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Special Rowing Issue

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Instructions to Authors

GENERAL

The New Zealand Journal of Sports Medicine is the official journal of Sports Medicine New Zealand, publishing material relevant to sports medicine and related disciplines. The New Zealand Journal of Sports Medicine welcomes submissions of original manuscripts from both members and non-members of Sports Medicine New Zealand in the following areas: *sports medicine, sports physiotherapy, clinically relevant sports science, rehabilitation, coaching issues as they relate to sports medicine, exercise prescription and training, sports chiropractic, sports podiatry, and sports psychology.*

Manuscripts must not have been published elsewhere except in abstract form. Manuscripts will be reviewed by the editorial board and/or experts in the field of interest. Submissions are in the following categories:

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One hard copy of tables, illustrations, figures, photos, etc, must be submitted. Tables should be included on a separate sheet rather than in the body of the text. Identify all illustrations with the manuscript title, name of author, figure number, and. if necessary, identification of the top of the image, on the back of the illustration in pencil. All markings should be removed from x-rays before photographing. Please do not produce graphics in Microsoft Word. Graphics should be supplied in TIF, EPS or PDF format, preferably at a resolution of no less than 300 dpi.

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Book:	McRae R. *Practical fracture treatment.* Edinburgh; Churchill Livingstone, 1989.
Chapter in Book:	Figoni S F. Spinal cord injury. In, Wikgren S (ed.): *ACSM's exercise management for persons with chronic diseases and disabilities.* Champaign: Human Kinetics, 1997; 175:179.

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Contents

Rowing Special Issue

Rowing is an ancient sport, having its origin among the Phoenicians, Greeks and Egyptians who raced galleys on natural waterways or artificial lakes. It was not until the 18th Century that the first modern rowing regattas were held in England and the first Oxford-Cambridge boat race was held in 1829. Ten years later the first Henley Royal Regatta was held. The International Rowing Federation (FISA) was formed in 1892. Rowing has been an Olympic sport since 1900, although women's events were not introduced until 1976.

Olympic rowing events are held over a 2000m course on still water. There are sweep oar events for pairs, fours and eights and sculling events for singles, pairs and quads.

Rowing requires people who are tall with high aerobic capacity and strength with a dedication to good technique and teamwork. These attributes seem to fit well with New Zealanders, who have had a long history of success in this sport.

New Zealand is fortunate to have a vey strong high school rowing scene. Each year the competition culminates in the Maadi Cup Regatta which attracts over 2000 athletes.

There are only a few common injuries that rowers sustain. The time spent becoming familiar with the management of these will be well rewarded and appreciated by your rowing patients.

New Zealand rowing is currently on a high. At the recent World Championships held in Karapiro in November 2010 our athletes won 10 medals. Six of these were in Olympic events which augers well for the future, particularly looking forward to the London 2012 Olympics. However, we need be under no illusions; an Olympic medal is infinitely harder to win than a World Championship medal and the current crop of athletes will have to continue with their same dedicated training and remain relatively injury-free to perform to their potential at the 2012 Olympic regatta.

Welcome to this special edition which draws on the expertise of several of the key providers of services to rowing via the New Zealand Academy of Sport. By dissemination of this knowledge amongst the clinicians around the country we aim to enhance the management of all rowing related problems.

Enjoy.

Chris Milne
Editor

BEST OF BRITISH 2010

August

The August issue opened with a provocative editorial entitled 'The epidemic has gone global'. The epidemic refers to physical inactivity and its resultant chronic diseases. In 2007 the American College of Sports Medicine trademarked the phrase 'Exercise is medicine'. Since then they have put strenuous efforts into trying to promulgate the message.

I was fortunate to attend the 2010 ACSM Meeting in Baltimore where the official world launch of the initiative took place. This was in association with the Inaugural World Conference on Exercise is Medicine (EIM). The tenants of the charter of EIM are that physicians assess physical activity during every patient visit similar to the vital signs of pulse and blood pressure and, secondly, give physical activity a central role in the prevention and treatment of disease. This is no small order, as having previously been a GP myself one soon confronts the realities of a 10 or 15 minute consultation slot where the patient wishes to discuss two, three or sometimes more problems and time is short. However, EIM's strength is as lobbying tool to get new policies implemented and implement behavioural change in individuals. Typically people change their behaviours not when they are told to but, rather, when the social context guides them to do so. All in all, a thought-provoking editorial.

Later in the same issue James McGarvey, Dale Speedy and colleagues assessed the sensitivity and specificity of clinical signs for assessment of dehydration in endurance athletes. They looked at five parameters including decreased skin turgor, sensation of thirst, sunken eyes, inability to spit and dry mucous membranes. They studied 206

competitors in the 2006 Auckland Marathon. They found none of the symptoms or signs showed acceptably high validity for detecting a weight loss of 3% or more. This adds weight to Dale Speedy's suggestion that athletes competing in endurance events only be allowed to start once their pre-race bodyweight has been recorded. This provides a low cost and accurate surrogate marker of hydration status if a significant decrease from the pre-race weight occurs.

Adam Castricum and colleagues studied the role of bronchial provocation tests in the diagnosis of exercise induced bronchoconstriction in elite swimmers. They found that the Eucapnic Voluntary Hyperpnoea (EVH) Challenge was highly sensitive in identifying EIB in elite swimmers. By contrast, laboratory and field-based exercise challenge tests significantly under-diagnosed the condition.

Jenny Ross and colleagues from Lincoln University evaluated the New Zealand Physical Activity Questionnaire in 70 adults aged 18 to 65 years. Participants were required to read an accelerometer during all waking hours for seven consecutive days. Analysis of the data showed that the self-report questionnaires tend to overestimate physical activity levels by approximately 165%. In other words, people think they are doing more exercise than they actually are.

A similar study by Ewald and colleagues from Newcastle, Australia, compared pedometer counts with a physical activity scale in older adults (mean age 63 years). They also found that pedometer derived step counts were a more valid measure of overall physical activity than responses to a questionnaire.

Finally in the August issue there was another in the series of A to Z of Nutritional Supplements. This issue studied creatine, one of the most widely used supplements. Most studies have focused on sporting performance and creatine supplementation has been shown to lead to improved performance of repeated high intensity exercise, particularly when combined with progressive resistance training. Two schedules are in widespread use, one involving a loading dose of 20g per day for five days followed by a maintenance dose of 2-3g per day, or an alternative regimen using a maintenance dose of 2-3g per day for 30 days. Both seem effective. An underappreciated use of creatine is to improve muscle mass and fatigue resistance in sarcopaenic older adults. In these people better function means an enhanced ability to perform activities of daily living. There were concerns about deleterious effects on renal function but no adverse effects have been found in multiple studies. The authors wisely advise that creatine supplementation should not be used by individuals with pre-existing renal disease, and those with diabetes or hypertension would be at increased risk of renal complications with exercise. Athletes should start exercise fully hydrated and avoid concurrent use of NSAID, which can decrease renal blood flow.

September

The September issue opened with an editorial commenting on a landmark paper in the New England Journal of Medicine by Froebel et al. These authors studied patients with ACL ruptures who were managed non-operatively, and found that early reconstruction after ACL rupture was not essential. They provided a detailed rehabilitation protocol and followed patients through to two year outcomes, even when they crossed from rehabilitation to surgical reconstruction. They utilised the Knee Injury and Osteoarthritis Outcome Score to evaluate patient outcomes and intend following their patients in the longer term. They found that rehabilitation may eliminate the need for surgery in up to 61% of cases and this paper is certain to generate a lot of interest and controversy in the coming years.

Whilst talking accumulation of evidence, it is heartening to see the development of the Physiotherapy Evidence Database (PEDro). Physiotherapy interventions have often been short on RCT data and PEDro has now been in operation for 10 years. It can be accessed at http://www.pedro.org.au. PEDro therefore provides ready access to research evidence which can be used to guide clinical practice.

In the same vein, Vicenzio et al looked for clinical predictors for identifying patients with patellofemoral pain who were most likely to benefit from foot orthoses. They found that age, height, pain severity and midfoot morphometry were most useful predictors of successful treatment of anterior knee pain using foot orthoses. The morphological predictors included midfoot width difference >10.96mm and an arch height ratio <0.34.

Promoting physical activity in children is a laudable objective and Van Mechelen and colleagues evaluated the JUMP-in programme in the Netherlands. It included a system to follow up individual pupils plus daily exercises with advice regarding movement patterns and involvement of parents and clubs. The authors commented that a complex intervention such as this demanded a coordinated response across a number of sectors. The objectives seem broadly similar to those of KiwiSport in New Zealand.

Vibration therapy has its strong advocates and Broadbent and colleagues evaluated its use in preventing delayed onset muscle soreness after downhill running. They studied 29 male recreational runners and found reduced pain scores and interleukin 6, a marker of muscle inflammation. They therefore concluded it may be a useful therapeutic tool for treating soft tissue injuries. This represents a further potential use in addition to its value in increasing bone density and leg strength in athletes and special populations.

As we get older we consume more healthcare dollars. Does physical activity reduce the need for healthcare? Woolcott and colleagues studied 24,281 Canadians and found that average healthcare costs for the most active group were about 40% of those for the least active group. This gives further weight to the idea that physical activity should be encouraged across the lifespan.

The A to Z of Nutritional Supplement Series continues and the section on dehydroepiandrosterone (DHEA) caught my eye. This is a pro-hormone or precursor of testosterone that is available as an over the counter supplement in many

countries and is frequently sold as a component of anti-aging formulas via the internet. However, it is on the WADA banned drug list. Studies quoted by these authors show that DHEA does not promote fat loss or muscle gain or augment adaptations to resistance training in healthy men. However, it remains banned and all athletes who take supplements, particularly those with an anti-aging promotion, need to be on their guard that these supplements do not contain DHEA.

The September supplement was devoted to injury prevention. The highlight paper was entitled 'Sports injuries and illnesses during the Winter Olympic Games 2010'. Doctors covering 2,567 athletes from 82 NOCs participating in the Winter Olympic Games reported 287 injuries and 185 illnesses during the course of the Games. Not surprisingly, the riskiest sports for injury were bobsleigh, ice hockey, short track skating, alpine freestyle and snowboard cross. In each of these sports between 15% and 35% of registered athletes sustained an injury. By contrast, injury rates were much lower in endurance events such as cross country skiing. Having been present at those Games as a member of the IOC Games Group, I would say that the data collection and standard of medical care was world class so this study provides reliable evidence on which to base clinical decisions. We should all be keen to prevent injuries in our developing players.

FIFA has designed a specific programme for football entitled The 11+. Compliance with this programme was evaluated by Roald Bahr's group in Oslo. They found high compliance with the injury prevention programme and the compliant players had a significantly lower injury risk than those who were lazy. Positive attitudes towards injury-related prevention tended to be associated with higher compliance and lower injury risk, which is not surprising – attitude is everything.

Still on soccer, Brink et al studied injuries and illnesses in 53 elite youth soccer players aged between 15 and 18 in the Netherlands. They found that physical stress, e.g. a higher training load, played an important role in relation to both the occurrence of both injuries and illnesses. By contrast, psychosocial stress was important in relation to illness only.

October

The October issue contained a useful paper describing the spectrum of pathology affecting the rotator cuff. Based on a model by Jill Cook and Craig Purdham there is a continuum between under-loaded tendon through normal tendon to reactive tendinopathy and ultimately tendon disrepair and degeneration. In the early phase of tendon overload there is an increase in bound water content but the tendon may still return to its preloaded state. However, if there is significant impingement under the coracoacromial arch and insufficient physiology capacity for repair then a state of disrepair may ensue. There may well be an associated bursal reaction plus new vessel formation. Ultimately structural failure results in partial thickness then full thickness, and occasionally massive, rotator cuff tears with tendon retraction. Clearly, the aim is to educate people to be aware of the early symptoms of overload and reduce the load and alter the mechanics accordingly.

