Special Olympics
New Zealand

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SPECIAL OLYMPICS NEW ZEALAND ATHLETE HEALTH OVERVIEW

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Special Olympics New Zealand would like to extend their thanks to the Donald Beasley Institute and the IHC Foundation – without their support this wouldn't have been possible.

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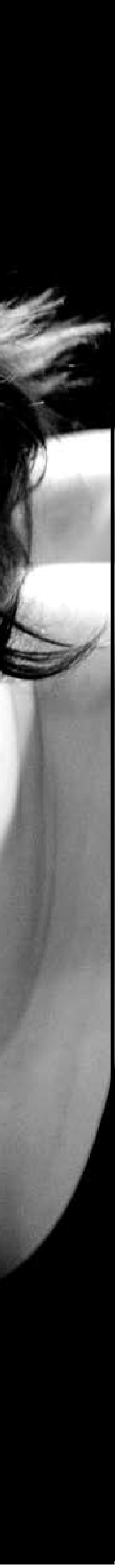
Executive Summary

Background

International research has consistently identified people with intellectual disability (ID) as experiencing poorer health outcomes than the general population. In response to this inequality, Special Olympics International developed the Healthy Athletes® Screening (HAS) programme which offers targeted health screening at designated Special Olympic events. In the New Zealand context, Special Olympics offers four HAS screens in the areas of: vision and eye health; hearing and ear health; dental and oral health; and podiatry and foot health. This report details an analysis of data relating to these four HAS screens collected from athletes who competed in the 2005 and 2009 Summer Games.

Method

Pre-coded data from 2,996 individual screens conducted at the 2005 Summer Games and 3,118 individual Healthy Athletes® screens conducted at the 2009 Summer Games were combined and analysed to provide a snapshot of the visual, auditory, oral and podiatry health status of New Zealand Special Olympic athletes. Where relevant, these results were compared to those reported in a Special Olympics International analysis of HAS data obtained from athletes competing at the 2003 Special Olympics World Summer Games.



Opening Eyes – Key Findings

- Nine out of every ten athletes tested at the 2009 New Zealand Summer Games failed at least one of the seven eye health elements included in the Special Olympics – Lions Club International Opening Eyes (SOLCIOE) screen.
- New glasses were recommended for 34% of athletes screened at the 2005 Summer Games and for almost half of the athletes screened at the 2009 Summer Games (47.8%).
- An external eye health problem was detected in almost half of the athletes who competed at the 2009 Summer Games with pterygium and/or pinguecula detected in one quarter of all athletes.
- Fifteen percent of athletes presented with blepharitis, an eye condition associated with poor hygiene.
- Strabismus, permanent eye misalignment, was identified in between 22-26% of athletes competing at the 2005 or 2009 Summer Games. This contrasts sharply with estimates of strabismus in the general population, which have been reported at 2-4%.
- An internal eye health problem was detected in one out of every five athletes screened at the 2009 Summer Games with cataracts being the most commonly reported internal eye health problem (13.1%). This is significantly higher than the incidence of cataracts reported for athletes competing at the 2003 World Games (4%).
- Over half the cataracts detected in New Zealand athletes were discovered in those athletes younger than 40 years.
- Over half of the athletes screened at the 2009 Summer Games failed two or more of the seven visual tests. A third failed three or more screens.
- 84% of athletes who had an internal eye problem also failed two or more of the other health screens.
- Every athlete over 60 years failed one or more visual eye screens.
- Recommendations for corrective lenses were made for eight out of every ten athletes aged over sixty years at the 2009 Summer Games.
- Seventy percent of athletes aged over 60 self-reported that they had not had an eye examination in the previous three years.
- A strong regionality to poorer eye health outcomes was observed with Northland, Bay of Plenty and Hawkes Bay emerging as regions of particular disadvantage in terms of the eye health of athletes.

Healthy Hearing – Key Findings

- Forty-five percent of athletes screened at the 2005 Summer Games were found to have a full or partial blockage in one or both ears, a similar proportion to that reported for the 2003 World Games (52%).
- At the 2005 Summer Games athlete age was found to affect the probability that cerumen (ear wax) would fully or partially block one or both ears with one out of every three athletes aged over 50 years presenting with a full or partial blockage in both ears.
- More athletes were referred for follow-up treatment at the 2009 (9.8%) than the 2005 Summer Games (3.6%). This rate of follow-up referral at both New Zealand Games is well below that reported for the 2003 World Summer Games (26%).
- Serious, undetected and untreated ear conditions were discovered in a number of athletes.
- Sixty-nine percent of athletes failed the otoacoustic emissions screen in 2005, and 75.3% of athletes failed this screen in 2009.
- A strong association was found between age and the likelihood an athlete would not pass the otoacoustic screen. A hearing deficit was measured for 95.1% of athletes over the age of 50 in 2005, and 98.8% of athletes screened in 2009.
- Athletes who failed the otoacoustic test then had their hearing measured by the Pure Tone screen. A hearing deficit was detected in 60.3% of athletes who had failed the otoacoustic test in 2005, and 76.3% of athletes who had failed the same test in 2009.
- Almost half (49.5%) of the athletes who failed the otoacoustic screen also failed the Tympanometry screen (responsiveness of the tympanic membrane and middle ear system pressure) at the 2005 Summer Games, with 44.1% of screened athletes failing this test in 2009.
- New Zealand athletes were more likely to exhibit a hearing loss on the Pure Tones or the Tympanometry screen at both the 2005 and 2009 Summer Games than athletes screened at the 2003 World Games.

Special Smiles – Key Findings

- New Zealand athletes self-reported good oral hygiene habits with 86.4% of athletes at the 2005 Summer Games and 91.8% of athletes at the 2009 Summer Games indicating that they cleaned their mouth one or more times per day.
- Nearly one out of every 10 athletes at both the 2005 Summer Games and 2009 Summer Games reported experiencing pain in their teeth or gums at the time of examination.
- Edentulism (no teeth) was detected at a rate of one in every three athletes over the age of 50 years at the 2005 Summer Games.
- Untreated decay was detected in one in every four athletes (20.1%) screened at the 2005 Summer Games and in 15.5% of athletes screened at the 2009 Summer Games however this was lower than that detected in athletes at the 2003 World Games (36.1%).
- The prevalence of untreated tooth decay increased with age.
- One or more missing teeth was detected in 38.7% of athletes at the 2009 Summer Games. This finding is consistent with that reported for athletes competing at the 2003 World Games.
- Damage to the soft tissue lining of the mouth was detected in more than half of the athletes screened at the 2005 Summer Games (58.1%) and 44.4% of athletes screened in 2009.
- Male athletes and athletes over the age of 50 were more likely to have gingival signs.
- One or more indicators of poor oral health were detected in two out of every three athletes screened at the 2009 Summer Games (67.2%) with 29.1% of athletes failing two or more of the five tests included in the Special Smiles screen.
- At the 2005 Summer Games, one in every four athletes (25.2%) were determined to require dental treatment.

Fit Feet – Key findings

- Approximately one in every five athletes screened at the 2005 (19.8%) and 2009 (18.7%) Games presented with a fungal nail infection (onychomycosis). This is more than twice the proportion observed in athletes screened at the 2003 World Games.
- The incidence of tinea seen in New Zealand athletes (22.2%) was also twice as high as the incidence reported at the 2003 World Games. Tinea has a range of environmental and biological risk factors including participation in fitness activities and communal bathing.
- Corns or calluses were detected for 22% of athletes in 2005, and 16.3% of athletes in 2009, a similar rate of detection to that seen at the 2003 World Games.
- A foot abnormality was more likely to be detected in older athletes across the range of conditions assessed (and particularly in relation to the conditions of onychomycosis and corns and calluses).
- One or more skin conditions, were detected in over half of the athletes screened at the 2009 Summer Games, with two or more conditions observed in 17.2% of athletes.
- One or more biomechanical abnormalities were detected in eight out of every ten athletes (80.5%) screened at the 2009 Summer Games.
- The prevalence of over-pronation (a biomechanical problem associated with the collapse of the foot arch) was highest amongst younger athletes, while supination (outward orientation of the foot and ankle) was more likely to be detected in older athletes.
- A high incidence of abduction (when the foot and leg are laterally rotated away from the midline of the body) was detected in both 2005 (34.5%) and 2009 (47.5%).
- Approximately one out of every four athletes screened were found to be wearing shoes on their right (22.4%) and left (24.9%) that were more than two sizes too big or too small for their feet.

1 INTRODUCTION

1. Introduction

International research has consistently identified people with intellectual disability as experiencing poorer health outcomes than the general population, as being at risk for a range of specific health conditions, and of experiencing greater difficulty accessing population-based health promotion strategies.[1-8] In an attempt to address this widely recognized and long-standing inequality, Special Olympics International introduced Healthy Athletes® Screening (HAS), a programme offering targeted health screening to athletes with intellectual disability competing at designated Special Olympic events. The Special Olympics HAS is based on the rationale that increasing the quality and availability of healthcare will enable athletes to train and compete more effectively.[9] The generation of quality data that can inform both the disability and health sectors, and the wider community about the health status of people with intellectual disability is also an important function of the HAS programme.

Informed and led by highly skilled clinicians, Healthy Athletes® Screening has now been in operation for two decades. The programme has a presence across a range of Special Olympics regions and at an increasing number of events, offering screening in seven discrete health areas: vision; dental; audiology; physical therapy; health promotion; podiatry; and general physical assessment.[9] At present, New Zealand athletes have the opportunity to participate in four individual health screens in the areas of vision, audiology, dental and podiatry. A fifth screen, health promotion, was added to the New Zealand HAS repertoire in 2011.

In February 2011, Special Olympics New Zealand commissioned the Donald Beasley Institute[1] to conduct an analysis of Healthy Athletes® Screening (HAS) data collected from athletes who competed at the 2005 and 2009 New Zealand Summer Games. The project provides the first comprehensive analysis of HAS data in the New Zealand context, and aimed to contribute empirical evidence about the health status of New Zealand Special Olympic athletes; and to identify methodological improvements to the way New Zealand HAS data are collected and analysed in the future.

This report presents results generated through the analysis of HAS data and specifically reports on the four individual Healthy Athletes® Screening assessments: Opening Eyes, Healthy Hearing, Special Smiles, and Fit Feet. The New Zealand data were analysed in a manner that enabled comparison to HAS results reported for the Special Olympics World Summer Games held in Ireland in 2003.[9] Analysis of each HAS Screen is presented separately, along with a brief overview of the literature relevant to the specific health area.

1.1 Background to the project

1.1.1 Health status and health needs of people with intellectual disability

As evidenced by the international research literature, people with an intellectual disability experience poorer health outcomes than the general population.[1, 10, 11] Key health issues for adults with intellectual disability have been identified as: dental disease; hearing impairments; changes in vision; thyroid disease (particularly in people with Down syndrome); mental health problems; gastro-oesophageal disease; helicobacter pylori infection; and skin disorders.[3, 4, 11, 12] With regard to targets for health promotion and health screening there is evidence that adults with intellectual disability are less likely to be up to date with vaccinations[13-15], and that women with intellectual disability are less likely to access breast or cervical screening.[6, 7, 13, 14, 16]

While it can reasonably be assumed that New Zealander's with intellectual disability will share a similar health profile to their peers overseas, there is surprisingly little available empirical evidence about the health status of this group. In 2004 the National Advisory Committee on Health and Disability[10] asserted that primary health provision for New Zealand adults with intellectual disability needed to be urgently addressed and described the health of this group as "disturbing." More recently, the Ministry of Health compared a selection of health status and health care utilization indicators for New Zealanders with and without intellectual disability. People with intellectual disability were found to be 1.5 times more likely to have consulted with a GP in a three-month period, and were over four times more likely to have avoidable hospitalisations. Furthermore, in comparison to people without intellectual disability, people with intellectual disability were 1.5 times more likely to receive care or treatment for cancer, coronary heart disease, diabetes, kidney disease, and morbid obesity. This combination of poor health status and high health service utilization has culminated in a situation whereby people with intellectual disability, on average, receive three times the amount of government funded primary healthcare annually than that received by the general population.[17] However despite this information, and the directive contained within the Primary Health Care Strategy[18] to address the health needs of vulnerable groups within the community, there has been no comprehensive or systematic response to the health needs of New Zealand children and adults with intellectual disability.

1.1.2 The contribution of Special Olympics New Zealand to improving the health of people with intellectual disability

Special Olympics New Zealand (SONZ), in partnership with Special Olympics International (SOI) is well placed to make a significant contribution both to the health of athletes, and also to the health of the wider intellectual disability community through the Healthy Athletes® Screening Programme. While data collected through the HAS programme have been used to generate research findings related to the health outcomes of athletes at an international level, individual Special Olympics countries have been slower to recognise the potential in analysing their own national data as a way of contributing empirical evidence that could influence how the health needs of people with intellectual disability are responded to at a national level.

