- B:** Investigate if students are more likely to make ergonomic adjustments for specific ultrasound examination types to reduce the high prevalence of WRMSD among sonographers and prevent injury in students
- C:** No further research is required as this study was conclusive

THE END



MEMBER INFO

(Complete sections marked with an asterisk *)

***FOH number**

***HPCSA number**

ID number

Personal detail changes

I hereby declare that the completion of this document is my own effort without any assistance.

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This activity is accredited for **FOUR (4) CLINICAL CEU'S**. You have to achieve **70%** to pass this activity.

ANSWER SHEET

A19(25)

Knowledge and use of work-related musculoskeletal disorder (WRMSD) prevention techniques in the daily practice of final-year Australian sonography students: A cross-sectional study

*Time spent on activity						hour						min					
PART 1						PART 2											
	A	B	C	D	E		A	B	C	D	E		A	B	C	D	E
1						1											
2						2											
3						3											
4						4											
5						5											
6						6											
7						7											
8						8											
9						9											
10						10											

How relevant was the content of this activity to your scope of practice?			
			
Not at all	Somewhat	Mostly	Extremely

RETURN ANSWER SHEET TO

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