However, one issue not covered in this paper relates to chronic adaptations that occur in habitually active people. Clinicians practising in provincial areas are well aware of the large number of older farmers who present for the first time in their 60s or 70s with complete tears of one or more rotator cuff tendons yet surprisingly good function. This suggests that the issue is more complex than the study of individual tendons would indicate. We have much to learn from our active farmers in this regard.

Sticking with tendons, there was a paper by Jill Cook and associates describing grey scale abnormalities on ultrasound in the patella tendon and their correlation with pain and new vessel formation. They found tendons with normal ultrasound appearances were more likely to transition to diffuse thickening rather than hypoechoic change. Hypoechoic regions were more likely to be painful and show associated new vessel formation. By contrast, diffusely thickened tendons were still quite likely to be painful but rarely displayed new vessel formation, with only 6% showing this characteristic.

The influence of personality on activity is huge – we are not all lab rats. Therefore, a study by Davies and colleagues on the relationship between personality, theory of planned behaviour and physical activity in people with type 2 diabetes is especially welcome. People with this condition have more to gain than the average person from being physically active. The authors found that people who are highly conscientious are more likely to have a positive attitude and stronger perceptions of behavioural control. These people are therefore more likely to become active and stay active. The authors propose that regardless of an individual's personality, interventions should target attitudinal change and increase perceptions of control. By this means we could motivate this population to develop a conscious decision to act on their intentions and become more active, rather than just thinking about it.

Finally, the regular series on nutritional supplements had a useful discussion on electrolytes. They considered sodium, potassium, chloride, bicarbonate, calcium and magnesium. Potassium losses in sweat are generally low enough to be met by a normal diet. By contrast, athletes in heavy training can accumulate a sodium deficit and may need to add extra salt to their diet. This is a commonly observed phenomenon in endurance athletes in heavy training, particularly in the warmer months of the year such as we have been experiencing recently. Too many people who are physically active are reluctant to take extra salt as they have heard of its harmful effects on the sloths. However, if they merely drink water or dilute fluids during endurance events they can become hyponatraemic, which has potentially severe consequences. Therefore, a little more salt in the diet of our active people would probably do more good than harm.

There was also a brief discussion of echinacea, which has been promoted to prevent respiratory tract infection. One recent study demonstrated a shorter duration of infection and improved post-exercise salivary antibody levels in athletes given echinacea compared with placebo. It remains to be seen whether

the results of this can be repeated. By contrast, ephedra is a sympathomimetic alkaloid similar to methamphetamine and in high doses has serious adverse effects. Therefore, it is on the banned drug list. Several fatalities have been attributed to ephedra.

The bottom line with supplements is buyer beware and the athlete needs to understand that with any compound they take they are essentially taking the manufacturer on trust. Clinicians should not allow themselves to be talked into endorsing particular supplements for their athletes as it is only a matter of time before they will be caught out with an athlete taking a supplement containing a banned substance who is found guilty of a doping offence. By association, they will be drawn into a controversy that is best avoided.

Chris Milne
Sports Physician

WHAT I'VE LEARNED - PEARLS FROM THE SENIOR PRO'S

As clinicians, we have all been exposed to many great teachers. The best of them were able to pass on their experience in a way that resonated, and you could incorporate their ideas into clinical practice. I think this is the great strength of the so-called 'apprentice' model of training. This column is designed to pass on a few of the gems from our most expereinced and respected clinicians. The first column has been written by Mike Lamont, one of our senior physiotherapists who has been involved with the work of SMNZ for over 30 years. Enjoy.

Ed

"The patient knows what is wrong – you need to listen carefully, ask questions, and interpret what they are saying into clinical language" said the Professor of Medicine at Otago at his first lecture of my Physiotherapy class in 1965. He went on to say "listen, look and then touch". Of course he was absolutely right.

Christmas is the time for friends and relatives to visit – one such visit was particularly interesting. My male friend of 40 years came with a limp. Curiosity got the better of me and I asked what the problem was. To paraphrase – playing an indoor ball game; landed on a flexed and externally rotated knee; heard something 'crack' in his knee; immediately painful; noticed swelling within two hours. This was two months ago and now he has only 90 deg knee flexion and a painful knee.

So from that story the most likely diagnosis will be a tear of the ACL (90% probability); the next will be a menisical tear – within the remaining 10% probability. "Oh", he said "there is nothing wrong – I have had an xray and it didn't show anything". I wouldn't expect an xray to show anything unless I was suspicious of an avulsion fracture within the knee joint – which, on the story, is unlikely. Fractures also sit within that 10% probability.

So what has been done to confirm or exclude the provisional diagnosis? It appears very little – but he is seeing a physio every two weeks who does some work on vastus lateralis (judging by the movements of the patient's hand). "Do you know what has been damaged within your knee?" – a shrug of the shoulders. The patient does not seem to be adequately informed of the clinical problem nor of the plan to manage it.

Just on my looking at his knee there is a significant pre-patella bursitis – nothing is being done about that either.

The management of acute trauma is very straight forward: establish a diagnosis and then implement a management plan – which involves the patient. So for this patient an MRI will establish the diagnosis and then appropriate treatment can commence. Waiting for nature to run its course will not result in the best outcome for the patient. Not involving the patient in the management plan is like giving a sibling a car but not the keys – not much they can do without the keys!

My advice to my friend? Go and see somebody who is competent in knee trauma and get the problem diagnosed and then be an integral part of establishing a management plan.

Hopefully that practitioner will listen to the patient's story and interpret it appropriately.

Michael Lamont,
Dip Pty, Dip Occ Health, MPP
CEO Mangere Community Health Trust and Mangere Health Resources Trust – organisations delivering a variety of health programs in Mangere and the wider Counties Manukau region from Tattoo removal to GP clinics to Retinal screening.

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Nutritional issues and challenges of elite rowers preparing for the World Championships

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ABSTRACT

Rowing is a sport with unique nutritional challenges that must be solved to optimise performance at an elite level. Prolonged training sessions of several hours are required for cardiovascular conditioning and endurance. During this high volume phase, comprising several sessions per day, rowers share the nutritional challenges of endurance athletes. Therefore, a high-carbohydrate diet timed before and soon after each session is required to maintain workload. Supplementation of carbohydrate is also beneficial during training sessions of over one and a half hours. A challenge for rowers is supplementation during training is difficult to consume due to the need to keep the hands on sculls/oars. This discourages regular intake and has a negative impact on carbohydrate intake and hydration status. These issues were addressed over a three-month period (August-October) during the lead up to the 2010 World Championships at Karapiro, New Zealand. A series of measurements including dietary analysis, urine measures, and skin-folds, were taken to assess the nutritional and hydration status of 14 New Zealand heavy weight male rowers. Based on these measurements it was found that carbohydrate intake was too low for optimum performance. Individual nutrition plans and recommendations were provided to the athletes with the aim to improve intake and performance.

INTRODUCTION

Elite rowers tend to be tall, with a large lean mass and aerobic power.[1] There is a requirement to undertake high-volume training programs consisting of on-water sessions, using rowing ergometers, specific resistance training, and cross-training such as cycling. This training volume is performed in two to three training sessions per day to develop the separate characteristics of skill, aerobic and anaerobic endurance, and muscular power.

The interaction between exercise training-induced responses and nutrient intake has long been recognised.[2] It is essential therefore to acutely alter the substrate supply to match the estimated energy expenditure. Achieving this goal, while still meeting the recommended intakes of energy and macro nutrients is challenging due to the high training volumes and consequent high energy expenditure. Energy expenditure during rowing is particularly high due to the large muscle mass being used. During the three month period leading up to the 2010 World Championship nutrition and hydration assessments of 14 elite male rowers were carried out and strategies to improve nutrient and fluid intake were implemented. The measures taken and plans reported were part of a nutritional consultancy with Rowing New Zealand. No individual details are described in this article to retain the confidentiality of the rowers involved.

METHODS

The assessment of the energy intake, macro and micro nutrient intake of the 14 heavy weight rowers was based on a self-reported seven day food diary and analysed in the dietary program FoodWorks 2009 (version 6). Body weight (kg) of the rowers was recorded monthly using a standard calibrated scale. Hydration status was measured twice during the three month period by Urine Specific Gravity (USG) with an ATAGO hand refractometer. The body composition of the athletes was measured via standards set by the International Society for the Advancement of Kinanthropometry (ISAK). To enable to monitor health and lean mass eight skin-folds measurements were taken four times during this period with a Harpenden Skin-fold Caliper. Analysis was based on the sum of eight sites. Results are described as means ± standard deviation.

RESULTS AND DISCUSSION

After selection of the 14 athletes for the Rowing World Championships (August 2010), an initial nutrition assessment via a self reported seven-day food diary was performed. Total daily energy intake ranged between 9.639 and 23.957 KJ, the lower number is likely due to under reporting by some of the younger athletes. The mean energy intake was 16.112 ± 3.913 KJ. As body weight was stable over the months leading up to the World Championship (mean weight was 93 ± 0.9 kg on the 10th of August and on the 1st of November was 92 ± 1.6 kg) it may be concluded that energy intake was in balance with expenditure.

It is widely recognised that carbohydrates are essential for athletes to perform at an elite level.[3] Rowing training sessions are undertaken at moderate and high intensities over prolonged periods (90-120 minutes). This can cause high rates of carbohydrate oxidation and substantial depletion of glycogen content in the deltoid muscles of well-trained individuals.[4] The mean carbohydrate intake was 5 ± 1.6 g / kg of body weight. However, the literature suggests that athletes need to consume 8-10 g / kg of body weight to be able to normalise glycogen stores.[5] Low carbohydrate intakes are detrimental for performance because athletes chose a lower workload or intensity when training sessions are undertaken with low carbohydrate availability, probably due to athletes perceiving the efforts to be higher.[6] Low carbohydrate availability is also likely to impair the adaptation to training such as muscle fibre recruitment and reduce immune function, resulting in an increased risk of illness and injury. Therefore, the carbohydrate intake of 5 ± 1.6 g / kg of body weight taken during this initial assessment was not sufficient for rowers preparing for the World Championships. Strategies were implemented to increase carbohydrate availability before, during and post workouts, thereby preventing or delaying the depletion of body carbohydrates stores. Table 1 is an example of a plan to increase carbohydrate availability, and shows a detailed description how to strategically place sports supplements during training to increase the carbohydrate intake.

It is also recognised that the timing of carbohydrate ingestion may significantly affect the adaptive response to exercise[6]. Ideally athletes should consume carbohydrates pre-exercise to maximise endogenous glycogen stores and maintain serum glucose levels. The optimal carbohydrate content of a pre-exercise meal is 1-2 grams CHO/kg [7]. The body weight of the athletes varied from 89 kg to 105 kg with a mean of 93 ± 1.2 kg equating to a recommended consumption of ≈93-186 g of CHO before their morning row (this would normally be at 6 AM). If you were to translate this to food, a rower would have to consume 1-2 cups of raw oats + milk + banana OR 5-10 Weet-Bix + milk + banana OR 5-10 slices of bread one hour prior to training. The dietary analysis revealed that the majority of the athletes were not consuming these amounts. This was partly due to the athletes' tolerance for bulky food in their stomach prior to training. In an effort to raise the pre-training carbohydrate intake, easily digested, low Glyceamic Index, high carbohydrate foods like juices were introduced into the athletes' diet.

As mentioned above, training sessions are undertaken over prolonged periods. When exercise duration exceeds 90 minutes, exogenous sources of carbohydrate are an important and an effective way to maintain blood glucose and muscle glycogen stores. Strategies to replace fluid and carbohydrate during exercise are therefore required. Ideally this carbohydrate source should supply 30-60 grams of carbohydrates per hour and can typically be delivered by drinking 250-500 ml of a 6-8% solution every 10-15 minutes. Intake during rowing is practically restricted to the breaks in the session however, due to the need to keep the hands on the sculls or oars. As a result, it was found that carbohydrate intake during exercise did not always meet these requirements. The introduction of a plan to strategically place supplement intake (e.g. sports drinks and gels) into breaks during a training session markedly improved the consumption of carbohydrates during training (Table 1). Most rowers were receptive to this approach to the supplementation during exercise. During subsequent interviews they reported feeling less fatigued and claimed that the quality of the later stages of training sessions were improved.