Special Olympics New Zealand has been working to improve the health status of Special Olympic athletes for over seven years using HAS. The current research has explored Healthy Athletes® Screening data to gain insight into the health status of New Zealand Special Olympic Athletes. Through this research a baseline has been established that has the potential to inform ongoing research that is focused on the relative health status of New Zealand athletes compared to their disabled and non-disabled peers; change over time in the presentation of conditions; and the access athletes have to appropriate assessment and intervention. Comprehensive, targeted, and on-going health screening is critical to developing an evidence-based profile of the health of New Zealand children and adults with intellectual disability, and to informing the education of health professionals design and delivery of health services.

[1] The Donald Beasley Institute is an independent research organisation that specialises in research and education in the field of intellectual disability. The Institute is based in Dunedin, New Zealand.

1.2 Method

1.2.1 Coding and analysis

Pre-coded Healthy Athletes® Screening data from the 2005 and 2009 Summer Games was sent to the Donald Beasley Institute for analysis by Special Olympics New Zealand. Data from athletes screened at both Summer Games was combined and analysed using IBM®SPSS® Statistics 19 statistical software.

Separate Coding Dictionaries were written to support the development of a consistent coding structure and to aid subsequent analysis. Assumptions made in the transposition of data from the original spreadsheets were detailed in each Coding Dictionary. A region of origin category was also created, clustering athletes from different delegations within their respective New Zealand provincial boundaries. Separate codes were created for missing data and where testers indicated an inability to complete a screen, however all analysis excluded missing values.

Chi square tests for independence were the primary method used to explore the strength of association between health status outcomes and the age, sex, region of origin, eye and screening history of athletes. Direct logistic regression modelling was also performed to assess the unique contribution the same array of potential predictors made to explain variation in likelihood that athletes would pass or fail Healthy Athletes® screen tests. Yates Continuity Correction was adopted for two-by-two cross tabulations and the standard tests for multicolinearity and outliers used for regression modelling.

1.2.2 Special Olympic Athletes

Pre-coded data from 2996 individual Healthy Athlete screens conducted at the 2005 Summer Games and 3118 individual Healthy Athlete screens conducted at the 2009 Summer Games were combined and analysed to provide a snapshot of the ocular, auditory, oral and podiatry health status of Special Olympic athletes screened at both events. Athletes aged 8 – 80 years contributed information about their health status with the mean age for specific Healthy Athlete screens ranging from 29.3 years (sd=11.78) for athletes who participated in the SOLCIOE screen conducted at the 2005 Summer Games through to 33.6 years (sd=13.25) for athletes who participated in the Healthy hearing screen conducted at the 2009 Summer Games. (Please refer to Appendix 1 for details relating to the demographic profile of athletes and athlete region of origin).

The current analysis enables the health and disability community to access results which have the potential to contribute a more comprehensive evidence-based understanding of the health status and health needs of Special Olympic athletes who have been drawn from the wider population of New Zealanders with intellectual disability.

The number of athletes screened from different New Zealand provincial regions varied, with the contribution made by athletes from the North and South Island fluctuating with the location of the event. Athletes from regions that included a major New Zealand urban centre were well represented in the overall data set, with the largest proportion of health status information provided by athletes from Auckland (23.8%), Manawatu-Whanganui (12.2%), Wellington (10.6%) Canterbury (9.7%) and Otago (7.1%)

[2] For the purposes of this report descriptive statistics have been used as the primary device for presenting results. Consistent with the conventions of Statistical reporting, the statistical test measures of distribution and confidence intervals have been included in other reports and publications.

2 OPENING EYES

2. Opening Eyes

2.1 Special Olympics - Lions Clubs International Opening Eyes Healthy Athletes® Screen

Special Olympics– Lions Clubs international Opening Eyes (SOLCIOE) is a comprehensive vision screening offered to Special Olympic athletes at designated events. Sponsored by Lions Clubs International, the programme assesses the vision of athletes to identify any refractive errors, vision deficits or other abnormalities of the eye.[9] Athletes receive a comprehensive assessment of their vision and eye health to take to their own optometrist or ophthalmologist, new prescriptions, up-dated prescriptions, and protective eyewear (sunglasses) at the event. New Zealand Special Olympic athletes have had the opportunity to participate in Opening Eyes vision screening since 2005.

2.2 Vision, eye health and people with intellectual disability

It is generally agreed that adults with intellectual disability are at increased risk for visual impairment, with research reporting that almost 50% of this group have some degree of visual impairment either at near or distance.[19] Research involving an institutionalised population of adults determined that half (51%) of the participants were found to have visual impairment, refractive error, squint and other ocular conditions.[20] In contrast, vision screening research involving 148 adults with intellectual disability who were accessing community-based services reported that over 60% of participants had below-normal distance acuity[21] with 41% of participants potentially benefitting from distance spectacles and 56% spectacles for near tasks. This research concluded that lack of awareness of the importance and feasibility of testing for visual impairment on the part of families, support services and optometrists contributed to the poor eye health status of adults with intellectual disability. In a comprehensive review of the literature on the prevalence of visual impairment in adults with intellectual disability Warburg[22] stated: "*every publication describes an alarming prevalence of blindness and visual impairment*," and questioned the ethics of failing to address common, well described, easy diagnosed and easily treated disorders.

A relatively small body of published research has analysed SOLCIOE data collected at Special Olympic events.[9, 23-25] Results of vision screening conducted at the 1995 Special Olympics World Summer Games identified 28.5% of athletes as having ocular problems.[23] Analysis of data collected during vision screening of UK athletes who participated in the 2001 Special Olympics National Summer Games in Cardiff[24, 25] presented a more acute picture with 40% of athletes having ocular abnormalities. SOLCIOE results reported for the Special Olympics World Summer Games held in Ireland in 2003 identified the following: 30% of athletes reported having never had an eye examination; headaches and sensitivity to light were the two most frequently reported symptoms; 41% of athletes reported difficulty seeing; 30% of athletes failed the vision distance screening and 18% failed the near vision screening; more females than males failed to pass the screening; and 32% of athletes required new glasses.[9] In summary, the analysis that has been conducted on SOLCIOE data consistently shows that Special Olympic athletes, like the wider intellectual disability population, experience a high prevalence of vision and eye health problems.

2.3 An analysis of the vision and eye health of New Zealand Special Olympic athletes

2.3.1 Last eye examination

Approximately one-third of athletes screened at the 2009 Summer Games self-reported having had an eye examination in the past three years (35.5%). A similar proportion of athletes self-reported having an eye examination more than three years ago (34.1%) and 176 athletes (30.4%) self-reported either never having had an eye examination or had an eye history that was unknown.

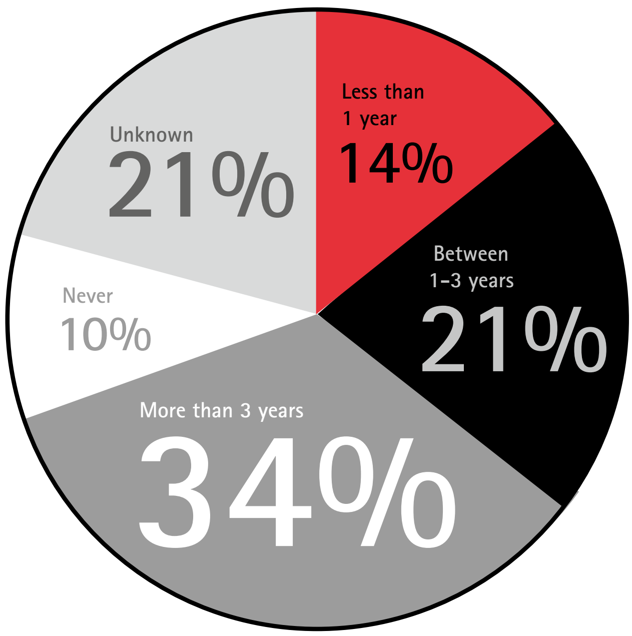


Figure 1 The length of time since last eye examination self-reported by athletes screened at the 2009 Summer Games

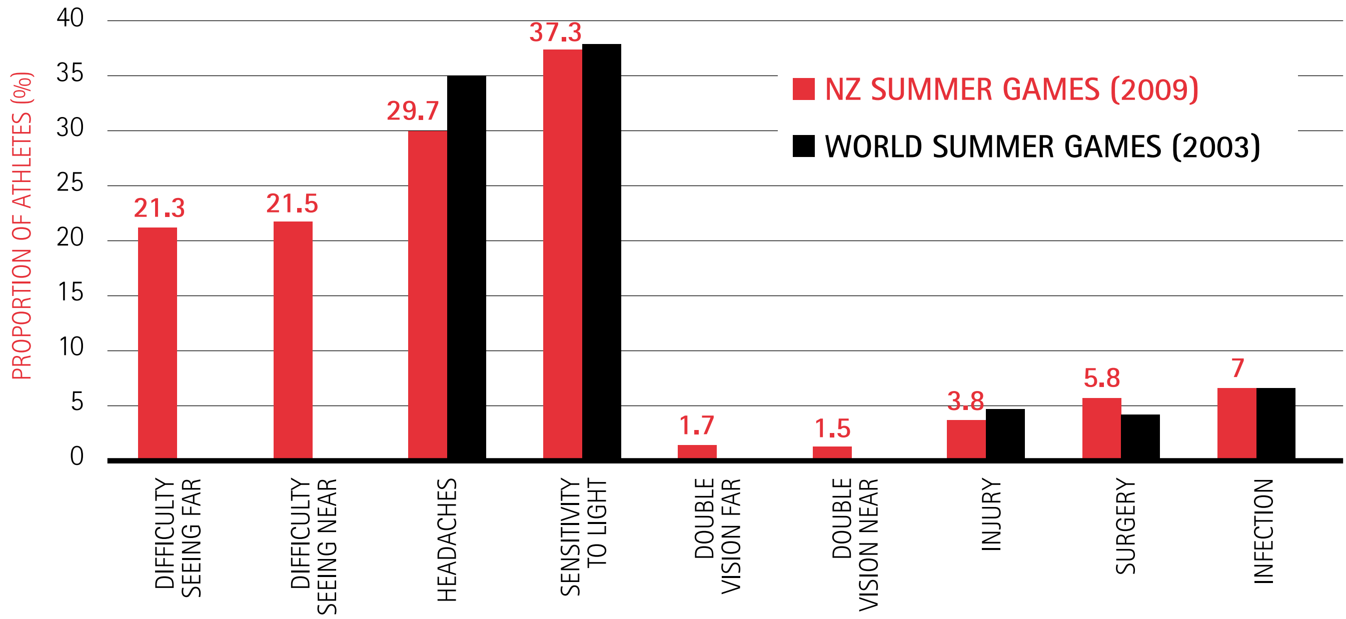


Figure 2 Visual symptoms self-reported by athletes screened at the 2009 NZ and 2003 World Summer Games

A statistically significant[3] association was found between athlete age and the length of time since their last eye examination. Younger athletes (10-19 Years) were most likely never to have had an eye examination (18.6%) and of the twenty athletes aged over 60 years screened at the 2009 Summer Games, only six (30%) had had an eye examination in the previous three years despite research evidence that age related degeneration in eye health occurs faster and is more prevalent in adults with intellectual disability.

Regional differences were found in the proportion of athletes who had never received an eye examination, or for whom their history was unknown. Northland, Bay of Plenty, and Central Plateau emerged as regions where athletes were least likely to have received a recent eye examination and Waikato, Marlborough and Otago as regions where athletes appeared to have the greatest access to specialist examination.

[3] In Statistics a result is termed statistically significant if it is unlikely to have occurred by chance. In reporting these statistical results an alpha level of 0.05 was set as statistically significant. This means a statistically significant result provides 95% confidence that the result did not occur by chance.

2.3.2 Visual symptoms

Approximately one-third of all athletes screened at the 2009 NZ Summer Games reported experiencing headaches (29.7%) or sensitivity to light (37.3%), similar to the proportion reported by athletes competing at the 2003 World Games.

One hundred and eighteen athletes (21.3%) screened at the 2009 Summer Games self-reported experiencing difficulty seeing far and 124 athletes (22.1%) self-reported difficulty seeing near. Athletes who described experiencing difficulty seeing far and near were more likely to have new glasses recommended at the conclusion of the screen, with the association found between the self reporting of visual symptoms and need for new prescription glasses indicating athletes could reliably report poor eye health.

Prescription glasses were recommended for 43% of athletes who had not previously been prescribed glasses, but almost two out of every three athletes (61.0%) who typically wore glasses were found to require a new prescription. This indicated that the eye health needs of athletes who already wore glasses was the least well attended to.

Athletes who wore corrective lenses but for whom new prescription lenses were recommended were also more likely to report difficulty seeing far, near, and that they experienced headaches and sensitivity to light. This result suggests that the wearing of inappropriate lenses may have contributed to self-reported visual complaints.