TABLE 1; Example of a plan of the strategic placing of sports supplements during training:

16 km Row @U2 + Bungees
@Turnaround 300 + mls Sports Drink + 1 x Red8 Gel
@end of Return Piece 300 + mls Sports Drink and Warm Down for 15 mins

The hydration status of the rowers ranged from 1.010 to 1.035, mean Urine Specific Gravity (USG) was 1.02 ± 0.007. After providing the athletes with strategies to improve hydration, the USG measures in September improved (range: 1.008 to 1.028 and mean USG was 1.01 ± 0.005). Research indicates that USG measurements greater than 1.027 may be due to dehydration.[9] As sports drinks were used to rehydrate during prolonged workouts and to rehydrate after the session there was an additional benefit of adding more carbohydrates to the diet. The chosen sports drink (Red 8 sports hydrate™) contained carbohydrate (7%) and electrolytes to help replace sweat losses and increase voluntary intake of fluid. In addition, Red 8 sports hydrate is relatively high in sodium (920 mg / litre) in comparison to many other sports drinks available in New Zealand (Table 2). Although, there is much debate as to the optimum sodium concentration[10] due to high sweat losses during training higher sodium consumption was recommended. Other electrolytes in Red 8 sports hydrate were calcium (8 mg / litre), Potassium (200 mg / litre), Magnesium (240 mg / litre), Phosphorus (160 mg / litre) and Chloride (160 mg / litre).

TABLE 2; Sodium content of Red 8 hydrate in comparison to some other well known brands.

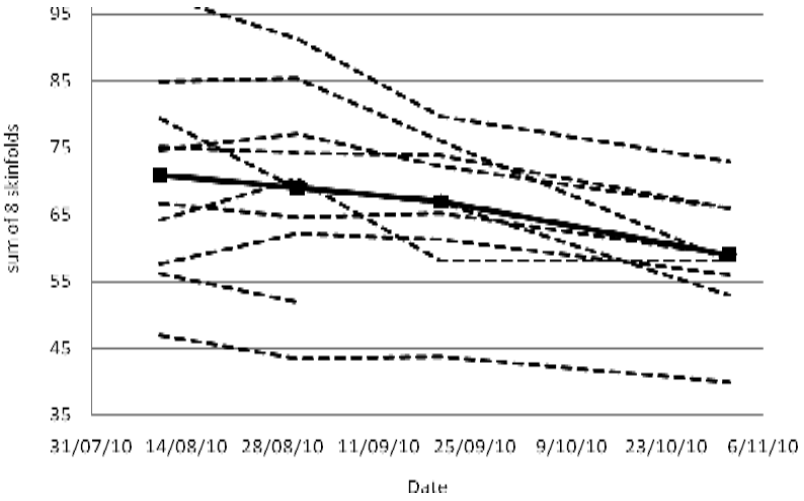
Sports Drink	Sodium (mg/litre)
Red 8 Hydrate	920
Powerbar, Endurance	800
Gatorade, Endurance	800
PB Accelerate	580
Powerade Isotonic	544
Horleys Replace	460
Gatorade	450
Mizone Rapid	235
Water	Variable

Many nutritional interventions have been considered in attempts to enhance recovery from exercise. Athletes who ingest 1.5 g CHO / kg body weight within 30 minutes after exercise have been shown to experience a greater rate of muscle glycogen re-synthesis compared to when supplementation is delayed by two hours, largely due to a greater sensitivity of muscle to insulin at that time.[8] Additionally, both solid and liquid forms of carbohydrates promote similar levels of glycogen re-synthesis.

Due to the fact that rowers train two and often three times per day the ingestion of quickly absorbed (high Glyceamic Index) carbohydrates immediately after exercise is essential as delaying carbohydrate intake by as little as two hours can reduce the rate of muscle glycogen re-synthesis by 50%[6]. Although, carbohydrate intake of 0.6-1.0 g/kg per hour during the first 30 minutes, and again every two hours for four-six hours would be appropriate to adequately replace glycogen stores.[11] This would not be practical as rowers would have carried out another one or two training sessions in this time frame. Therefore, more acute carbohydrate supplementation is required. Studies also indicate that maximal glycogen re-synthesis rates have been achieved when 1.2 g CHO / kg per hour is consumed every 15-30 minutes.[9] This strategy was found to be more practical for this particular group. Carbohydrate intakes at 1.2 g / kg per hour were introduced via a detailed a plan which strategically placed supplements (eg, sports drinks and gels) after a training session.

One of the concerns of athletes expressed during consultations is that when they increase their carbohydrate intake they will carry more fat mass. It is recognised that rowers are taller, stronger and heavier than other endurance athletes as the training programmes of elite rowers are associated with an increase in lean body mass and ideally a decrease in fat mass. To monitor the effect of the dietary changes described above a series of skin-fold measurements were taken. The sum of eight skin-folds decreased from a mean of 71 ± 13 mm early August, to a mean of 60 ± 9 mm in November in the three months leading to the 2010 World Championship (Figure 1.) This change in skin-folds indicates that fat mass actually decreased during the recording period, despite the increased carbohydrate intake.

FIGURE 1: Sum of 8 skin-folds (dotted lines) with the mean score denoted by the solid line.



CONCLUSION

A nutritional and hydration analysis during the three months prior to the 2010 World Championships indicated that the carbohydrate and fluid intake of 14 elite rowers was sub-optimal. Several nutritional and hydration strategies for increasing the energy and fluid intake of the rowers were therefore developed and implemented. These strategies successfully increased the carbohydrate intake, hydration status and reduced perceived fatigue during training. It should be noted that this was not a controlled study so no direct effect on performance could be determined as a result of these changes. However, based on the literature, the increased carbohydrate intake would be predicted to increase the intensity, pace and work output during training and improve the rate of glycogen re-synthesis after exercise. It is important to note that the increased carbohydrate consumption strategies used in this intervention resulted in a decreased fat mass and were readily accepted and implemented by the athletes.

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Rowing injuries and medical problems

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Rowing is an endurance sport with Olympic events raced over a 2000m course. In recent years adaptive rowing has been introduced and these competitors race over 1000m. A rowing course is six lanes wide and for fairness the water should be as still as possible. There are two broad classes of rowing: sweep oar where the athletes each have two hands on one oar, or sculling where each person has two oars.

Athletes with long levers are at a mechanical advantage so it is no surprise to find many tall athletes in rowing. They also require a high aerobic capacity and strength plus plenty of mental stamina. Most rowing training takes place in the early morning, so school aged athletes need to start at 6.00 am or earlier. This often means getting out of bed at 5.00 am to get the nearest body of water. Not surprisingly, this builds discipline from an early age.

For open weight crews, male athletes are between 1.85 m and 2 m tall and weigh 90 kg to 100 kg. Typical female open weight athletes are between 1.7 m and 1.9 m tall and weigh 70 kg to 90 kg. Lightweight crews are significantly smaller, with male crews averaging under 70 kg and female crews averaging under 60 kg. Coxswains need to be light and ideally weigh around 50 kg. The racing is carried out in lightweight skiffs made of carbon fibre and the oars are also made of this material. Coaches will usually accompany their crew either on the water in a powerboat or via a cycle on a pathway nearby.

From the doctor's perspective, the issues of concern are only a handful and I will detail these below.

The most common is low back pain. Mostly this is discogenic and the underlying cause is high axial loading in the spine, with an estimated compressive load of 6000N in elite male rowers. In addition, there are anterior shear forces which have been estimated at up to 800N at the L2/3 segment. In addition, sweep oar rowers have rotational stresses through the lumbar spine. The surprising thing is that although back pain is common, it is not universal among rowers. Spondylolisthesis has been mentioned by some authors including Rumball et al, but in my experience over the last nine years at medical director of Rowing New Zealand, it is no more common than in the general population.

Prevention is always the ideal and this involves the proper aerobic conditioning via a structured training programme. Hamstring flexibility is important so that at the catch phase of the stroke the maximum flexion is occurring at the hips, rather than all the load being taken on the lowermost lumbar segments. Core stability exercises are essential, particularly as rowing training is long and strenuous and all muscles in the body are prone to fatigue. The other important prevention measure is to perform passive lumbar extension exercises to balance up the amount of time the body spends in flexion, particularly for students and those of us who are in sedentary occupations (the majority).

For rowers who develop low back pain, they should present early for clinical evaluation and a standard approach utilising manual therapy plus postural advice and optimising core stability is important. Prescription of analgesics and anti-inflammatories agents can help in early return to on-water training. If radicular pain is evident then I find that early referral for an epidural steroid injection can optimise recovery and, once again, hasten return to full training. Very rarely is surgical treatment required. In my nine years of involvement with the sport, only one international athlete has required lumbar spinal surgery and one further athlete had to retire from the sport on account of lumbar spinal problems.

The second important rowing injury is stress fracture of the rib. Any rower complaining of focal pain in the chest wall should be regarded as having a stress fracture of the rib until proven otherwise. The commonest site is in the mid-axillary line but pain can appear in the posterior or anterior aspect of the rib. It will typically occur with deep inspiration and be reproduced by rib springing and sometimes by resisted adduction and extension of the upper arm. The mechanism is thought to arise from repeated traction via serratus anterior, although there has been some debate and I would refer you to the article by Craig Newlands in this issue of the journal. It is a waste of time ordering a chest x-ray as this will typically be normal. If there is a need to confirm the diagnosis via imaging then a bone

scan is recommended and specialist referral should be arranged.

Management of rib stress fracture requires time out of the boat to rest the injured area. The athlete should be asymptomatic with routine ADL, eg, driving, lifting a jug of water or rolling over in bed. They should be able to continue with cross-training, eg, lower body weights or exercycling. Once the rib pain has abated then they can return to off-water training. This should include road cycling plus running and then ergometer training before getting back into a rowing skiff. Coaches should be observant for technical faults and these should be addressed. The athlete should avoid the bench pull exercise at weight training for the remainder of their rowing career. The bench pull is known to reproduce the same stresses as would cause a rib stress fracture. Female athletes should pay particular attention to their menstrual history and if amenorrhoea is present then this needs to be specifically addressed.

The third characteristic rowing injury is intersection syndrome. This is an overuse problem relating to the APL and EPB tendons of the forearm. It causes irritation in those tendons, with characteristic pain and grating on wrist flexion and extension. Usually the problem arises after a period of intensive training, particularly if there is suboptimal technique in feathering the blade of the oar. Initial management consists of physiotherapy treatment plus training alteration, with on-water training being curtailed. An ultrasound guided cortisone injection can be very helpful in the early phase of the injury. If however symptoms have been going on for any longer than a couple of weeks then surgical decompression is often required. This is the definitive management and I have never seen a relapse of the condition once surgery has been performed.

The final injury-related problem rowers face is that of blisters. These are caused by shearing forces between the skin and underlying tissues. They are most common over the flexor surfaces of the hands but are also evident over the ischial tuberosities. Fluid accumulates in the space between the tissues and the local pressure effect causes pain. I recommend decompressing the tissue and draining the fluid and applying some local flexible dressing to the area. This should have the ability to conform to complex curves and thereby enable the rower to get back to on-water training in the shortest possible time. If secondary infection is present then I recommend treatment with systemic and local antibiotics. It is important for all doctors to be aware that WADA regulations prohibit the use of Probenecid, and in athletes of large stature with any signs of axillary or inguinal adenopathy it is important to use high dose flucloxacillin, e.g. 1g three times daily, at least for the first few days to try and get on top of the infection. For those who are allergic to penicillin then Erythromycin is the preferred alternative.