Table 1 The association between visual symptoms and the likelihood that new glasses would be recommended for athletes who did and did not wear corrective lenses to the 2009 Summer Games

Did not wear corrective lenses	Difficulty seeing far	Difficulty seeing near	Headaches	Sensitivity to light
Prescription for new glasses recommended	43.2%	61.1%	41.0%	45.4%
No prescription for glasses recommended	56.8%	38.9%	59.0%	54.6%

Wore corrective lenses	Difficulty seeing far	Difficulty seeing near	Headaches	Sensitivity to light
Prescription for new glasses recommended	64.5%	68.3%	56.8%	57.0%
No prescription for glasses recommended	35.5%	31.7%	43.2%	43.0%

2.3.3 Visual acuity

Almost half of the athletes screened at the 2009 Summer Games recorded visual acuity scores at or below 20/40 in their right (46.1%) or left (46.0%) eyes with the chart set at 3m and 38.1% of athletes recorded visual acuity scores at or below 20/40 with the chart set at 40cm. Forty-four percent of athletes competing at the 2005 Summer Games and 63% of athletes competing at the 2009 Summer Games failed one or more of the visual acuity screens.

A statistically significant association was found between age and visual acuity. Older athletes were more likely to fail one or more of the acuity screens both at the 2005 and 2009 Summer Games. Fifty-six athletes aged between 50-59 years (94.9%) screened at the 2009 Summer Games, for example, failed one or more visual acuity tests, more than twice the proportion of athletes aged between 10-19 years (43.8%) who did not pass in the same year.

The proportion of athletes who failed one or more visual acuity tests varied between regions. In 2009, athletes from the Waikato region had the lowest visual acuity failure rate (50.0%) and athletes from Bay of Plenty the highest (87.0%). A statistically significant association between athletes region of origin and visual acuity was found.

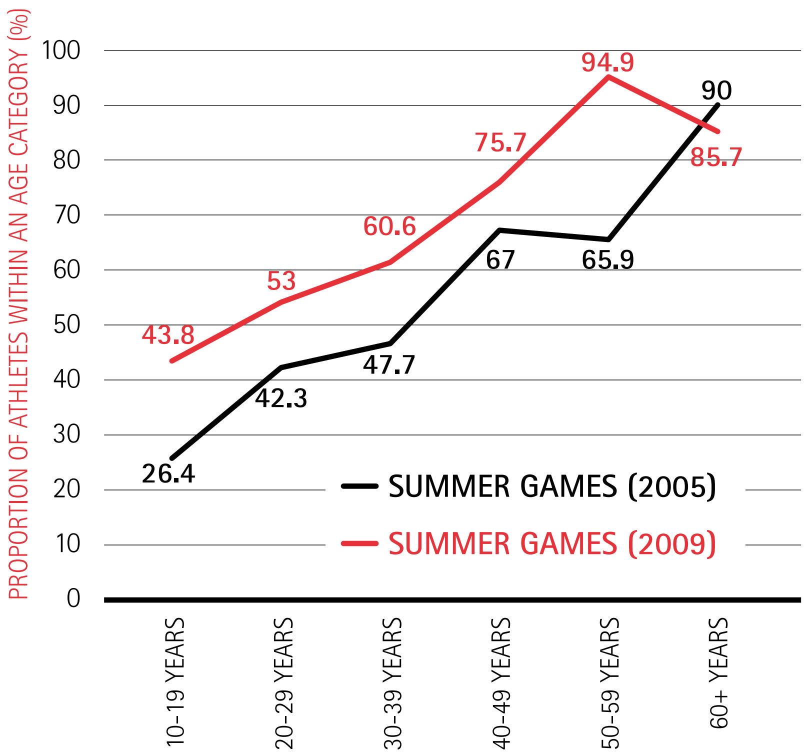


Figure 3 The proportion of athletes screened at the 2005 and 2009 Summer Games with a visual acuity score at or below 20/40 by sex

2.3.4 Strabismus

In the general population, consistent misalignment of the eyes (strabismus) is known to occur at a rate of 2-4%. The prevalence of strabismus in people with intellectual disability has consistently been found to be higher than that of the general population. One hundred and ninety athletes who were screened at the 2005 Summer Games were recorded as presenting a form of strabismus. When athletes for whom no data was available were excluded (n=46, 5.8%), misalignment of the eyes was found in 25.5% of tested athletes.

In 2009, a form of strabismus was detected in 96 athletes with viewing targets at 3m (17.5% of tested athletes) and 91 athletes (18.3%) who completed testing with targets viewed at 40cm. When results from the two screens were combined, strabismus was detected in 22.6% (n=115) of athletes who competed in the 2009 Summer Games.

Recent research suggests that people with intellectual disability mirror the trend in the general population for esotropia (convergent strabismus) to be the most common form of eye misalignment. Esotropia was found in approximately ten percent of athletes competing at the 2009 Summer Games who were successfully tested at 3m and 40cm. Exotropia (divergent strabismus) was found in 6.3% of athletes successfully tested at 3m and 6.6% of athletes successfully tested at 40cm.

Athletes were also tested to establish the prevalence of any tendency towards eye misalignment that could be controlled for by athletes (Phoria). Despite not typically interfering with binocular vision or depth perception, the effort required to align both eyes for large phoria can cause eyestrain and headaches.

In 2009, a phoria was detected in 78 athletes successfully tested at 3m (14.2%) with the rate almost doubling when athletes viewed targets at 40 cm (n=135, 25.4%). When data from the two test screens were combined, temporary misalignment of the eyes was detected in almost one third of athletes successfully tested (n=158, 31.2%).

2.3.5 Stereopsis

More than one-third of athletes screened at the 2005 (35.2%) and 2009 (34.9%) Summer Games did not pass a test to detect their sensitivity to binocular disparity at 50cm. Failure to detect retinal disparity can interfere with the visual processes necessary for depth perception. A statistically significant association between the age of athletes competing at the 2005 and 2009 Summer Games was found. Insensitivity to binocular disparity was detected in 61.1% of athletes aged 60+ years successfully screened at the 2009 Summer Games and 44.4% of athletes aged 60+ years successfully screened at the 2005 Summer Games. The rates of binocular insensitivity amongst athletes aged 60+ years was more than double the rate for athletes aged 10-19 years in 2005 (20.7%) and more than three times the rate for athletes aged 10-19 years in 2009 (19.4%).

2.3.6 External eye health

Two hundred and fifty four (45.9%) of 553 athletes who successfully completed an external eye screen at the 2009 Summer Games were found to have one or more external eye anomalies.

Pterygium and/or pinguecula were the most commonly detected external eye health problems. The high prevalence of pterygium and/or pinguecula in New Zealand athletes (25.6%) stands in

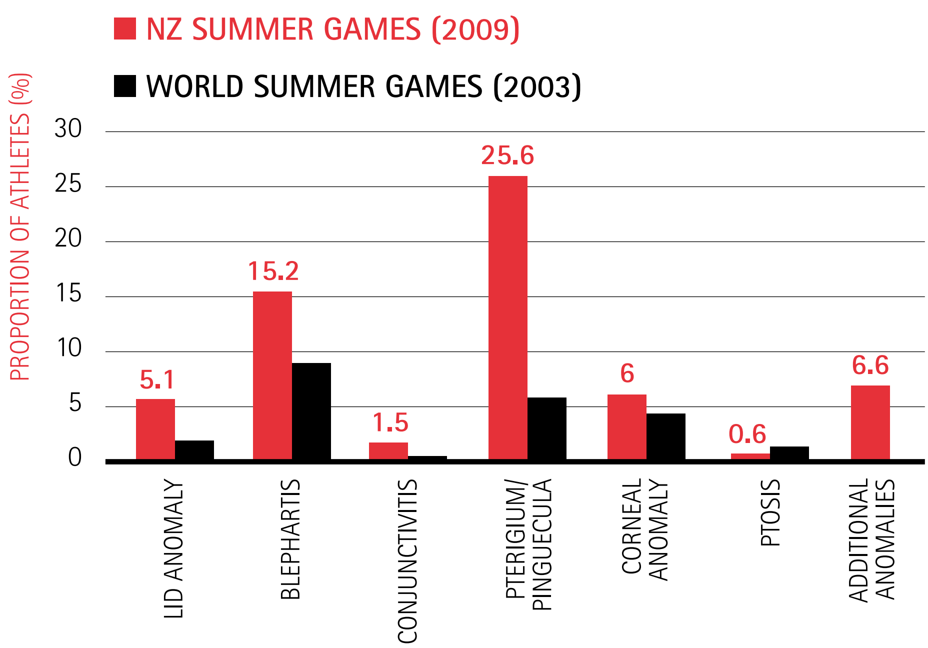


Figure 4 The prevalence of external eye health problems in athletes screened at the 2009 New Zealand and 2003 World Summer Games

contrast to international findings, perhaps as a consequence of New Zealand athletes being at greater exposure to eye irritants. At the 2003 World Games, pterygium was the third most common external eye health problem observed, affecting approximately 5.5% of all international athletes.

Blepharitis was the second most frequently detected external eye health problem. Inflammation of the eyelash follicles was detected in one or both eyes of 15.2% of athletes who successfully completed an external eye examination at the 2009 Summer Games. The prevalence of blepharitis was again, higher in New Zealand male athletes than was reported for all athletes screened at the 2003 World Games (approximately 8.9%). In 2009, the proportion of male athletes in which blepharitis was detected was nearly double the proportion of female athletes and a statistically significant association between sex and the presence of blepharitis was found.

The age of athletes also had a significant impact on the likelihood that an external eye health problem would be detected. In 2009, an external eye health problem was detected in 68.9% of athletes aged between 50-59 years, 3.5 times the rate of detection in athletes aged between 10-19 years.

2.3.7 Internal eye health

Of the 557 athletes who successfully completed an internal eye examination at the 2009 Summer Games, at least one internal eye health problem was detected in 117 athletes (21.0%).

Consistent with findings from the 2003 World Games, cataracts were the most commonly detected internal visual problem. Cataracts were detected in one or both eyes of 13.1% of athletes screened at the 2009 Summer Games. At the 2003 World Games, cataracts were detected in approximately 4% of all athletes.

For all internal eye health conditions, except for the presentation of cataracts, no association was found between the sex of athletes and the likelihood of detecting an internal eye health problem. In 2009, however, the proportion of female athletes in which a cataract was detected in one or both eyes (18.3%) was almost twice the proportion of male athletes in which a cataract was detected (9.9%). A statistically significant association between sex and the presence of cataracts was revealed.

Many internal eye health problems are known to become more prevalent as individuals age. Cataracts, for example, are more common in older populations and a similar trend was found for athletes screened at the 2009 Summer Games. It is important to note, however, that although the detection rate for cataracts increased with age, a significant number of cataracts were discovered in younger athletes. Cataracts were found in 19 athletes aged below 30 years and 22 athletes aged between 30-39 years. Fifty six percent of all cataracts were detected in athletes younger than 40 years.

The age of athletes screened at the 2005 and 2009 Summer Games had a significant impact on the likelihood that an internal eye health problem would be detected. In 2009, an internal eye health problem was detected in 43.8% of athletes aged over 60 years, 6 times the rate of detection in athletes aged between 10-19 years (7.3%). Similarly, 4.5 times the proportion of athletes aged 60+ (22.2%) that successfully completed an internal eye examination at the 2005 Summer Games were found to have an internal eye health problem than athletes who were screened at the same games and were aged between 10-19 years (6.7%).

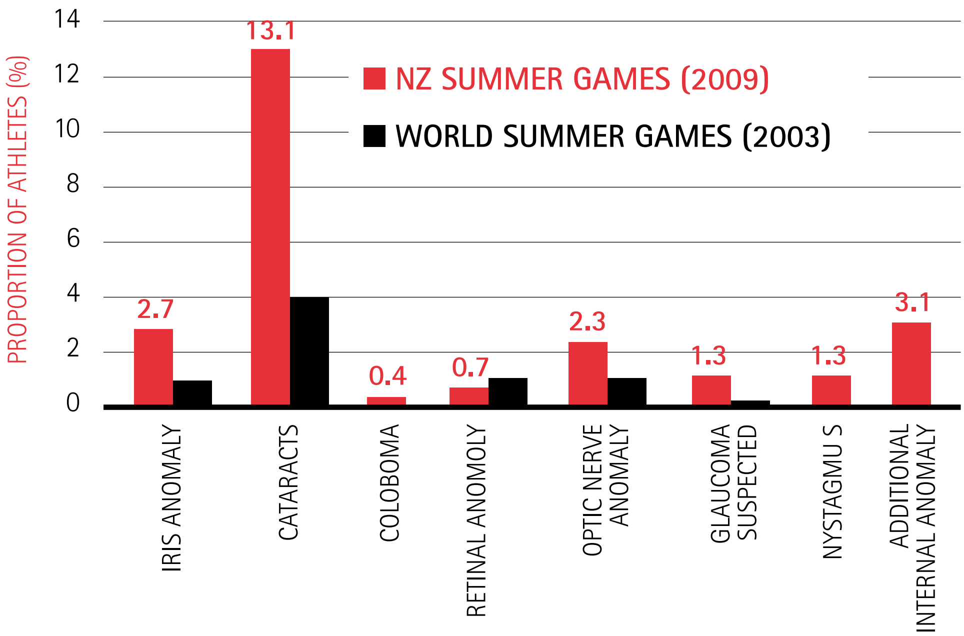


Figure 5 The prevalence of internal eye health problems in athletes screened at the 2009 New Zealand and 2003 World Summer Games

2.3.8 Overall eye health

In addition to tests to determine visual acuity, the presence of strabismus and sterioptic deficit and prevalence of external and internal eye abnormalities, the SOLCIOE screen includes tests for colour vision and intraocular pressure amongst the array of eye health status measures available to athletes. Five hundred and sixty-eight (86.5%) of 657 athletes screened at the 2009 Summer Games were described by testers as presenting at least one negative eye health outcome within one of these seven elements of eye health.

A picture also emerged of a group of athletes whose eye health status was multiply compromised. Valid data across all seven elements of eye health was available for 288 athletes. A remarkably consistent 83.3% of athletes who successfully completed all seven, eye health element screens recorded one or more negative health outcomes within one or more of the seven screens.

A strong association was found between the age of an athlete and the likelihood that one or more eye health problems would be detected.

Athletes' age also affected the probability that a negative eye health outcome would be detected in three or more areas of the eye health screens. Every athlete aged over 60 years (n=21; 100%) failed at least one eye health screen, whereas approximately one third of athletes aged between 10-19 years passed all seven components of the eye health screens (n=34, 32.1%). Similarly, 76.5% of athletes aged between 50-59 years failed three or more health screens, eleven times the proportion of athletes aged 10-19 years (7.0%).

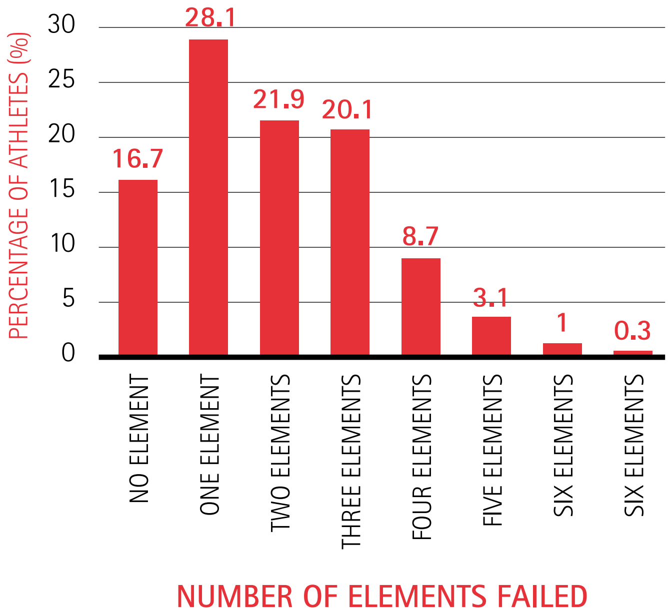


Figure 6 The number of eye health elements failed by athletes who completed all seven screens at the 2009 Summer Games

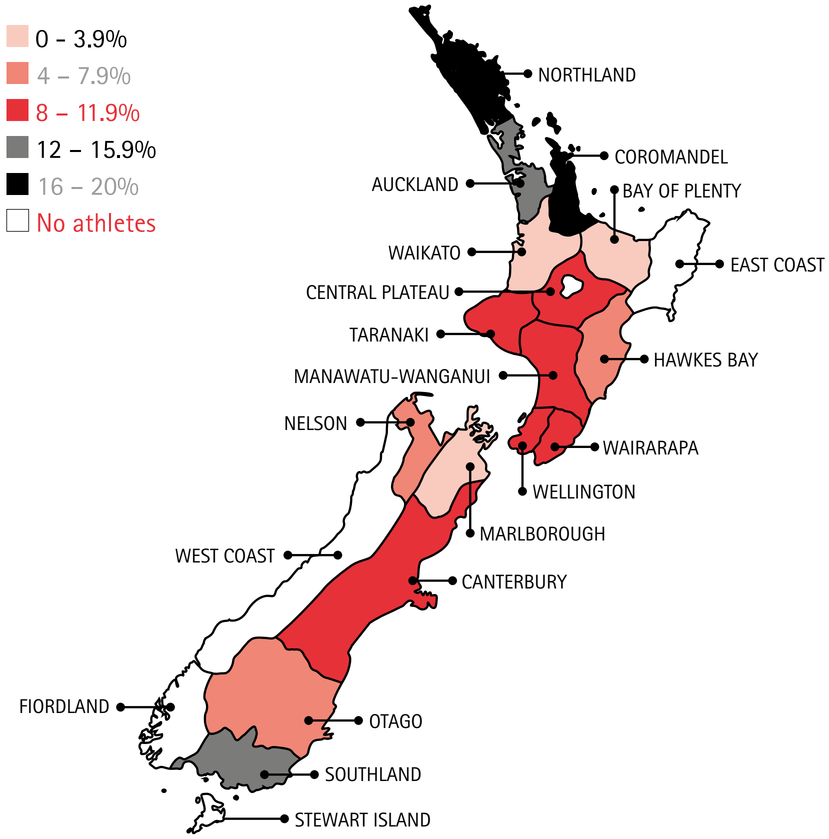


Figure 7 The proportion of athletes screened at the 2009 Summer Games that failed three or more eye health screens and had never had an eye test by region

2.3.9 Regional differences

Significant regional differences in the overall eye health status of athletes screened at the 2009 Summer Games were also found. Regions that recorded the highest proportion of athletes failing one or more health screens included Bay of Plenty (n=23, 100%), Northland (n=20, 95.2%), Manawatu-Whanganui (n=85, 93.4%) and Hawkes Bay (n=40, 93.0%). Waikato (n=16, 72.7%) and Wellington (n=58. 78.4%) recorded the lowest proportion of athletes who failed one or more health screen.

Failing three or more health screens was used as an indicator of more pervasive eye health problems. Not surprisingly, a high degree of correspondence existed between regions that were found to have the highest proportion of athletes failing one health screen and those that had the most compromised eye health status. Bay of Plenty (n=7, 87.5%), Northland (n=5 62.5%) and Hawkes Bay (n=9 (42.9%) emerged as the regions from which the highest proportion of athletes failed four or more components of the eye health screens and Marlborough (n=2, 22.2%), Otago (n=5, 22.7%) and Wellington (n=27, 25.0 %) amongst those larger regions with the lowest proportion of athletes who failed four or more health screens. The regions from which athletes were observed to have the most compromised eye health status were also the regions in which athletes were also least likely to have received an eye health examination in the past three years.

3 HEALTHY HEARING

3. Healthy Hearing

3.1 Special Olympics Healthy Hearing Healthy Athletes® Screen

Special Olympics Healthy Hearing provides audiological screening that identifies hearing loss, middle ear dysfunction and cerumen blockage. The screen also provides education to athletes, coaches and caregivers about ear health and athletes are referred to appropriate clinicians or services when required.[9]

3.2 Hearing, ear health and people with intellectual disability

Research has reported that approximately 40% of people with intellectual disability have hearing loss.[26, 27] Given that many people with intellectual disability also experience communication difficulties, it is vitally important that the hearing and ear health of this group is attended to, to ensure such difficulties are not exacerbated. Researchers have contended that it is critical for auditory specialists, families and care providers to be aware of and alert to symptoms that may indicate hearing loss.[26]

A number of studies based on Healthy Hearing data have been conducted in recent years.[9, 28-31] Analysis of data collected during the 2003 Special Olympic World Summer Games identified that 30% of athletes failed hearing tests, a rate that is up to six times higher than rates typically observed in the general population.[9] Hearing screening of 755 athletes competing at the German Special Olympics Summer Games in 2004 resulted in 38% of athletes failing the screening. Fifty-three percent of these athletes required the removal of ear wax, 56.1% of the fails indicated sensorineural hearing loss, 13.6% indicated mixed hearing loss, and 12.5% of the fails were the result of unremovable ear wax.[30]

A further study was conducted using the 2006 German Special Olympic Summer Games. In this instance 552 athletes were screened according to the Healthy Hearing Protocol.[31] Twenty-four percent of athletes failed the screen and ear-wax was removed from 48% of all athletes. Seventy–four of the ninety-nine athletes who had shown a screening-based suspicion of hearing loss, had an undetected hearing loss confirmed through pure tone audiometry (PTA) screening. The researchers concluded that Healthy Hearing screening reliably detects hearing disorders

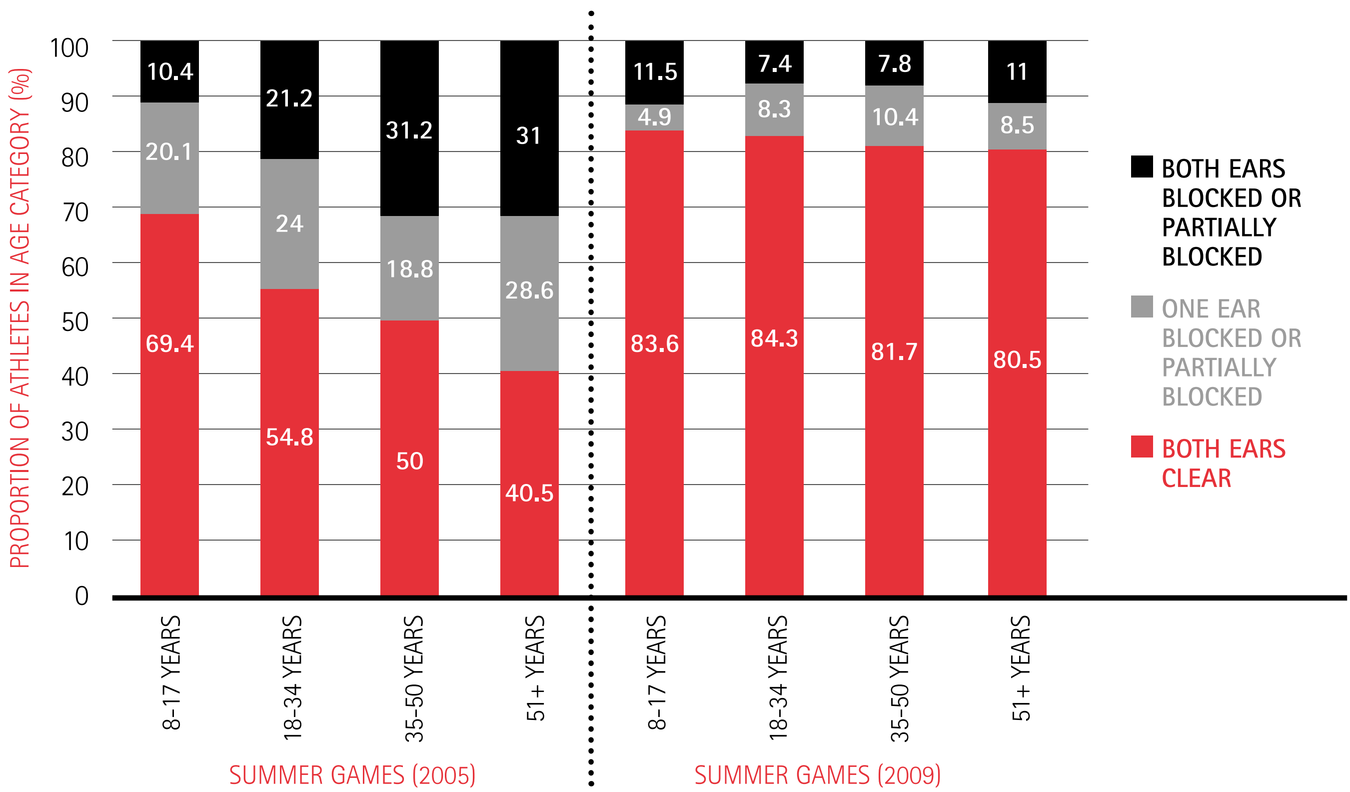


Figure 8 The proportion of athletes screened at the 2005 and 2009 Summer Games found to have a full or partial blockage in the outer canal of one or both ears by age category

among people with intellectual disability. Data collected from athletes competing at the UK National Games in Glasgow have also been analysed.[28] Before conducting the analysis, researchers were unconvinced that the Healthy Hearing screen would offer real benefits to UK athletes given the availability of free local healthcare, including ear care services. Of the 996 athletes screened, 40% were identified with previously undetected hearing loss, 52% required medical ear care, and 43% required wax removal. The findings of the reported studies are remarkably similar and highlight a need for consistent attention to be paid to the hearing and ear health of people with intellectual disability.

3.3 An analysis of the hearing and ear health of New Zealand Special Olympic athletes

3.3.1 External ear canal

At the 2005 Summer Games, 45.1% of athletes screened were found to have a full or partial blockage of one or both ears, very similar to the proportion of athletes who presented with a full or partial blockage in one or both ears following an examination of the ear canal performed at the 2003 World Games (52%).