Medical problems are uncommon in rowing athletes. Most are due to overtraining due to the high volume of aerobic conditioning required to perform at a high level. Elite rowers typically complete over 200 km of training in their build up phase. In addition, they are required to perform repeated short bursts of sprinting in preparation for racing. Not surprisingly, they become more prone to upper respiratory and other infections and most elite rowing squads will have a physiologist attached to their staff. The job of this person is to monitor training loads and lactate levels and make sure that the athletes are not being over pushed. Early signs of metabolic overload should lead to a reduction in the training volume and intensity.

One final medical issue of note is atrial fibrillation. The most high profile case occurred when Rob Waddell was racing Mahe Drysdale for the singles berth at the 2008 Olympics. He developed atrial fibrillation some 300m into the event. Most endurance athletes require over 10 years of high volume training to achieve their potential, and it is this high volume of training over many years that causes volume overload in the heart. Any rower who complains of an irregular pulse should present for clinical evaluation and atrial fibrillation should be high on the differential diagnosis. If present for less than 48 hours then cardioversion can be carried out immediately. Otherwise, anticoagulation with warfarin is required. Subsequently the athlete needs to remain in sinus rhythm and this may be achieved via antiarrhythmic drugs. Occasionally ablation therapy, either via radiofrequency or surgical ablation, is required.

In summary, rowing is a sport with a huge legacy of success in New Zealand and the promise of much success in future. There are only a few characteristic injuries and attention to these will bring much gratitude from the rowing athlete to those who care for them.

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Just row faster

Rod Corban PhD

Since the end of 2004 I have been lucky enough to be associated with arguably one of New Zealand's most successful high performance programmes. My role in this programme has been that of the lead psychologist and during this time I have travelled with the elite teams to numerous world cups, world championships and the Beijing Olympics. What a person in my position does is often not obvious and even my closest friends often ask me what is it that I do with these athletes, to which my response is simply: "I tell them to row faster". Of course this is not quite the case but that is my goal in any sport I work with: to help athletes jump higher, run faster, play better and… to row faster.

I think most people will admit that being a successful high performance athlete requires great mental as well as physical strength and just as sports employ individuals to help develop physical strength so it would make sense that sports utilise expertise in the areas of building mental strength (or what I prefer to call psychological flexibility) using a similar model of delivery. Specifically, just as muscle gets stronger through regular work outs so the brain builds "better" or more efficient connections through continual work. For example, there is some evidence that mental exercise (eg, Sudoku) staves off the onset of dementia in the elderly. Thus, regularly putting brains through appropriate mental work outs we will build mental strength. For example, the goal for athletes is often to be confident or to be able to concentrate (or more precisely limit the distractive impact of the stories our mind is constantly telling us about ourselves) thus the athletes I work with are often required to work on these things in all aspects of their lives; particularly in training. This last point is important: most athletes spend large amounts of time training and relatively little time actually competing and which is especially true for our rowers. If you consider that between now and the London Olympics some of our rowers may well be required to compete in less than five international regattas, while the majority of the next 20 months will be spent training. During this time I will continually ask athletes to embrace mental and emotional adversity with the aim of improving their willingness to deal with situations that challenge them psychologically. This will not make what they do any easier, but it will allow them to develop the confidence to cope with the rigours of high performance sport rather than struggle with it. This approach is based on the recent developments in mindfulness based interventions and in particular the work by Steven Hayes and others promoting what has been called Acceptance Commitment Therapy (Hayes, Stosahl &Wilson, 1999) or more precisely in this context; Acceptance Commitment *Training*.

During the recent World Champs as Karapiro this approach was central to the work I did with individuals (both coaches and athletes) and with crews. A key part of this was monitoring behavior and using this to feedback to athletes to see if they were on "track" mentally and emotionally. Often people will say it is impossible to measure the impact of psychology in a programme, however I would challenge this. Ultimately we are trying to change behavior which we can measure using information from the individual's themselves, performance based measures (heart rate, force gate data, training times/ splits etc.), their interactions with others (eg, crew mates, management and other service providers). However, perhaps one of the best sources of feedback is from the observations of the coaches who spend a large amount of time with the athletes and observe them under all kinds of stress, both physical and mental. By doing this we are holding not only the individuals I work with accountable but also me for this work. I have found rowing coaches in particular always willing to tell me when what I am doing is not working and I need to be better (although you can imagine the language they use is often more colourful).

Being immersed in this programme means I spend a considerable amount of time in the environment at Karapiro and at international regattas I get to observe the athletes (and coaches) in their natural environment. My first degree at University was a double major in Psychology and Behavioural Ecology and I have found that the observation skills required to study the behavior of animals have served me well when working with athletes and coaches! In this way over time I have also learned to identify when particular individuals are struggling by observing their behavior, both verbal and non-verbal and act accordingly. In the recent book "Reflections of Gold" Caroline and Georgina Evers-Swindell talk about the work we did together leading into the Beijing Olympics and how this was beneficial to them. Much of this work was based on my knowledge gained over the previous four years, where although I had not done much with this crew (why would you, when it wasn't broken) I was able to use this experience to monitor their behavior in the weeks leading into the Olympics as well as during the regatta itself and intervene accordingly. Also, because of the good relationship with other key people in their programme especially Dick Tonks and Brett Smith, I was able to use information from them to challenge some of the girls' unhelpful thoughts and behaviours and, just as in motivational interviewing, was often able to create ambivalence in their thinking which brought about subtle changes in their thoughts (I assume) and more importantly their behavior. Also, a large part of the success of my work with this crew was the fact that what I did was reinforcing Dick's message which was that there were no magic bullets and they just needed to … *row faster*. Thus the final take home message for any sport science or medicine provider working in a sport is that you can only be successful if you work closely with the person who is ultimately held accountable: the coach.

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Heart rate variability and psychological stress in an elite female rower who developed over-training syndrome

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INTRODUCTION

Coaches of elite athletes would benefit from simple markers that predict overtraining syndrome. Despite extensive research efforts the search continues for a marker that is both sensitive and specific enough to consistently predict overtraining syndrome.[5] Amongst candidate markers are measures of heart-rate variability,[1-4] psychological state,[5] and performance itself.[5] Here we describe changes in these measures during a period of overload training that resulted in overtraining syndrome of one member of a squad of elite athletes. Our findings lead us to doubt whether any of these measures alone can be trusted for decisions about early intervention to prevent overtraining syndrome, but in combination they may be useful.

METHODS

Ten elite female rowers from the New Zealand Senior-A rowing squad preparing for international competition were monitored during a 4-wk overload period in accordance with ethical approval of the Auckland University of Technology. Their mean height, weight and age were: 177.7 (range 175-181.5) cm, 74.9 (68.2-92.8) kg, 22 (19-25) y. The timeline for the study was 2 wk of cross-training, a 4-wk overload during which various markers were sampled, and a 1-wk taper. The 4-wk overload consisted of ~12 aerobic rowing sessions and two weight training sessions per week, and volume of rowing training increased by ~7% each week. Training volume was reduced by ~20% during the subsequent taper. Change in performance was determined by a stepwise lactate-threshold test at the beginning of the study and following the 1-wk taper, plus a 30-min rowing ergometer test at midday on Friday during the 4-wk overload. Reduced performance in both tests was used to classify athletes as non-functionally overreached, and any rower whose performance in tests and competitions deteriorated over the subsequent seven months was deemed to have overtraining syndrome. All rowers maintained the prescribed training throughout the season.

The performance tests were conducted on a rowing ergometer (Model IIb, Concept2, Morrisville, VT). The first lactate-threshold test was preceded by at least 2-d of rest prior, and the second test was completed after a 7-d taper. The test involved 6-min steps with 15-W increments and rests of 1 min, during which blood lactate was sampled; the power corresponding to 4 mmol.L^{-1} lactate was determined visually by interpolation from a scatter chart. The 30-min ergometer was a maximal test, restricted to 18 strokes per minute and conducted as a competition to optimise motivation. Both tests have very high correlations with the criterion measure of rowing performance the 2000-m rowing ergometer time trial[6] (TB Smith, unpublished observations).

The rowers were provided with a daily diary to record hours of sleep and number of times they awoke; they also recorded perceived fatigue when awakening and prior to bed using a 5-point scale (1–not at all, through 5–very much), rating of

perceived exertion from the morning row on a 10-point scale, and their mood state using the Positive and Negative Affect Schedule (PANAS).[7] Immediately upon waking the rowers were requested to record their resting morning heart rate for 5 min while lying supine with the RS800 polar heart rate monitor (Polar Electro OY, Kempele, Finland). The Polar software (Version 4.03) provided five valid measures of heart-rate variability[8] (see Table 1).

The team undertook a medical examination approximately every 6 months, a monthly blood test and all had free access to a highly qualified sport physician and physiotherapist. We received all reports of injury, illness or disease diagnosed by these practitioners or any specialists the rowers were referred to. No rowers showed any consistent poor performances in the two months immediately preceding this study that would indicate any possibility of overreaching or overtraining.

Measures of performance and heart-rate variability were log-transformed before analysis; changes were back transformed to percents after analysis. A measure of linearised mean change was derived by fitting a straight line through each individual's values, then calculating the difference between the predicted values for the first and last performance test or assay. We were interested a gradual changes that would be consistent with a gradual onset of overtraining fitting a simple linear model and deriving a linear change estimates such gradual changes. This approach is an appropriate parsimonious way to estimate a gradual change during the monitoring period, which would be consistent with overtraining for noisy data of this nature. Individual changes were standardised for interpretation of magnitude.[9] The analyses were performed with the Statistical Analysis System (Version 9.1, SAS Institute, Cary, NC).

RESULTS AND DISCUSSION

Taking the uncertainties in the performance measures into account, at least three rowers (1, 2 and 3) were candidates for non-functional overreaching (Table 1); of these, only Rower 1 suffered continuing performance decrement over the seven-month season with no indications of illness, injury or disease, which is consistent with overtraining syndrome.[5] Rowers 1 and 2 showed substantial reductions in heart-rate variability, whereas Rower 3 showed generally large *increases*. Small-moderate reductions in heart-rate variability occurred with only one other rower (Rower 8). The only rowers to experience large increases in several markers of psychological stress were the rower with overtraining syndrome and the most improved rower (Rower 10). An increase in psychological stress in combination with a decrease in heart-rate variability might nevertheless identify an overreached athlete who will eventually overtrain (Rower 1), but the failure of Rower 2 to complete her diary deprived us of additional evidence for this possibility.

Whether measures of heart-rate variability and psychological stress together would have sufficient sensitivity and specificity for early intervention to prevent overtraining syndrome is unclear. For example, Figure 1 shows that the rower destined to suffer overtraining syndrome (Rower 1) had a marked reduction in the LF/HF ratio in the first 2-3 wk of the overload, but so did the rower who showed the most improvement in the overload (Rower 10). Both rowers also had high levels of morning fatigue, and if anything Rower 10's morning fatigue showed a greater increase than that of Rower 1. A reduction of training aimed at limiting the decline in LF/HF and reducing morning fatigue might have prevented overtraining in Rower 1 but might also have reduced Rower 10's dramatic improvement. We are unaware of any studies providing evidence that

TABLE 1: Linearised changes in measures of performance, heart-rate variability and psychological stress over the 4-wk overload. Data are means and SD of changes for the group, standardised individual change scores, and standardised 90% confidence limits for each individual's change. Boxes enclose individual rowers' clusters of substantial reductions in performance, reductions in heart-rate variability, and increases in psychological stress.