Four years later, less than one in five athletes screened at the 2009 Summer Games (17.1%) presented with a full or partial blockage in one or both ears. This dramatic change in result suggests that there may have been a greater awareness of and attendance to problems caused by ear wax blocking the external ear canal.

At the 2005 Summer Games, the age of athletes did affect the probability that cerumen (ear wax) would fully or partially block the outer ear canal of one or both ears. While a clear ear canal was detected in seven out of every ten athletes aged between 8-17 years, only four out of every ten athletes aged over 50 years presented with a clear ear canal and almost one out of every three athletes aged over 50 years had a full or partial blockage in both ears.

Interestingly, a follow-up referral was recommended for a higher proportion of athletes screened at the 2009 Summer Games. Approximately one out of every ten athletes screened at the 2009 Summer Games (9.8%) were assessed as requiring follow-up treatment compared to 3.9% of athletes screened at the 2005 Summer Games. Both rates of referral were well below that reported for athletes screened at the 2003 World Games (26%).[4]

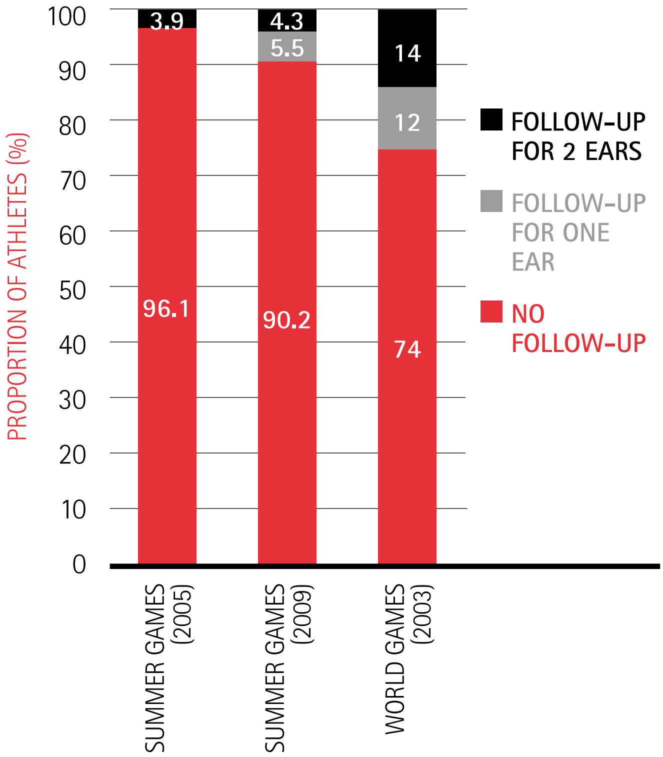


Figure 9 The proportion of athletes assessed as in need of follow-up treatment at the 2005 and 2009 Summer and 2003 World Games

For a few of the 1524 athletes screened at the 2005 and 2009 Summer Games, a number of serious ear conditions had remained undetected. A retracted eardrum was discovered in eleven athletes, three athletes were found to have a perforated eardrum, eight presented with a retracted tympanic membrane and an atretic ear was detected in four athletes.

Table 2 Ear conditions detected during an external ear canal inspection at the 2005 and 2009 Summer Games

Reason for referral	Summer Games (2005)	Summer Games (2009)
Retracted ear drum	3	8
Retracted tympanic membrane	2	6
Perforated eardrum	3	0
Unusual ear canal	3	19
Atretic ear	3	1
Removal of cerumen	43	44

[4] Given that most referrals were made to remove cerumen and that a full or partial blockage was more likely to be detected in athletes screened at the 2005 Summer Games, it is probable that the lower rate of referral in 2005 reflects differences in the training and threshold for follow-up adopted by testers that conducted the ear canal examination at the two events.

3.3.2 Otoacoustic emissions screen

At the 2005 and 2009 Summer Games, approximately one out of every two athletes did not pass the first order otoacoustic emission screen in both ears with a further twenty percent failing the screen in one ear. The proportion of athletes who did not pass the otoacoustic screen in one or both ears at the 2005 (68.9%) and 2009 (75.3%) Summer Games was much higher than the proportion reported for athletes screened at the 2003 World Games (48%).

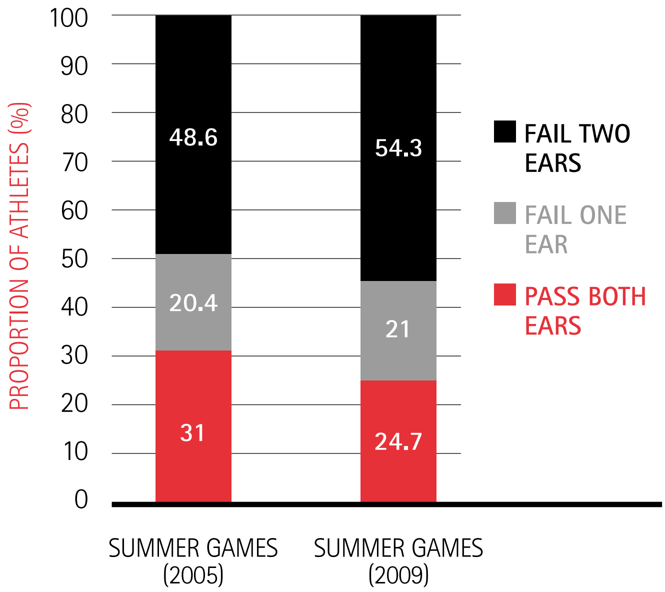


Figure 10 The proportion of athletes screened at the 2005 and 2009 Summer and 2003 World Games that did not pass the otoacoustic emission screen in one or both ears

A strong association between age and the likelihood that an athlete would not pass the otoacoustic screen in one or both ears was found for athletes tested at the 2005 and 2009 Summer Games. A hearing deficit as measured by the otoacoustic screen was detected in almost every athlete aged over 50 years screened in 2005 (95.1%) and in 2009 (98.8%) compared to one out of every two athletes aged between 8-17 years screened at the same event.

3.3.3 Pure Tone screen

Of the 558 (68.9%) athletes who failed the otoacoustic screen in 2005, 548 continued on to the pure tones screen and in 2009, 483 of the 514 athletes who failed the otoacoustic screen (75.3%) had their hearing for pure tones tested at a frequency of 2000Hz and 4000Hz (25dB HL).

A hearing deficit, as measured by the Pure Tone screen, was detected in 60.3% of athletes who had also failed the otoacoustic screen at the 2005 Summer Games and 76.3% of athletes who had failed the otoacoustic screen at the 2009 Summer Games.

Predictably, a strong association between the age of athletes and the likelihood that a hearing deficit would be detected at 2000HZ or 4000Hz persisted for athletes screened at the 2005 and 2009 Summer Games. No association was found between sex and the likelihood an athlete would not pass the Pure Tone screen.

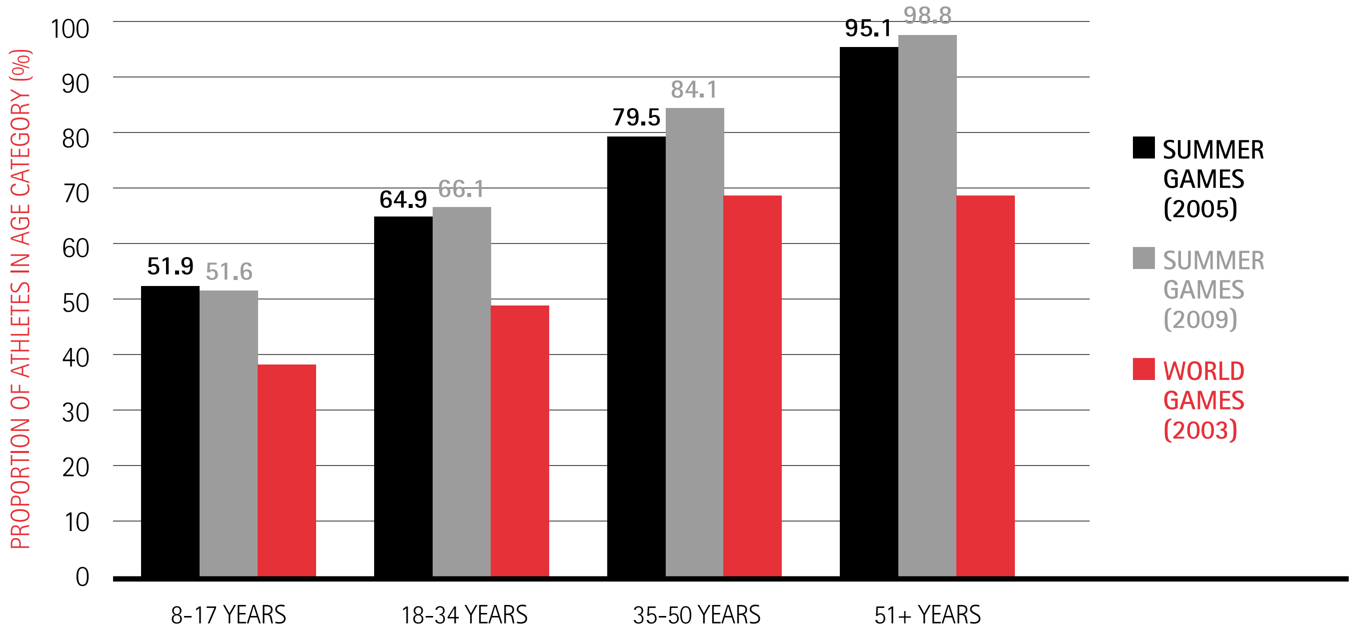


Figure 11 The proportion of athletes screened at the 2005 and 2009 Summer and 2003 World Games that did not pass the otoacoustic emission screen in one or both ears by age category

3.3.4 Tympanometry Screen

Conductive hearing loss occurring as a consequence of a middle ear condition is likely to have contributed to the hearing deficit detected in approximately half of the athletes who did not pass the otoacoustic screen. Two hundred and sixty-seven of 544 athletes (49.1%) that had the responsiveness of their tympanic membrane and middle ear system to pressure change tested, did not pass the Tympanometry screen in one or both ears at the 2005 Summer Games. Evidence of a middle ear condition was found in 44.1% of athletes who failed the otoacoustic screen at the 2009 Summer Games. Both results were consistent with findings reported for athletes screened at the 2003 World Games.

New Zealand athletes were more likely to exhibit hearing loss at 2000Hz and 4000Hz [25dB HL] than athletes screened at the 2003 World Games. Almost one out of every two athletes who began the Healthy Hearing® screen at the 2009 Summer Games did not detect a pure tone at 2000Hz [25dB HL] (46.1%) and 44.3% failed to detect a pure tone at 4000Hz [25dB HL]. Hearing loss at these frequencies was detected in approximately one third of athletes who began the Healthy Hearing® screen at the 2005 Summer Games. Evidence of a middle-ear condition was also detected in approximately one out of every three athletes who began the Healthy Hearing® screen at the 2005 and 2009 Summer Games.

New Zealand athletes were more likely to exhibit hearing loss at 2000Hz and 4000Hz [25dB HL] than athletes screened at the 2003 World Games. Almost one out of every two athletes who began the Healthy Hearing® screen at the 2009 Summer Games did not detect a pure tone at 2000Hz [25dB HL] (46.1%) and 44.3% failed to detect a pure tone at 4000Hz [25dB HL]. Hearing loss at these frequencies was detected in approximately one third of athletes who began the Healthy Hearing® screen at the 2005 Summer Games. Evidence of a middle-ear condition was also detected in approximately one out of every three athletes who began the Healthy Hearing® screen at the 2005 and 2009 Summer Games.