		Rowers 1 to 10: status and standardised change scores										
		OTS	Non-functional OR <——									>Improved
	Mean ± SD	1	2	3	4	5	6	7	8	9	10	CL
Performance												
30-min power	-0.4 ± 2.7 %	-1.4	-1.2	-0.5	-0.2	-0.1	0.1	0.2	0.2	0.6	2.2	1.4
4-mmol.L^{-1} power	2.5 ± 3.3 %	-1.1	-1.3	-0.4	-0.1	0.4	-0.7	1.0	1.7		0.5	1.5
Heart-Rate Variability												
LF/HF	-2 ± 40 %	-0.8	-0.1	-0.5	2.4		-0.4	0.6	-0.3	-0.6	-0.3	0.8
SDNN	18 ± 34 %	-1.0	-1.0	0.8	1.8		0.2	-0.7	-0.8	0.9	-0.2	0.7
RMSSD	10 ± 35 %	-0.8	-1.0	1.5	-0.3		0.3	-0.6	-0.9	1.5	0.4	0.9
MeanRR	4.0 ± 4.2 %	-1.1	-1.8	1.2	0.5		-0.4	0.9	-0.5	1.0	0.2	1.3
pNN50	10 ± 20 %	-0.2	-1.0	2.5	-0.3		-0.4	-0.3	-0.6	0.1	0.3	1.1
Psychological Stress[a]												
Morning fatigue	0.53 ± 0.66	2.0		-0.2	-0.3	0.0	-0.3	-1.1	-0.7	-0.5	1.4	0.7
Evening fatigue	0.51 ± 0.73	1.4		-0.2	-0.1	0.1	-1.0	-0.4	-1.4	-0.1	1.7	0.7
PANAS negative	2.9 ± 6.7	1.3		-0.2	2.0	-1.2	-0.1	-0.8	-0.6	-0.2	-0.2	0.4
PANAS positive[a]	0.7 ± 2.6	0.2		1.7	-0.8	-0.3	0.5	-0.5	-0.2	1.0	-1.6	1.2
Sleep duration[a]	-0.59 ± 0.44 h	0.2		-0.4	0.2	-0.6	1.0	-1.0	1.9	0.0	-1.4	1.6
Times awoken	0.08 ± 0.67	-0.1		-1.9	0.3	-0.7	0.1	1.5	-0.2	-0.2	1.2	1.0
Morning RPE	1.3 ± 1.7	0.1		0.8	0.5	1.8	-0.3	0.2	-1.1	-1.3	-0.8	0.9

OTS, overtraining syndrome; OR, overreaching; CL, 90% confidence limits for each rower's change, expressed in "±" form; LF/HF, ratio of low frequency to high frequency power; SDNN, standard deviation of all NN intervals; RMSSD, root mean square of differences; MeanRR, mean time between normal RR intervals; pNN50, proportion of differences between adjacent NN intervals of more than 50 ms. Standardised change scores are each individual's change divided by the SD of change scores for the squad. Rowers are ordered from worst to best change in 30-min performance. Markers are ordered approximately best to worst for diagnosing the only case of overtraining syndrome (Rower 1).[a] The sign has been changed on PANAS positive and sleep duration so that positive changes indicate increased stress for all psychometrics.

decreases in heart-rate variability presage overtraining syndrome, but measures of psychological stress were apparently useful predictors of at least non-functional overreaching.[10]

In conclusion changes in performance, heart-rate variability, and psychometrics individually appear to lack the sensitivity and specificity to prevent overtraining syndrome, at least in these elite rowers. Together these measures may be useful indicators of excessive training.

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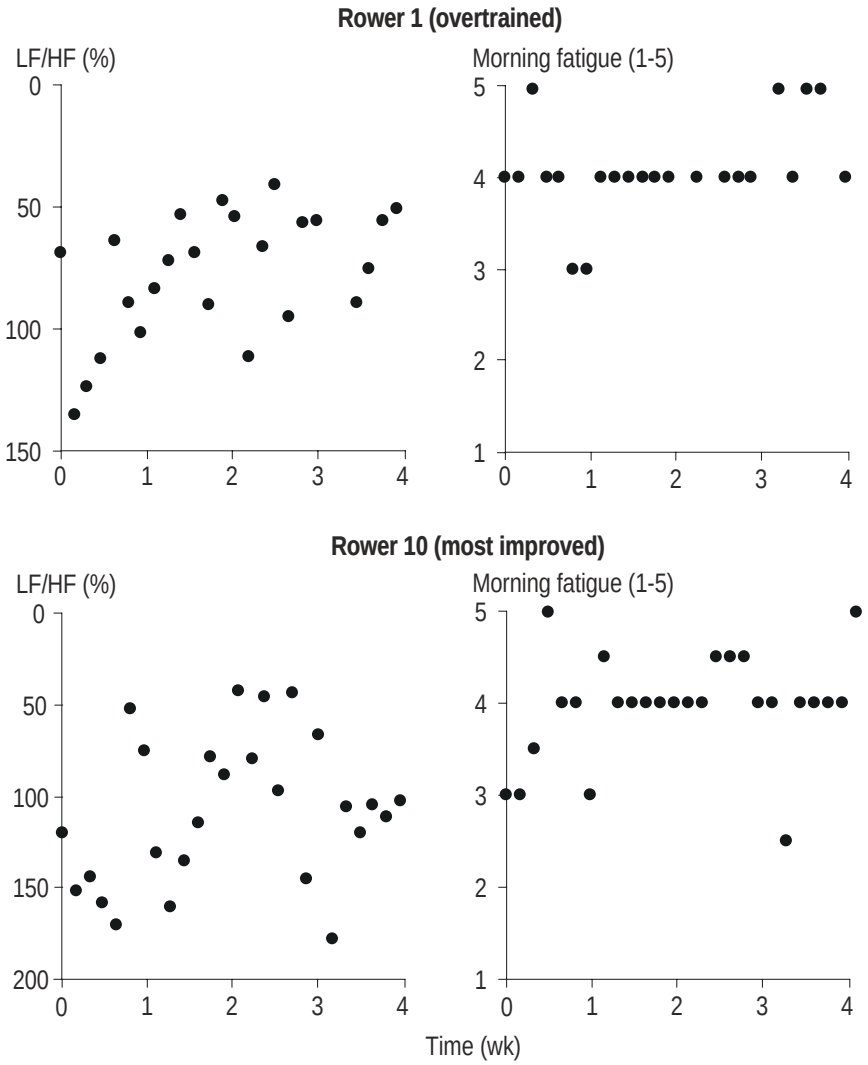
FIGURE 1: LF/HF and morning fatigue over the 4-wk overload for Rower 1 (who became overtrained) and 10 (who was amongst the most improved in performance). Values and changes over the first 2-3 wk are similar.



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A thoracolumbar dysfunction with underlying Scheuemann's disease in an elite surf boat rower

Chris McCullough

INTRODUCTION

Competitive surf boat rowing is a highly aerobic sport requiring technical skills, motor coordination, strength and endurance. A number of authors have reported a significant incidence of low back pain amongst the rowing population, mainly due to excessive hyperflexion and twisting. Reid and McNair (2002) have stated that in a single session a rower may train for 90 minutes and cover 20-25km on the water. This amounts to about 1800 cycles of flexion per session with 70% of the stroke cycle in a flexed posture. Repetitive microtrauma injury to the lumbar spine has been implicated as a cause of back pain. Independent variables that contribute individually or in combination to lumbar injury include poor technique, poor conditioning and abnormal anatomy.

HISTORY

A 28 year old male elite surf boat rower presented with thoracolumbar back pain that had been present for 2Ω years. He had bilateral pain from the thoracolumbar junction to the iliac crests with occasional radiation to the right groin in the past 18 months. Pain was intermittent. Aggravating features included prolonged standing, walking, running and rowing. By contrast, pain was eased by sitting, lumbar flexion exercises and rest at night. He had been diagnosed with Scheuermann's disease affecting the thoracic spine in 1995. By the time an x-ray was repeated in 2005 he had advanced wedging seen in the mid thoracic region. Past physiotherapy had included soft tissue therapy, acupuncture, mobilisation and muscle balance exercises with only short term relief.

EXAMINATION FINDINGS

Examination revealed a pronounced thoracic kyphosis with protracted head posture and a lordotic lumbar spine posture. Motion testing revealed a lack of curve reversal in both the thoracic and lumbar spines. Muscle balance assessment highlighted weakness of his core control muscles and tightness of latissimus dorsi, thoracolumbar fascia, quadratus lumborum, iliotibial bands and calves bilaterally.

DIAGNOSIS

He was diagnosed with a thoracolumbar dysfunction with underlying thoracic Scheuermann's disease and muscle balance issues. X-ray findings complemented the clinical picture and previous work by Sahrmann has shown a sequence of acquired impairment resulting from a marked kyphotic spine.

Classic Scheuermann's disease is characterised by wedging of at least three vertebral levels of the thoracic spine with Schmorl's nodes and a structural round back. Some cases may actually be the result of severe lumbar extension contracture with

excessive flexion demands transferred to the thoracic spine and resultant anterior vertebral plate fracture with secondary bony deformation of the vertebrae. This athlete was also on a long course of acne medication (Isotretinoin) and use of this medication has previously been associated with generalised arthralgia and myalgia.

TREATMENT

The treatment approach was trunk stabilisation as recommended by O'Sullivan, Sahrmann and Hides. A graduated exercise loading regime was provided to enable a managed return to surf boat competition.

Phase 1

Local stabilisation exercises utilising co-contraction of transversus abdominis and multifidus. Specific stretch exercises layered upon a stable core were instituted. These were to address key areas of stiffness, in particular lumbar flexion and rotation. There was liaison with allied health professionals including a sports physician to clarify the diagnosis and arrange x-rays and discuss the effects of his skin medication on joints and muscles in heavy training. The sports physician recommended a trial of Glucosamine, a supplement that has been shown to help with some joint problems. He also recommended maintaining euhydration and reducing weight-bearing exercise loads.

This athlete responded steadily to graded mobilisation and manipulation, myofascial release techniques, dry needling and therapeutic exercise prescription. His symptoms had improved by 50% at Week 4 and 75% at Week 8.

Phase 2

Clinical Pilates rehabilitation work was instituted and supervised without our clinic from the eighth week onwards. The bias was a neutral pelvis position with a focus on restoration of lumbar flexion and thoracic extension. A specific gym weights programme was recommended with a prehabilitation, endurance focus. This involved light loads in balance positions with short rest periods of 30 seconds each. Symptoms further improved to be 80% resolved by Week 16 and 90% resolved by Week 24 with only minimal residual symptoms occurring whilst jogging.

Phase 3

Gym/global strength was progressed from twice to three times per week in an effort to focus on hypertrophy and strength in a split programme from Week 20. Guidelines included a low-load rowing ergometer warm up at level 2 with technique focused to eliminate the thoracic slouch. Due to the kinetic chain requirements of rowing, strength exercises were centred around primal movements so squats, dead lifts, cleans, lunges and trunk rotation were all part of the regime. Loads were gradually increased, with supersetting of exercises and longer rest periods of 90 seconds each.

OUTCOME

By the end of treatment the patient was 95% better and was self-managing with an enhanced range of motion and functional control. He resumed pre-season surf boat rowing with ongoing weight training, rowing ergometer, jogging and martial arts training. He stopped the skin medication.

CONCLUSION

Rehabilitation training needs to be specific to the problem. A lack of attention to the underlying thoracic Scheuermann's disease and acquired impairments meant that postural imbalances had not been previously addressed in this patient. Training loads, time and technique are key issues to address in athletes with a return to sport focus. There are often significant structural and medical factors underlying physical symptoms in our patient. Physiotherapists need to be aware of these influences to avoid harmful delays in correct management. Thoracic Scheuermann's disease usually presents without a distinct traumatic injury and with deformity rather than pain.

The patient was able to steadily increase his training load and competed within New Zealand over the summer and later at the World and Australian Championships.

In summary, this case exemplifies how attention to multiple factors and a team approach can result in an optimal treatment outcome.