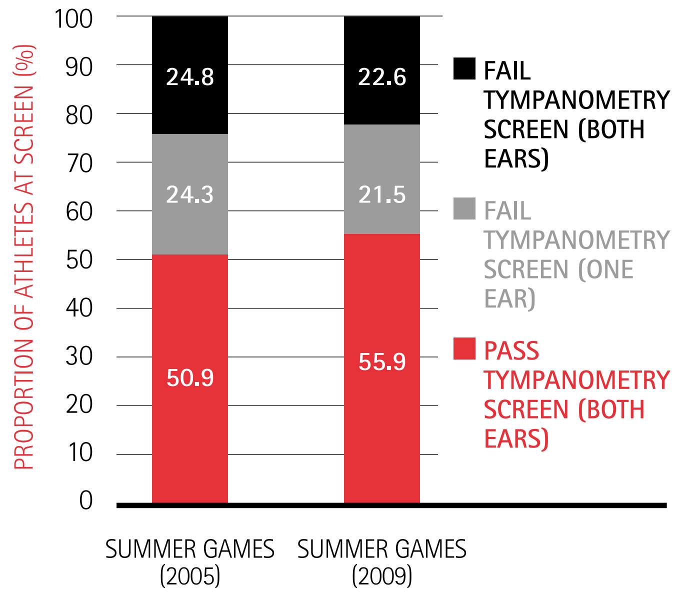


Figure 12 The proportion of athletes screened at the 2005 and 2009 Summer Games that did not pass the Tympanometry screen in one and two ears

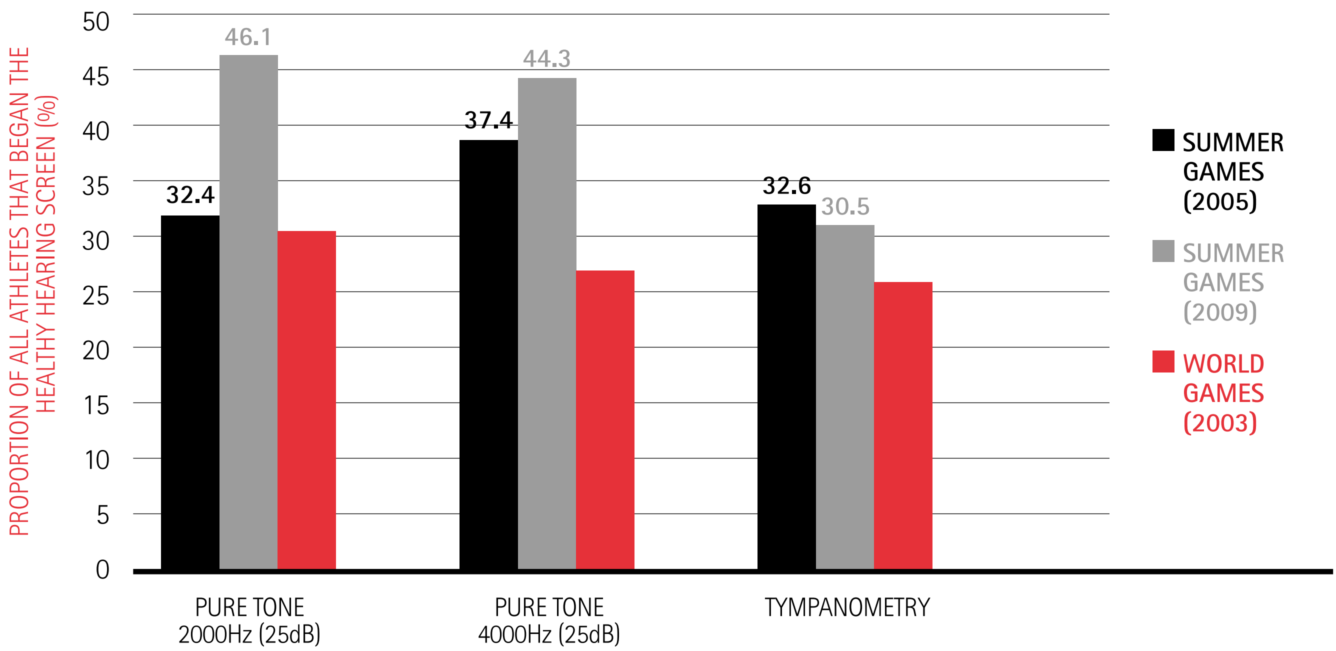


Figure 13 The proportion of athletes screened at the 2005 and 2009 Summer and 2003 World Games that did pass the Pure Tone or Tympanometry screens

4 SPECIAL SMILES

4. Special Smiles

4.1 Special Olympics Special Smiles Screen

The Special Olympics Special Smiles programme was designed to address the range of oral health problems experienced by people with intellectual disability. The screen assesses the oral health condition of athletes and is particularly focused on decay, fillings fluorosis, injury and the presence of periodontal disease. Oral health instruction is provided to athletes, including education in the areas of brushing and flossing. Mouthguards are provided for athletes participating in contact sports and referrals are made where necessary.

4.2 Dental and oral health and intellectual disability

Consistent with other areas of health, the oral health status of people with intellectual disability has also been reported as being poorer than that of the general population[32].
In particular people with intellectual disability have been identified as having poorer oral hygiene, periodontal disease, dental caries, and more extractions.[33] Barriers to dental care for people with intellectual disabilities include the cost of care and lack of transportation.[33]

Utilising Special Smiles screening data collected in 2002, Reid et al[34] compared the oral health status of U.S. athletes to international athletes from China, Lebanon, Poland, South Africa and Turkey. While the data were grouped in a manner that did not allow for inter-country differences, broad cross-country comparisons were achieved. The international athletes were generally younger than those of the United States (mean age 17.4 versus 24.0 years), were more likely to be males (64.3 versus 54.6%) and international athletes had more evidence of treatment needs and less evidence of past dental care than U.S. athletes.[34]

Data collected from athletes participating in the 2005 Glasgow Special Olympics were compared to a general population studied as part of the 1998 U.K. Adult Dental Health Survey.[35] Perhaps reflective of the fact that Special Olympic athletes tend to be younger, healthier and better supported than other individuals with intellectual disability,[35] Special Olympic athletes were found to have better dental and oral health than the general population. The study did, however, highlight the vulnerability of older Special Olympics athletes to dental problems.

Special Smiles data has recently been used to explore previously under-researched areas such as the oral health of young people with intellectual disabilities[36] and the impact of regional differences on oral health outcomes.[37]

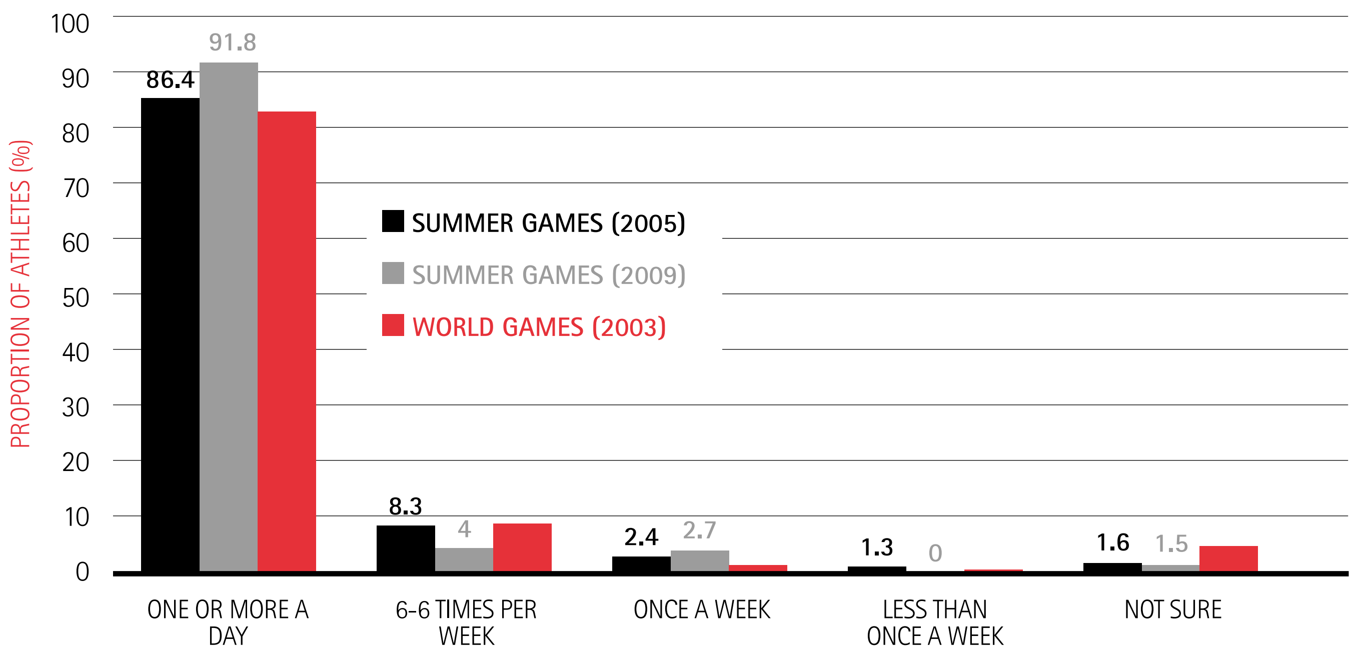


Figure 14 The frequency of mouth cleaning self-reported by athletes screened at the 2005 and 2009 Summer Games and 2003 World Games

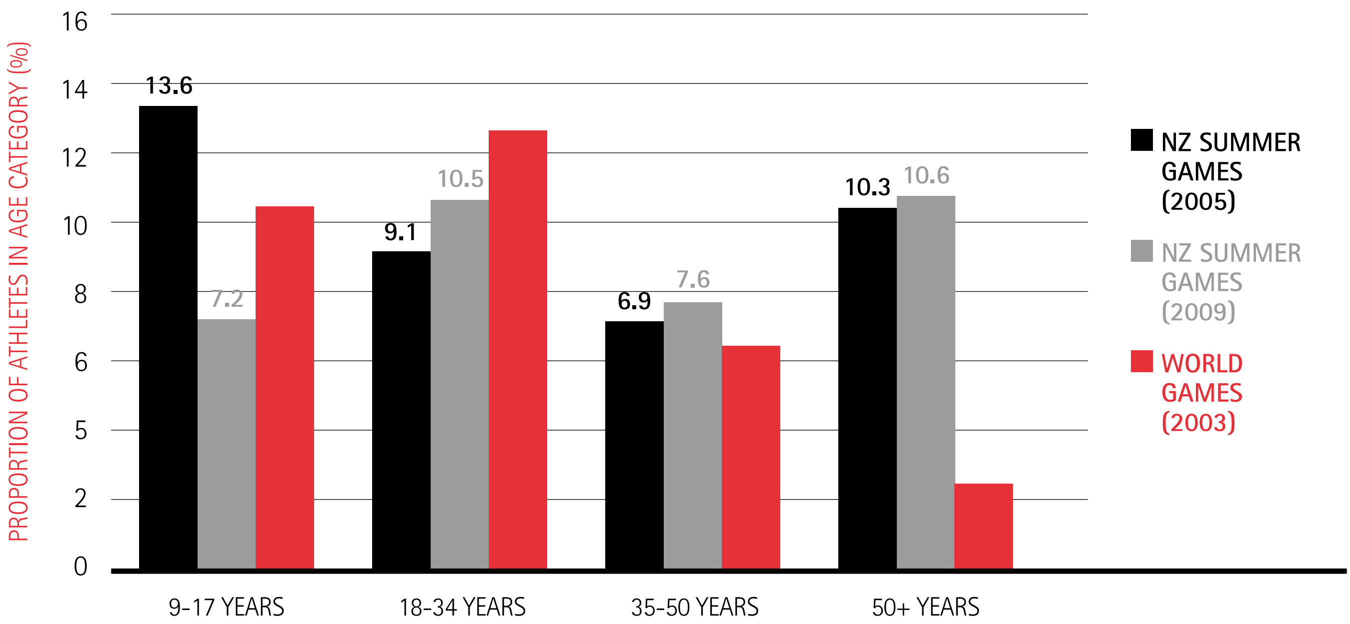


Figure 15 The proportion of athletes screened at the 2005 & 2009 Summer Games and 2003 World Games that self-reported mouth pain by age category

4.3 An analysis of the dental and oral health of New Zealand Special Olympic athletes

4.3.1 Frequency of mouth cleaning

Good oral hygiene habits were self-reported by New Zealand Special Olympic athletes. At the 2005 Summer Games, 86.4% of athletes screened self-reported cleaning their mouth one or more times a day, with the proportion rising to 91.8% at the Summer Games four years later. New Zealand athletes were slightly more likely to self-report cleaning their mouth one or more times a day than athletes screened at the 2003 World Games.

4.3.2 Pain inside the mouth

Approximately one out of every ten athletes screened at the 2005 (9.6%) and 2009 (9.2%) Summer Games reported experiencing pain in their teeth or gums at the time of examination. In 2005, 65.2% of athletes who self-reported pain and for whom data was available identified their teeth as the source of pain and 68.1% of athletes screened in 2009 identified their teeth as the source of their pain.

With the exception of older athletes, New Zealand athletes were less likely to self-report mouth pain than athletes screened at the 2003 World Games (12%). Slightly more than ten percent of athletes aged over 50 years who were screened at the New Zealand 2005 and 2009 Summer Games self-reported mouth pain compared to two percent of their age peers screened at the 2003 World Games.

4.3.3 Edentulism

Approximately five percent of athletes screened at the 2005 (4.9%) and 2009 (4.9%) were found not to have teeth and whilst no association was found for sex, a strong association between age category and likelihood athletes would present with no teeth emerged in 2005 and in 2009.

The rate at which edentulism was detected was not uniform. More than one in three athletes screened at the 2005 Summer Games aged between 50-59 years had no teeth, with the rate of detection 6.5 times higher than for athletes aged between 40-49 years. Athletes aged over 50 years were most likely to have lived in one of New Zealand's major specialist institutions where the practice of removing patients' teeth was not uncommon. It is possible that in addition to age related decay and improvements in the level of oral hygiene and treatment available to people with intellectual disability over time, the support practices of institutional care may also have contributed to generational differences in the prevalence of edentulism.

4.3.4 Untreated decay

Untreated decay was detected in one in every four athletes screened at the 2005 (20.1%) and 15.5% of athletes screened at the 2009 Summer Games. The prevalence of decay was lower in New Zealand athletes than that detected in athletes screened at the 2003 World Games (36%) with a smaller proportion of athletes presenting with untreated decay across all age categories. Unlike the trend observed for athletes screened at the World Games, the prevalence of untreated decay tended to increase with age and an association between age and tooth

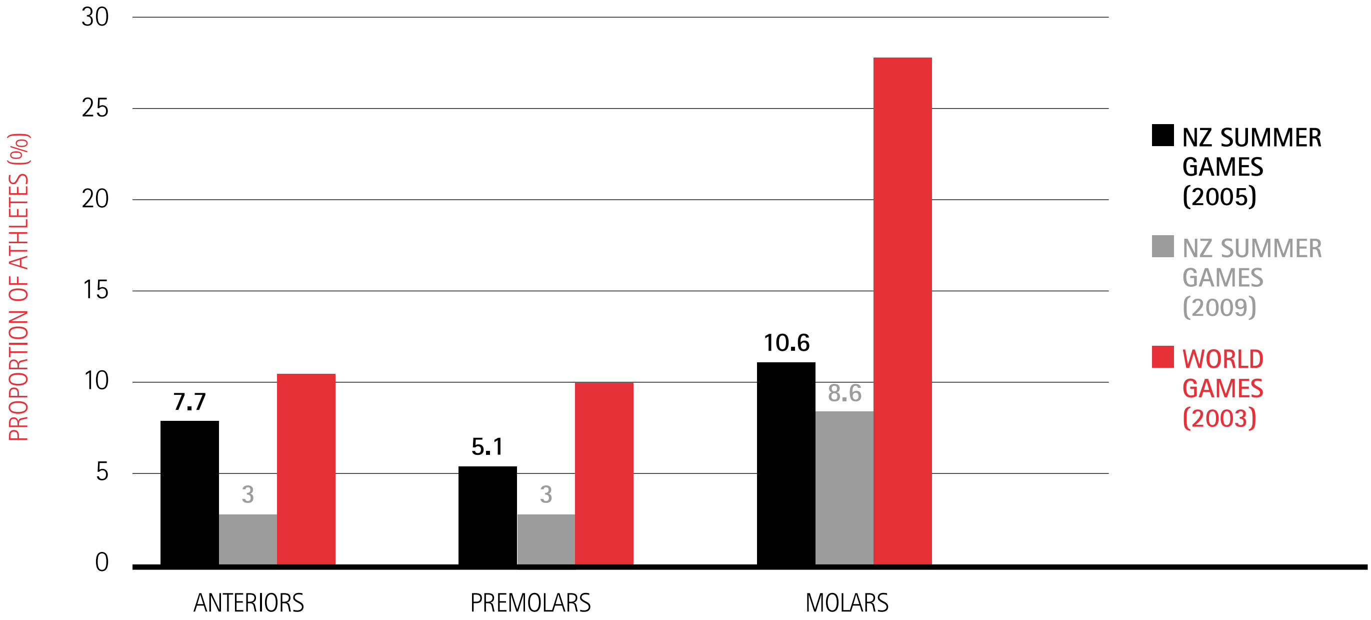


Figure 16 The site of untreated decay in athletes screened at the 2005 and 2009 Summer Games and 2003 World Games

decay was found in 2005 and in 2009. The odds of untreated tooth decay being detected in athletes screened at the 2009 Summer Games increased by 1.03 times for every one-year increase in athlete age.

More decay was detected in first and second molar teeth (2005= 10.6%; 2009=8.6%) than anterior or premolar teeth, consistent with findings reported after the 2003 World Games. The prevalence of untreated decay in New Zealand athletes screened was, however, lower than that found for athletes screened at the 2003 World Games. An association was also found between the year New Zealand athletes were screened and the likelihood cavitations would be detected, suggesting an improvement in the oral health of athletes in the four years that separated New Zealand Summer Games.

4.3.5 Missing teeth

One or more missing teeth were detected in 38.7% of athletes screened at the 2005 Summer Games and 35.9% of athletes screened at the 2009 Summer Games. The prevalence of missing teeth in New Zealand was very similar to that reported after the 2003 World Games.

Missing teeth were detected in more than four out of every five athletes aged over 51 years screened at both Summer Games (2005=89.5%; 2009=82.9%) with the odds of missing teeth being detected increasing by 1.14 times in 2005 and 1.12 times for every one year increase in athlete's age.

Missing teeth were approximately twice as likely to be detected in an athlete's first and second molars than their central or lateral incisors or cuspids at both the 2005 and 2009 Summer Games.

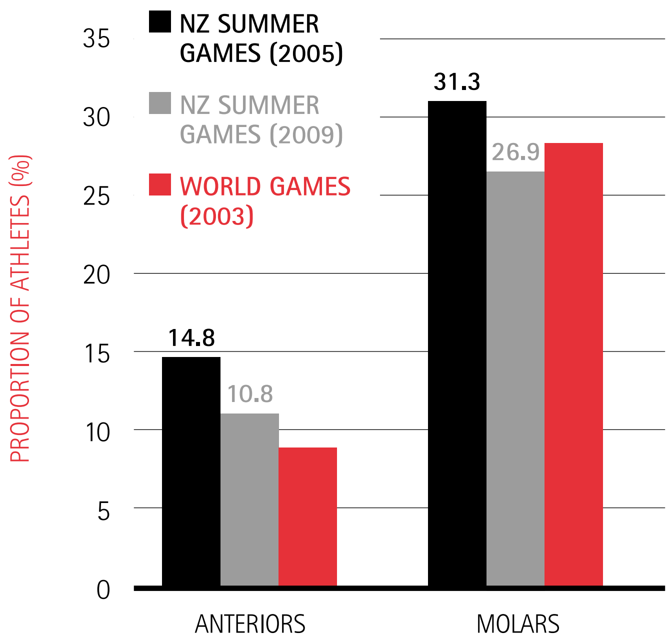


Figure 17 The site of missing teeth detected in athletes screened at the 2005 and 2009 Summer Games and 2003 World Games

4.3.6 Gingival signs

Damage to the soft tissue lining of the mouth was detected in more than half of the athletes screened at the 2005 Summer Games (58.1%) and 44.4% of athletes screened at the 2009 Summer Games. The proportion of male athletes with permanent abnormalities to the buccal gingiva of three or more teeth was consistently higher than female athletes.

As with other indicators of oral health, the age of athletes had a statistically significant impact on the likelihood 'gingival signs' would be detected at the 2005 and 2009 Summer Games. Damage to the buccal gingiva was detected in 71.2% of athletes aged between 35-50 years in 2005 and 55.2% of athletes screened at the 2009 Summer Games with the odds of 'gingival signs' being detected increasing by 1.044 times and 1.029 times for every one year increase in the age of athletes screened at the 2005 and 2009 Summer Games respectively. The prevalence of gum abnormalities also varied regionally. Fewer 'gingival signs' were detected in athletes from Auckland (34.9%) and Marlborough (38.1%), whereas damage to the buccal gingiva was detected in over half of the athletes who travelled from Northland (62.5%) and Hawkes Bay (55.8%) to the 2009 Summer Games.

4.3.7 Overall oral health

In addition to the prevalence of untreated decay, missing teeth and 'gingival signs', the Healthy Athletes, Special Smiles oral health screen tested athletes for the presence of dental injury (fractured teeth or teeth lacking pulpal vitality or missing as a result of injury) and fluorosis alongside signs of decay related corrective or protective dental intervention (sealants and filled teeth).

Evidence of tooth injury was detected in 15.7% of athletes screened at the 2005 Summer Games, more than twice the proportion of athletes screened four years later (7.3%) and the prevalence of fluorosis ranged between 5.6% (2005) and 4.6% (2009) of athletes screened at consecutive Summer Games.

One or more indicators of poor oral health were detected in two out of every three athletes screened at the 2009 Summer Games (67.2%) with 29.1% of athletes failing two or more of five tests included in the Special Smiles oral health screen. Seventy-seven percent of athletes screened at the 2005 Summer Games presented with one or more of the five indicators of poor oral health tested for in the Special Smiles oral health screen.

A statistically significant association was between age and the likelihood one or more and two or more negative oral health outcomes would be detected in athletes screened at the 2005 and 2009 Summer Games. Region of origin also played a role with athletes from Southland (83.3%), Waikato (78.1%), Coromandel (76.9%) and Northland (74.2% most likely and athletes from the Central Plateau (52.6%), Auckland (61.3%), Manawatu-Whanganui (64.9%) and Otago (65.4%) least likely, to have one or more negative oral health outcomes detected at the 2009 Summer Games.

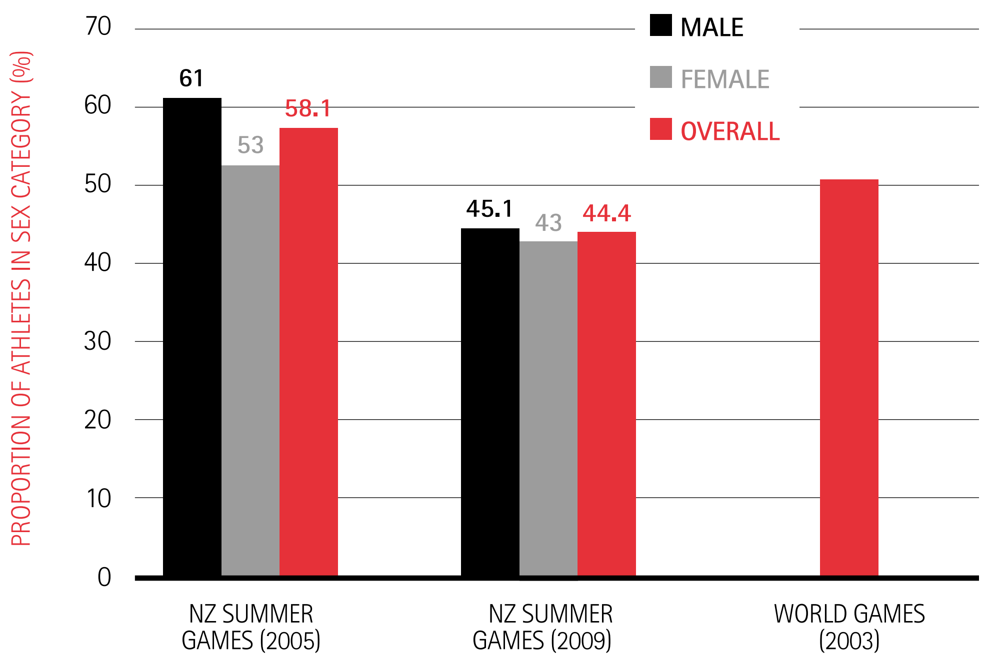


Figure 18 The prevalence of 'gingival signs' detected in athletes screened at the 2005 and 2009 Summer Games and 2003 World Games

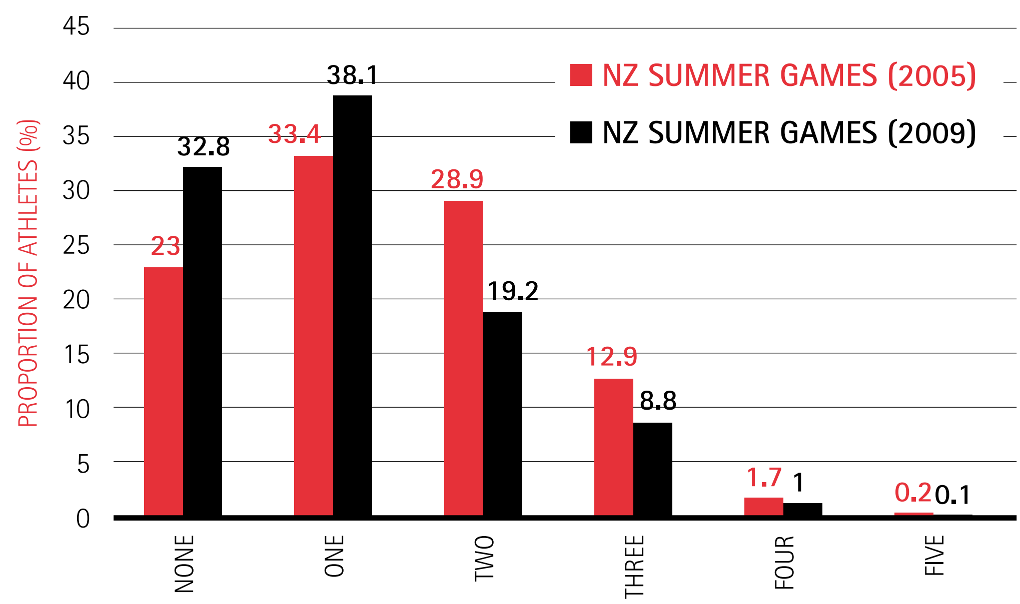


Figure 19 The number of oral health screens failed by athletes at the 2005 and 2009 Summer Games