Reflections of Gold

Authors: **Peter Bidwell**
Publisher: **Harper Collins**
Price: **NZ$60**

This superbly presented book chronicles the development of New Zealand rowing over the last 50 years. It unashamedly concentrates on the personalities that have contributed to the success of the sport and finishes just prior to the recently completed highly successful World Championships at Lake Karapiro.

The first half of the book concentrates on the era when the Eights were king. It documents the success of the New Zealand Coxed Four at altitude in Mexico City at the 1968 Olympics. These athletes were originally the spare athletes but, in the event, their performances exceeded those of their Eights counterparts. However, continued investment in the Eights bore fruit most spectacularly in 1972 when the crew won a gold medal at that Olympic Games. The coach through this golden era was Rusty Robertson, who was clearly the dominant force in ensuring New Zealand's successes during those years.

An often forgotten crew at the Munich Olympics was the New Zealand Four containing one Richard Tonks, who obviously picked up on Robertson's methods, and that crew were silver medallists just pipped by the East Germans after they had beaten them in the semi-finals.

New Zealand persevered with Eights crews with reasonable success at World Championships, including wins in 1982 and 1983. However, their fourth placing at the Los Angeles Olympics in 1984 was regarded as a relative failure. That brought to the end what many would regard as the first golden era in New Zealand rowing.

The second golden era has been built on what I would term counterintuitive planning. Most countries put their best eight athletes into the largest boat, the Eight. New Zealand has always had a relatively small core of elite rowers and has employed the philosophy of putting our best athletes in small boats, thereby maximising the chances of picking up multiple medals. This philosophy has borne fruit over the last decade.

This period of unprecedented success has coincided with Dick Tonks being appointed the head coach for Rowing New Zealand. It began with Rob Waddell winning World Championships titles in the late 1990s and then the gold medal at Sydney 2000 Olympics. It has continued with success of the Evers-Swindell twins and of Mahe Drysdale, and their success has been infectious. Other strong crews have been assembled and this book documented their progress, too.

As a book it is very well written and the writing is complemented by superb photographs documenting the success of our elite athletes over the last 50 years. All that is needed now is a follow up volume at a later date to cover the wonderful recently completed World Championships where New Zealand crews won 10 medals.

This book is of undoubted interest to those who follow New Zealand rowing, and even though I have been involved as Medical Director for the last eight years, I learned plenty of new facts about various personalities. It also describes the essence of the teamwork that is essential to make a boat go fast, and the special interaction between a coach and crew. It does not shy away from mentioning controversies such as the then-government's refusal to grant leave for our crews to compete at the Moscow Olympics in 1980.

If you know someone who has a significant interest in rowing I would warmly recommend this book.

Chris Milne
Sports Physician

The Book of Rowing

Authors: **D C Churbuck**
Publisher: **The Overlook Press, New York 1999**
Price: **NZ$70 Approximately**

This magnificent monograph is a near 300 page comprehensive introduction to rowing. It begins with a history of rowing and then discusses sculls, shells and oars plus the basics of how a crew works. What follows is a couple of chapters on the technical aspects of sweep oar rowing and sculling, and these are well illustrated with diagrams explaining the catch, drive and finish phase of the rowing stroke before leading into the recovery phase. There is a whole separate chapter devoted to sculling technique.

Following that there are chapters devoted to collegiate rowing, youth rowing, women in rowing and an international rowing perspective; not surprisingly, this comments on major international events such as the Henley Rowing Regatta. The only mention of New Zealand is on p155 with regard to the comment that New Zealand crews have cut their expenses with gifts from Rothmans Tobacco Company and other sponsors. Clearly, the author was not familiar with developments in New Zealand Rowing in the last 20 years. This would be the only weak part of the book as it has a heavily North American, and particularly Harvard University, perspective. In fact, there is a whole chapter devoted to the Harvard-Yale Regatta.

There is also a further chapter on ocean rowing but, clearly, this predates the magnificent achievements of Rob Hamill and other New Zealand oarsmen who have been so successful in trans-Atlantic rowing events.

There is an excellent glossary, as people unfamiliar with the sport need to acquire knowledge of various nautical terms plus the specific terms applicable to rowing. For example, a “crab” refers to when the oar slices downward and out of control into the water as opposed to a crustacean.

The book is completed by an extensive bibliography plus a comprehensive list of rowing teams, clubs and organisations within the USA. It also lists the various races and regattas on a month by month basis and provides a list of suppliers for rowing shells and equipment.

This book’s greatest strength is its wonderful appreciation of rowing history with some truly historic photographs plus the detailed description of rowing technique plus equipment. Its greatest weakness is the lack of a true international perspective, and I have commented on this above.

However, for anybody new to rowing it provides possibly the best single introduction to general aspects of the sport. Medical aspects of rowing are better dealt with in the volume reviewed by my colleague, Dr Brendan O’Neill, in this issue of the Journal.

Chris Milne
Sports Physician

Rowing

Editors: **N H Secher and S Volianitis**
Publisher: **Blackwell Publishing, Massachusetts 2007**
Price: **NZ$105**

This book is one of a series of IOC Medical Commission handbooks summarising up to date information on specific sports, in particular the science and sports medicine of the sport. With the title of the book being "Rowing" I guessed this book was about rowing – no wasted student loan here! The aim is to provide practical application of the latest research into high performance rowing to as wide a group as possible, including athletes and coaches, to doctors and other health providers such as sports scientists and dieticians, and recreational rowers too. It has a number of authors contributing to the various chapters, and they are predominantly European based, with Australia's Louise Burke headlining the chapter on nutrition.

The book starts off with a very interesting review of the history of rowing, from the initial water craft endeavors of mankind to the current Olympic classed and various other disciplines covered under the Federation Internationale des Societes d'Aviron (FISA) organisation (the world governing body for rowing). Subsequent chapters summarise the latest findings in the many fields that make up a "high performance" team – principally physiology, biomechanics, nutrition and psychology. There are also focused chapters on overtraining, sports medicine, and the relatively new adaptive rowing discipline. Each chapter progresses through an introduction, leading into a thorough analysis of the literature pertinent to rowing. A summary finishes most chapters, with further recommended reading and key reference papers listed following the summary.

There is a lot of information in this book, some of which was lost on me, but highly appropriate for the rowing specific biomechanist/physiologist and coaches. That said, this book should appeal to the novice or recreational rower looking to improve their knowledge and rowing performance, and for a relative newby to the sport like myself was particularly invaluable in giving me the background information needed to work with rowers.

This is a comprehensive and detailed handbook on rowing, and should grace the learned bookshelf of anyone working or competing in rowing events. I have not read any of the other IOC Medical Commission publications, but this book sets a very high standard, and is a credit to its authors. It will satisfy the biomechanical and physiological purists, while also being accessible for those less scientifically based but still wishing to get an overall understanding of the science and medicine behind rowing performance.

Brendan O'Neill
Sports Doctor

Variation in menstrual symptoms and anthropometry throughout an oral contraceptive cycle

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ABSTRACT

The purpose of this study was to determine whether common anthropometric variables and menstrual symptoms, are affected by the acute hormonal fluctuations, within an oral contraceptive cycle. Twenty seven female athletes (monophasic oral contraceptive users) from a variety of sports completed an anthropometric assessment, menstrual symptom questionnaire and blood test (to assess endogenous hormone concentration) at three time points of a single cycle. Measures coincided with the oral contraceptive consumption phase (CONS) as well as early (WITH1) and late in the withdrawal phase (WITH2). Null-hypothesis testing revealed no significant difference between cycle phases (CONS, WITH1 and WITH2) for mass (63.1, 63.1 and 62.9 kg respectively) or skinfold sum (83.0, 84.3, and 84.3 mm respectively). However, inferential statistics emphasising precision of estimation, showed an approximate 27% chance that skinfold measures would be greater during both WITH1 and WITH2 compared to CONS. Menstrual symptoms were significantly higher during WITH1 compared to both CONS and WITH2 ($p<0.05$). Serum oestradiol levels were significantly greater during WITH2 compared to both WITH1 and CONS ($p<0.05$) but there was no difference in serum progesterone levels. Therefore, during a single oral contraceptive cycle there may be variation in skinfold sum, menstrual symptoms and endogenous oestradiol levels. These factors may have the potential to influence female athletic performance, particularly early in the withdrawal phase when skinfold sum may be elevated and menstrual symptoms more prevalent.

INTRODUCTION

Research suggests that oral contraceptive (OC) use is becoming more prevalent in the athletic population, possibly due to the availability of lower dose OC formulations and changes to the progestogen component, which has been linked to unwanted side effects.[2] Preliminary research prior to this study, involved the survey of 68 elite Australian athletes (mean age 25 years, ranging from state to international level) from fifteen different sports, to determine the prevalence of OC use, type of OC used and reason/s for usage. Results indicated that 83% of the athletes were taking an OC and of those, 98% took a monophasic and only 2% a triphasic formulation. There are several reasons why a female athlete may choose to use an OC. The following reasons were provided by the surveyed group of athletes: contraception (75%), cycle regularity (43%), for control of menstrual symptoms (34%), cycle manipulation (32%) and other (4%).

Despite the widespread use of OC agents among athletes, few researchers have examined the effect of acute hormonal fluctuations within an OC cycle. Predominantly the literature has focused on assessing differences between OC users and nonusers, or responses pre and post OC use. The research pertaining to body composition and OC use is inconclusive and findings vary based on the activity level of the participants, the type of OC administered, as well as the potency and androgenicity of the progestogen component of the OC.[4] Falls

in progesterone levels have been linked with increased aldosterone activity (due to progesterone being an antagonist at the aldosterone receptor site) therefore, when progestogen is lowered during OC withdrawal, the increased circulating aldosterone could potentially increase fluid and electrolyte retention.[8]

The dosage of oestrogen and progestogen in a monophasic pill is constant for 21 days and is followed by seven days of placebo. It is currently unclear whether the acute hormonal fluctuation within a single monophasic OC cycle has the potential to influence anthropometric variables. Without this information the inconclusive findings of the existing literature on OC use are further confounded, as it remains unclear whether differences resulting from OC intervention are a result of the intervention itself, or the biological variation that exists within an OC cycle. The purpose of this study was to determine whether anthropometric measures, menstrual symptoms and endogenous hormone profiles are affected by the acute hormonal fluctuation associated with the different phases of the monophasic OC cycle.

METHODS

Experimental Overview

Twenty seven competitive athletes (mean age 28 years) from a variety of sports including triathlon, cycling, swimming, water polo, hockey, netball and basketball were assessed to determine whether specific measures varied throughout a single OC cycle. Each participant had been taking a monophasic OC for a minimum of six months prior to the commencement of the study (mean time taking OC was 48 months). Following approval from the University of Western Australia ethics committee, all participants were informed of the purpose of the study, the risks of participation and each gave their written consent.

During the testing period, athletes were required to maintain a regular diet and training regime. Prior to each test, the participants completed a three day food diary, a weekly training monitor and a health questionnaire to ensure that dietary intake and training load were consistent. Test order was balanced and test times were standardised for each participant. The three test days were selected to represent the varied hormonal profiles seen within a normal monophasic OC cycle. This included one test between days 13 and 21 of the active OC consumption phase (CONS) and two tests during the OC withdrawal phase, two to three days post active pill cessation (WITH1) and six to seven days post active pill cessation (WITH2).

Test Protocol

A resting venous blood sample (~8 ml) was collected, then centrifuged, stored in a freezer and later analysed for endogenous serum hormones oestradiol and progesterone (Path West, Laboratory Medicine, WA), using a one-step chemiluminescent competitive immunoassay (% CV - oestradiol 4.7, progesterone 5.6). Athletes then completed a menstrual symptom questionnaire which required them to rate the presence and severity (0 - none, 1 - mild, 2 - moderate, 3 - severe) of eight common menstrual symptoms (abdominal pain, back pain, bloating, breast tenderness, cramps, headache, leg heaviness and nausea) producing a maximal possible score of 24. In addition, body mass ($\pm$0.05 kg, A&D, Australia) and sum of skinfold thickness (mm) at seven different sites were assessed with Harpenden skinfold callipers, by a Level 2 accredited anthropometrist (International Society for the Advancement of Kinanthropometry, ISAK).[4]

Descriptive statistics (mean ± SD) were used to characterise the data. All parameters were analysed using a one-way within-subjects repeated measures ANOVA to determine any difference between OC cycle phases, with statistical significance preset at $p < 0.05$. To make inferences about skinfold sum throughout an OC cycle, the uncertainty in the effect was expressed as 90% confidence limits and as possibilities that the true value of the effect represents substantial change. Scores were log transformed prior to analysis to reduce non-uniformity of error and to express effects as percent changes.[9] The smallest clinically or practically important performance change was set at 2%, slightly above the percent typical error for this variable (established by the anthropometrist during ISAK accreditation).

RESULTS

The mean and range for measured variables during each OC phase are presented in Table 1. No significant difference was observed between phases for mass (kg) or skinfold sum (mm) based on ANOVA results. However, inferential statistics emphasising precision of estimation, determined an approximate 27% chance that skinfold measures would be greater during both withdrawal phases compared to during CONS. Precision of estimation statistics are presented in Table 2. Menstrual symptoms (although minimal, as greatest possible score is 24), were significantly higher during WITH1 (2.5 ± 2.2) compared to both CONS and WITH2 (0.9 ± 1.1 and 1.3 ± 1.6 respectively, $p<0.05$). There was no difference in progesterone concentration between OC cycle phases, but serum oestradiol did vary, with values significantly higher in WITH2 (121 ± 105 pmol·L^{-1}) compared to WITH1 and CONS (66 ± 54 and 58 ± 28 pmol·L^{-1} respectively, $p<0.05$).

TABLE 1: Mean and range of dependent variables at different phases of the OC cycle.

VARIABLE	CONS	WITH1	WITH2
Mean body mass (kg)	63.1 (48.8 - 78.6)	63.1 (49.5 - 78.5)	62.9 (49.4 - 77.6)
Mean sum of skinfolds (mm)	83.0 (37.3 - 121.6)	84.3 (37.1 - 132.6)	84.3 (37.1 - 131.4)
Menstrual symptoms	0.9[b] (0 - 3.5)	2.5[a,c] (0 - 10)	1.3[b] (0 - 5)
Mean serum oestradiol (pmol·L^{-1})	58[c] (40 - 120)	67[c] (40 - 270)	121[a,b] (40 - 480)
Mean serum progesterone (nmol·L^{-1})	2.5 (1.0 - 4.0)	2.5 (1.0 - 4.0)	2.4 (1.0 - 4.0)

[a] significantly different to CONS ($p<0.05$)
[b] significantly different to WITH1 ($p<0.05$)
[c] significantly different to WITH2 ($p<0.05$)

DISCUSSION

In the early 1980's the incidence of OC usage by athletic women was reported between 5 to 12%,[16] up to 46%[1] and during the late 1990's a reported 47% of female team sport athletes used an OC agent.[3] Preliminary survey results from this study suggest that OC use is becoming more prevalent in the modern day athletic population and the most common preparation of choice is the monophasic treatment. The primary role of the monophasic OC pill is the suppression of the hypothalamic-pituitary system (including the endogenous production of oestrogen and progesterone), which prevents the mid-cycle surge of gonadotrophins, inhibiting ovulation and subsequent pregnancy.[7] The serum level of the synthetic oestrogen component, ethinyl oestradiol (EO), peaks approximately one hour after ingestion, then concentrations fall rapidly for six hours and decline slowly thereafter. Approximately 24 hours after ingestion, 33% of EO remains in circulation compared with about 20 to 25% of synthetic progestogen. However, EO is detectable for up to two days after discontinuation, while some progestogens are detectable for up to five days.[6] The current data supports earlier research[17,18] and demonstrates that early in the withdrawal phase (WITH1) both endogenous oestrogen and progesterone continue to be suppressed, whilst later in the withdrawal phase (WITH2) endogenous oestrogen levels rise significantly. The large standard deviation of the endogenous oestrogen level indicates that there is substantial individual variation in these measures and we recommend that researchers consider the withdrawal phase of the OC cycle as a transient hormonal profile.

Premenstrual symptoms are estimated to affect up to 40% of women of reproductive age, not taking an OC[5] and generally present several days prior to the menstrual period. Symptoms commonly include dull aching in the abdominal and lower back region, tenderness of breasts, feelings of heaviness and headaches.[1] Oral contraceptives are commonly prescribed to relieve the symptoms of dysmenorrhoea.[5] Beneficial effects were found by Bale et al[1] who reported that physical education students taking an OC suffered fewer premenstrual symptoms and to a lesser degree than their non pill taking counterparts. In support, we found symptoms were significantly greater during WITH1 (immediately pre menstruation) compared to WITH2 (end of menstruation) and CONS (whilst taking the active OC). Despite a significant increase during WITH1, the average score was only 2.5 out of a possible 24, which suggests that the monophasic OC effectively reduces the incidence and severity of menstrual symptoms in an athletic population.

Fluid retention and bloating have been associated with the premenstrual phase of the regular menstrual cycle[12] and as a side effect of monophasic OC use.[20] A fall in progesterone level is associated with increased aldosterone activity, because progesterone is an antagonist at the aldosterone receptor site.[11] Thus, when progesterone is lowered during the pre-menstrual phase of the menstrual cycle or during OC withdrawal, the increased circulating aldosterone could potentially increase fluid and electrolyte retention,[8] subsequently affecting anthropometric measures, including body mass and skinfold thickness throughout an OC cycle. Previous research has shown increases in sum of skinfolds and/or body mass in the initial cycles following OC commencement[13,15] and others have demonstrated an increase over a 4-6 month treatment period[10,21] Research to date[17,18,19] has shown no significant difference in anthropometric variables, as a result of the acute fluctuation of exogenous and endogenous hormones within a single OC cycle. However, the findings of these studies may be limited by small participant numbers and the use of null hypothesis statistics which may not have the sensitivity to detect relevant differences. In the current research, traditional null-hypothesis testing revealed no significant difference between phases for mass or skinfold sum. However, inferential statistics which emphasise precision of estimation, determined an approximate 27% chance that skinfold measures would be greater during both withdrawal phases compared to during CONS. This suggests that the cessation of progestogen ingestion during the OC withdrawal phase may increase fluid retention and skinfold thickness during this time. We therefore recommend that OC cycle phase be considered when interpreting skinfold results. Further research is necessary to determine whether the variables assessed in this research have the potential to influence female athletic performance.

TABLE 2: Inferential statistics describing the effect of oral contraceptive (OC) cycle phase on skinfold sum.

OC Cycle Phase Comparison	Mean Change (%)	90% Confidence Limits (Lower,Upper%)	Chances that the Effect is Substantially[a] Benficial (%)	Trivial (%)	Harmful (%)	Practical Assessment
W1 V CONS	1.3	-0.5, 3.2	0	73	27	Harm Possible
W2 V CONS	1.4	-0.4, 3.1	0	73	27	Harm Possible
W2 V W1	0	-1.2, 1.3	0.5	99	0.5	No Effect

[a] substantial is an absolute change of >2% for skinfoldd sum (see methods section).

Key: If chance of benefit and harm both >5% true effect assessed as unclear (could be beneficial or harmful). Otherwise, chances of benefit or harm were assessed as follows <1% almost certainly not, 1-5% very unlikely, 5-25% unlikely, 25-75% possible, 75-95% likely, 95-99% very likely, >99% almost certain. Where both potential harm and benefit are unlikely the assessment is reported as trivial.

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Stenosing flexor tenovaginitis ‘Trigger Finger’

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INTRODUCTION

Stenosing Flexor Tenovaginitis, commonly known as “trigger finger” is one of the most common problems in the hand. The site of this deficit is the first annular (A-1) pulley, as a result of a mismatch between the volume of the flexor tendon sheath and the flexor tendon.[5] The majority of trigger fingers have a primary idiopathic cause, however, activities involving power grip can cause high angular loads at the edge of the pulley, which can cause it to triple in thickness and lead to this condition.[8] As tendons glide through a constricted A-1 pulley it can lead to an inability to flex and extend the digit smoothly, and in some cases cause a nodule to form as the fibres bunch up, which can cause painful ‘triggering’.[5] The goal for treatment for this condition is to allow full pain-free, smooth range of movement of the affected digit.

CASE STUDY

A 53 year old female pharmacist presented with a four month history of stiffness in the ring finger of her dominant, right hand following weekly ten-pin bowling games. This progressed into clicking when bending her finger, which caused discomfort. After a few months this clicking became painful, making her reluctant to move her finger through the full range. She felt pain in the palmar aspect of the base of this finger. When her pain was at its worst it radiated down her finger. On presentation she was waking up some mornings with her finger ‘locked’, which loosened throughout the day. She struggled at work doing fine motor tasks. She had stopped bowling. No other digits were affected. She had no history of trauma or hand, wrist or finger pain. She had no family history of similar symptoms.

On examination there was no swelling, bruising, contractures or palmar scar tissue noted. There was tenderness of the 4th palmar metacarpi-phalangeal (MCP) head at the A-1 pulley, a non-tender nodule palpated on her flexor digitorum superficialis (FDS) tendon distal to 4th MCP joint under the A-1 pulley, and palpable crepitus of the A-1 pulley. Intermittent clicking was felt with active 4th MCP movement, with a 7 degree loss of full extension and pain at her MCP joint at end range. She had full passive 4th MCP flexion. Tenderness of her flexor tendon and weakness with resisted isometric flexion, with weakened grip strength was noted. She had no MCP joint laxity or pain and a normal examination of her left hand and fingers.

No further investigations were required as a clear diagnosis of stenosing flexor tenovaginitis was made based on clinical examination.

The differential diagnoses included Dupuytren’s contracture, MCP joint sprain and MCP osteoarthritis.

Treatment was commenced and relative rest from bowling was indicated for two weeks. During this time aggravating activities were modified and a new protective bowling glove with padding was purchased. She was referred to a hand specialist who administered one corticosteroid injection. She gradually returned to bowling over the next six weeks wearing this glove.

She had complete resolution of her symptoms and was back bowling twice weekly, six weeks after her injection.

DISCUSSION

Treatment recommendations for stenosing flexor tenovaginitis are agreed upon throughout all current literature; however it is important to provide information of all treatment

choices to each patient in order to choose an optimal care plan.[2]

Activity modification is an important part of initial management. Ryzewicz et al[8] suggest that if a specific activity is causing a patient's symptoms, avoiding it can occasionally result in spontaneous resolution of symptoms due to the natural history of this condition. Bowling causes inflammation of the tendon sheath at the MCP head, due to repeated direct pressure from the weight of the ball. It is suggested that on return to bowling, bowlers should wear protective gloves with padding over the metacarpal heads to limit this pressure.[7]

The most effective first-line treatment for this condition, agreed upon in all literature is corticosteroid injection. Nimigan et al[5] suggest that corticosteroid injection has an effect on connective tissue and adhesions between the tendon and the peritendinous tissue by inhibiting the production of collagen, extracellular molecules and granulation tissue. Murphy et al[4] and Lambert et al[3] studied the effects of a single corticosteroid injection on this condition, and while sample sizes were small, they showed complete resolution in symptoms after three weeks in 71% and 60% of patients respectively. At four months, Murphy et al[4] found that 64% of patients were still asymptomatic. Akhtar et al[1] explain that a second injection has approximately half the efficacy of the first, with any corticosteroid injection being most successful if being used in the thumb or if a nodule is palpable.

Another intervention discussed in the literature is splinting. Patel et al[6] assessed the effect of an MCP splint with 15 degrees flexion compared with corticosteroid injection. Splinting proved successful with 77% of patients, whose symptoms had persisted less than six months and 44% if longer. Corticosteroid injection showed 84% and 71% success rates respectively. Despite results showing splinting as being efficacious, all literature supports the use of corticosteroid injection over splinting. Splinting is suggested if patients wish to avoid an injection or have mild symptoms.[1] Ryzewicz et al[8] suggest trialling a day splint for 4-6 weeks if it is the patient's choice of treatment.

Surgery has high success rates, and is a widely used first-line intervention. Benson et al[2] reported the effects of A-1 pulley surgical release with mostly severe trigger digits. All patients had complete resolution without recurrence or complication at 20 months following surgery. However, all authors suggest injecting or splinting these fingers before attempting surgery, unless digits are locked in flexion or if symptoms have continued beyond six months, as expense and complication rates can be high.

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Diagnosis and management of lateral elbow pain in the elite athlete

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INTRODUCTION

Lateral epicondylosis is an injury that can occur to a diverse range of people. From the weekend gardener to the international sportsman, this injury can cause severe disruption to the sufferer's quality of life. Literature is plentiful on the injury more commonly known as 'Tennis Elbow'. The treatment of this injury is varied and the 'Gold Standard' treatment regime is yet to be defined. This case study will diagnose and attempt to rehabilitate lateral elbow pain in an elite athlete.

CASE STUDY

A 26 year old male professional cricket player presented complaining of right elbow pain radiating distally that had started eight weeks prior to presentation. He was a right handed top order batsman and did not bowl. After returning from a mainly sedentary off season he partook in a pre season tour to India where he concentrated specifically on his batting and gym fitness. It was during this tour that his symptoms began and upon returning home he was suffering increased discomfort. Being a right handed batsman his right hand is the top hand on the bat and provides the dominant force when playing shots. He experienced minimal discomfort with light activities of daily living. He had stiffness in the elbow upon waking and stated that he was finding it increasingly difficult to perform gripping activities. He had increased pain and subsequent weakness when holding the bat and practicing for extended periods of time. Following exercise he suffered from a 'dull ache' in the lateral elbow and into his forearm however experienced no wrist or hand pain and/or tingling. He had no history of elbow, shoulder or neck pain and no pain above the elbow. When throwing he did not experience his lateral elbow pain.

Objectively he had no visible scarring or swelling around the elbow although it was warm to touch and tender over the common extensor tendon origin (CETO). The tenderness extended approximately 3-4 inches distally tracking the common extensor tendon. There was no visible muscle atrophy in the right upper limb. Passive range of motion produced full range of the elbow, wrist and hand in all planes with no pain. Active wrist extension produced discomfort around the CETO. Resisted muscle testing produced significant pain with wrist extension and mild pain with 3rd finger extension. He has a reduction in grip strength and pain when tested on a hand held dynamometer. There was also weakness and discomfort with resisted pronation and supination on the right side. His shoulder and neck examinations were unremarkable.

The absence of a traumatic event to the elbow and with this history/examination the player is most likely suffering from lateral elbow epicondylosis. No further investigation was indicated at this stage and a full conservative rehabilitation programme was initiated.

The programme began with a thorough educational session with regards to the pathology present. He was told that throughout his rehabilitation he would be able to continue playing but may experience pain. This was managed with simple analgesia such as paracetamol and ibuprofen (if the paracetamol was inadequate). The athlete understood that the recovery process may take months and was prepared for this prior to his rehabilitation commencing.

An eccentric strengthening programme was implemented along with some concentric strengthening exercises for the forearm and hand. Eccentric wrist extensions using a 4 kg weight with 2 x 20 repetitions twice a day, 3 times per week were performed. Pronation and supination strength was also performed using his cricket bat as a weight. The bat was held with the elbow flexed at 90

degrees in the pronated position and rotated from parallel through 180 degrees of supination to a fully supinated position. The exercise was performed in a controlled manner with the aim being never to let the bat fall below parallel. High repetitions (3 x 15) were performed in order to increase muscular endurance.[1,10] The load was increased by shifting the hand further along the bat handle as strength increased and pain permitted.

The athlete also reduced his practice time in the nets to a shorter sharper session of no more than 15 minutes to reduce non-match related loading. An extra grip on the bat was trialled to reduce the effort required to grip the bat, this however was unsuccessful as he felt he that his overall feel of the bat had changed and would affect his game. A 'Tennis Elbow' brace was worn during all practice and match play. This reduced the forces on the common extensor tendon and increases grip strength whilst batting.[7] Ice was used as an analgesic agent post activity.

Eight weeks into his rehabilitation he had experienced a reduction in pain upon gripping and when batting for extended periods. He was aware that a full recovery was still some time away but was able to manage his pain and has noticed a definite increase in strength. Most importantly he had not missed any game time as a result of this injury.

DISCUSSION

Eccentric exercises are well known to be excellent for tendon healing but are a poor way to make the muscle stronger. Eccentric exercises involve the lengthening of a muscle tendon unit as a load is applied[6] and ensure the tendon is under greater load and hence privy to a greater remodelling stimulus.[8] The pronation and supination strengthening exercises were added into the rehabilitation plan to ensure structural adaptation of the musculotendinous units in order to protect it from increased stress and thus prevent re-injury. Corticosteroid injections into the CETO have been shown to have little long term effect,[9] as has pulsed ultrasound.[2,3,4] If symptoms do not continue to settle then topical nitrate GTN patches could be considered as they have been shown to improve patient's clinical signs.[5]

Lateral elbow pain is a common injury which is often mistreated. An active recovery including both eccentric tissue remodelling and concentric strengthening is essential. Simple pain relief medication can be used and it is possible for the elite athlete to remain in competition throughout rehabilitation from this injury.

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The 74 questions in the first-aid and concussion knowledge questionnaire consisted of two parts: (1) Thirty six multi-choice questions on first-aid assessment and knowledge incorporating five constructs (injury prevention, identification and management, cardiopulmonary resuscitation, and wound care) and, (2) Thirty eight closed- and open-ended questions on concussion recognition, management and prevention knowledge.

The answers are as follows:

1	d
2	a
3	d
4	c
5	a
6	c
7	c
8	b
9	c
10	d
11	c
12	a
13	a
14	b
15	a
16	c
17	c
18	a
19	a
20	b
21	b
22	b
23	a
24	b
25	c
26	b
27	d
28	a
29	c
30	c
31	b
32	b
33	c
34	d
35	b
36	d
2.1	Own answer
2.2	Own answer
3.1	Own answer
3.2	Own answer and yes it does affect school, sport and work activities
3.3	Own answer
3.4	Yes
3.5	Yes
3.6	No
3.7	No
4.1	d
4.2	Own answer
5.1	Own answer but b, c, e
5.2	Own answer
5.3	Own answer
5.4	Own answer
6.1	c, d, g, h, I, j, k, o
6.2.	1 F; 2T; 3T; 4T
7.1	a
7.2	d
7.3	d
7.4	d
7.5	d
7.6	c
7.7	c
7.8	c
8.1	a
8.2	d
8.3	b
8.4	b
8.5	d
8.6	d
8.7	a
8.8	c
9.1	a
9.2	c
9.3	a
9.4	a
9.5	d
9.6	d
9.7	b
9.8	a

PATIENT ADVICE SHEET

TRAMADOL FOR SEVERE MUSCULOSKELETAL PAIN

1 What is it?

Tramadol is a strong painkiller. It is similar to codeine, and is related to morphine.

2 How does it help is musculoskeletal pain?

Tramadol binds to pain receptors in the brain, just like morphine does.

3 How effective is Tramadol?

Tramadol is stronger than paracetamol or Paradex, and as strong as high dose codeine. It is nearly as strong as morphine, with less risk of side effects.

4 Are there side effects?

Tramadol is well tolerated by about 90% of people who take it. The other 10% may suffer one or more of these side effects:

a Nausea and occasional vomiting - if you have only mild nausea, it is reasonable to continue taking the Tramadol if it is helping your pain. If the nausea progresses to vomiting, you will have to stop taking Tramadol. Starting with a low dose and gradually increasing over a week or two can reduce the risk of nausea and vomiting.

b Drowsiness and fatigue - people who suffer this side effect should only take the medicine at night. People with drowsiness should avoid driving or hazardous work (eg, up a ladder).

c Constipation is rare (less than 1%) but if your bowels become sluggish then eat kiwifruit and high fibre food (eg, bran and high fibre cereals) and drink plenty of water.

5 Is it addictive?

There is risk of addiction if Tramadol is used in high doses forr long periods of time (several months or more). Therefore, I recommend use of Tramadol only in selected circumstances where there is severe pain and whilst the patient is waiting for other curative treatment (eg, an epidural steroid injection) or a consultation with an orthopaedic or other specialist.

6 What is it used to treat?

Tramadol can be used safely for any severe musculoskeletal pain. I generally reserve its use for those people who have had minimal benefit from Voltaren (Diclofenac) or other anti-inflammatory drugs and where Panadol has been tried but is not effective. In particular, it seems helpful for people with severe pain due to a pinched nerve, eg, sciatica or arm pain arising from a pinched nerve in the neck.

7 How is it best taken?

a Short acting Tramadol capsules (50 mg) are best taken up to three or four times daily.

b Long acting Tramadol tablets (100 mg or 150 mg) are best taken either just at night, for night pain, or twice daily for pain that is severe both day and night.

Dr Chris Milne
Sports Physician

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PATIENT ADVICE SHEET

INTERSECTION SYNDROME (also called Crossover Tendonitis)

1 What is it?

Intersection syndrome is an inflammation of two of the extensor tendons to the thumb, as they pass over the main extensor tendons to the wrist.

2 What Causes it?

It is an overuse injury, caused by a high number of arm repetitions in heavy training. It is most common in rowers and canoeists. There are sometimes technical factors to do with feathering of the oar that can be analysed andd corrected.

3 Symptoms - What you Notice

a Pain over the tendons in the forearm, about 5 cm above the wrist.
b Swelling over these tendons.
c You may feel a grating feeling when you move the wrist up and down.

4 Signs - What the Doctor Finds

a Swelling over the tendons.
b Tenderness over the swollen tendons.
c Crepitus - a grating sensation when the wrist is moved up and down.
d Pain on resisted extension of the thumb.

5 Investigations

X-rays are of no use for diagnosing this problem. An ultrasound scan will usually show inflammation of the involved tendons. Technique analysis by an experienced coach plus possible video analysis is very important.

6 Treatment

a Load reduction. You should drop all on-water training and erg sessions for a few days at least, to let the acute symptoms settle down.
b Ice massage and Voltaren Emulgel can help settle the acute pain.
c Try to have a loose and relaxed grip and roll the oar with the fingers not the wrist.
d Physiotherapy treatment including ultrasound plus exercises.
e Local corticosteroid injections to the involved tendon sheath are usually required to settle the inflammation. These are best done under ultrasound guidance, unless the person doing the injection has vast experience of successfully getting the injection into the correct tendon sheath. The chances of success with a local steroid injection are about 60%. Remember that if you are an athlete subject to drug testing, the cortisone injection must be notified to Drug Free Sport New Zealand and FISA.
f If the local steroid injection does not settle the problem, or you have a significant recurrence, then you should consider having surgery. This involves decompression of the inflamed tendons, and you can usually get back in the boat about two weeks after the operation.

7 Recovery Time

Average recovery time is 2-3 weeks.

8 Recovery Sequence

Step 1 Ice massage, Voltaren Emulgel
Step 2 Stop on-water training and erg work, and see a doctor who is knowledgeable about this condition.
Step 3 Get in for a guided injection as soon as possible.
Step 4 Continue leg weights and cycling exercise.
Step 5 Analyse your technique of feathering the oar in conjunction with your coach.
Step 6 Get back in the boat and on the erg when the swelling has settled down (usually 1-2 weeks after the injection).
Step 7 Build up the full training volume over the next 2-3 weeks.
Step 8 The last components of training to reintroduce are bungee work and hard pieces.

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