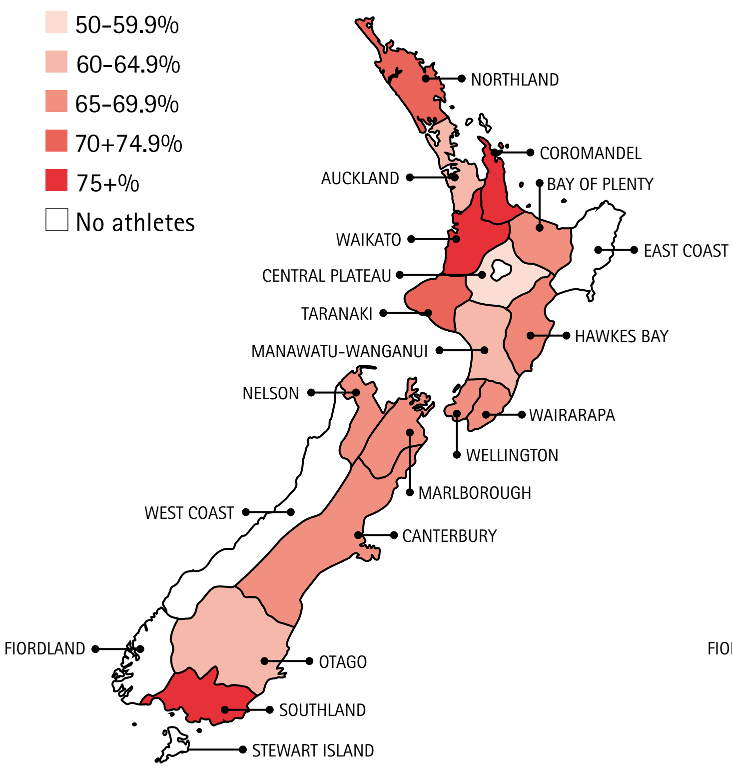


Figure 20 The proportion of athletes screened at the 2009 Summer Games that presented with one or more negative oral health outcomes

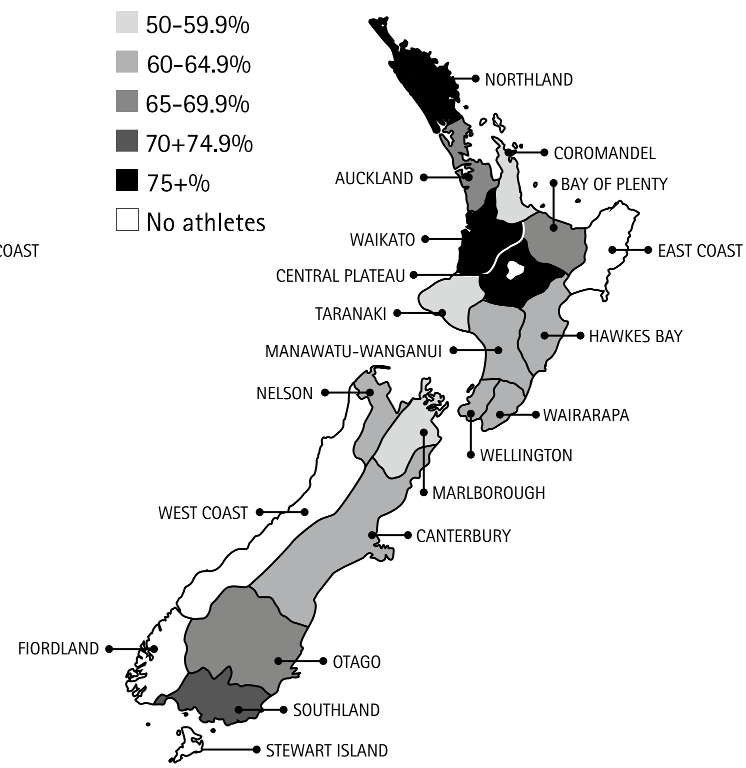


Figure 21 The proportion of athletes screened at the 2009 Summer Games that were assessed as needing dental treatment

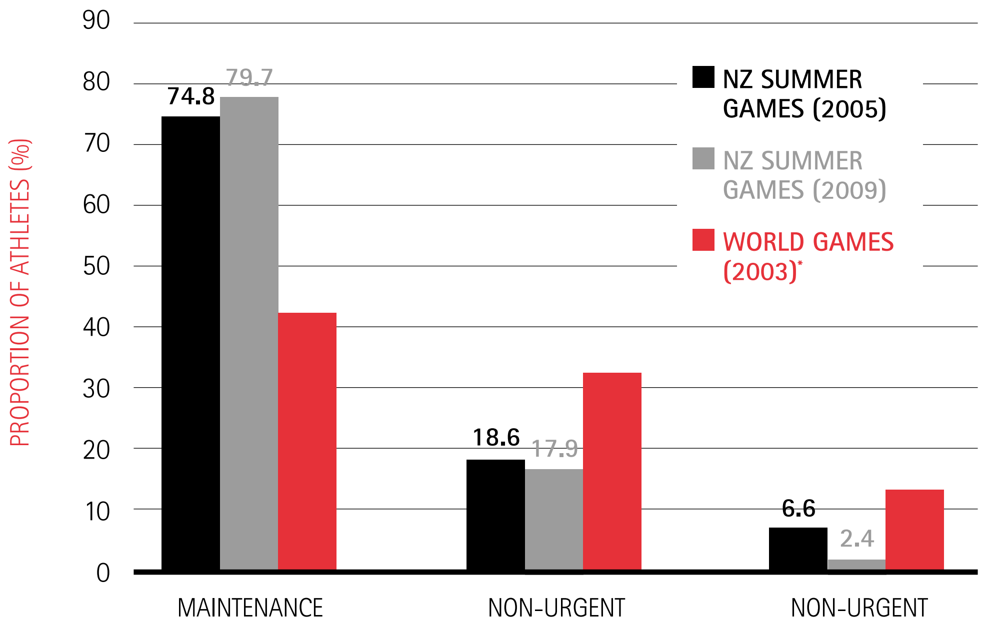


Figure 22 The proportion of athletes screened at the 2005 and 2009 Summer Games and 2003 World Games assessed as needing urgent or non-urgent dental treatment

4.3.8 Treatment Urgency

At the 2005 Summer Games, expert testers determined that one in four athletes screened required dental treatment (25.2%), of whom, 42 (6.6%) were evaluated as in need of urgent treatment. Four years later, one in five athletes were assessed as needing dental treatment with fewer (n=20; 2.4%) athletes screened at the 2009 Summer Games assessed as requiring urgent intervention. The proportion of New Zealand athletes who required dental treatment was lower than the proportion reported for athletes screened at the 2003 World Games.

Age was found to be an important indicator of the likelihood that athletes screened at the 2009 games would be assessed as requiring referral for dental treatment. Whereas 11.2% of athletes aged between 9-19 years screened at the 2009 Summer Games were assessed as requiring dental treatment, a determination that treatment was required was made for approaching half of athletes screened aged between 50-59 years (43.7%) and almost one in three athletes aged between 40-49 years (29.9%). For every one year increase in the age of athletes screened at the 2009 Summer Games the odds that dental treatment would be required increased by 1.04 times.

5 FIT FEET

5. Fit Feet

5.1 Fit Feet Healthy Athletes® Screen

The Fit Feet Healthy Athletes® Screen has been operating since 2003 and clinically assesses the lower extremities of Special Olympic Athletes.[38] The specific areas included in the Fit Feet screen are: musculoskeletal, dermatological, and biomechanics/gait. Added to this, the athletes' shoe size versus their actual foot size is measured to ensure that they are wearing the correct footwear. As part of this screen, athletes and their coaches and family receive education on preventive foot-care, and referrals are made to appropriate clinicians for evaluation and treatment of abnormal findings.

5.2 Foot health and people with intellectual disability

The majority of the available research in the area of podiatric conditions is focused on Down syndrome, rather than on the broader population of people with intellectual disability. This is reflective of the fact that approximately 20% of people with Down syndrome experience orthopaedic problems and as a consequence, foot and podiatric problems. For the purposes of this research, only two studies were found to specifically have focused on analysis of Fit Feet data[9, 38]. An analysis of 2003 Special Olympic World Summer Games athlete data reported that of the 1,000 athletes screened, ingrown toenails and tinea were common signalling a high incidence of poor foot hygiene among athletes. Furthermore, nearly half of all athletes screened had one or more skin or nail conditions, with older athletes the most likely to be in this category.[9]

A more comprehensive analysis of Fit Feet data has recently been published.[38] Screening data obtained from 1580 Special Olympic athletes participating in U.S. competitions between 2004-2006 were analysed. Importantly, this research made comparisons to the general population where possible. A range of structural, biomechanical and dermatological conditions were identified with the prevalence of all structural conditions notably higher for athletes than would commonly be observed in the general population. The higher rates of dermatological conditions were also noted, again indicating that ill-fitting footwear and poor hygiene are likely to be factors that contribute significantly to the poor foot health of Special Olympic athletes.[38]

5.3 An analysis of the foot health of New Zealand Special Olympic athletes

5.3.1 Foot, ankle, skin and nail conditions

Following a general evaluation of the physical condition of the feet of athletes screened at the 2005 and 2009 Summer Games, the proportion of athletes in whom a fungal infection and corns and/or calluses were detected emerged as the most pervasive negative foot health outcomes affecting New Zealand athletes.

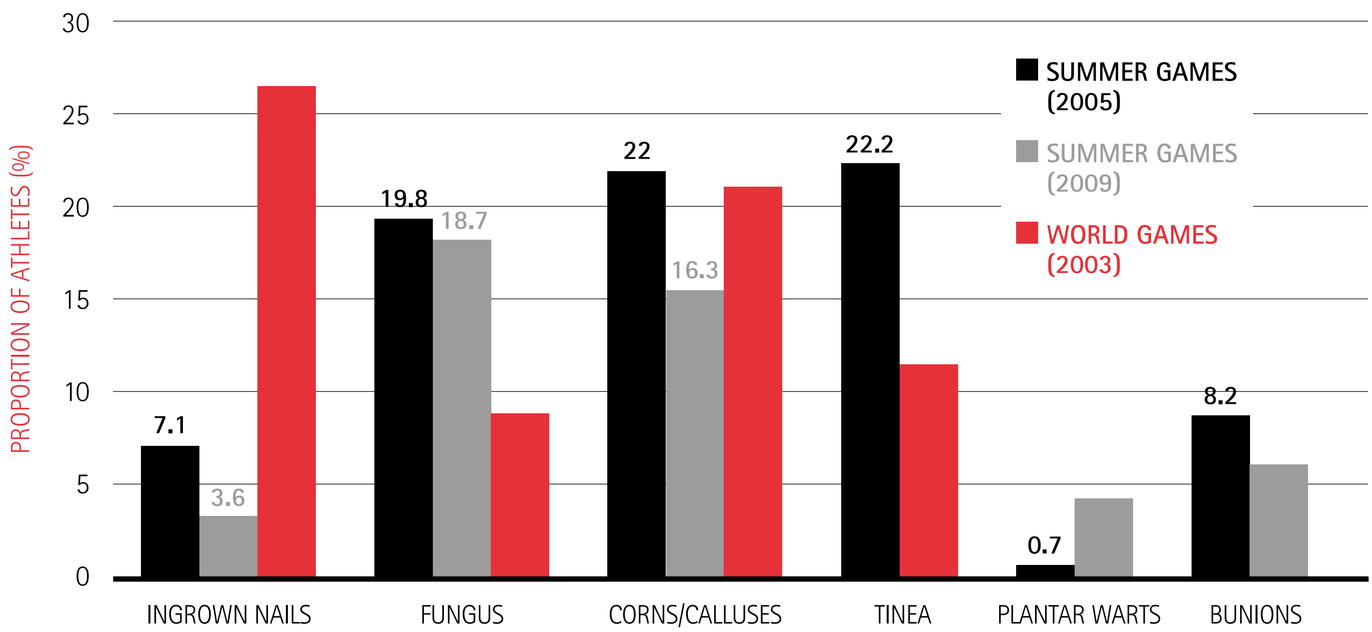


Figure 23 Foot and nail conditions detected in athletes screened at the 2005 and 2009 Summer and 2003 World Games

Approximately one out of every five athletes screened at the 2005 (19.8%) and 2009 (18.7%) Summer Games presented with a fungal nail infection (onychomycosis), more than twice the proportion of athletes screened at the 2003 World Games. At the 2003 World Games, the high incidence of tinea was interpreted as indicative of foot hygiene frequently being neglected in adults with intellectual disability. The prevalence of tinea amongst New Zealand athletes screened at the 2005 Summer Games (22.2%) was also twice as high as the incidence reported at the 2003 World Games. In addition to a range of environmental (warm wet climate, occlusive footwear, injury) and biological (age, poor health, diabetes, psoriasis) risk factors, participation in fitness activities and communal bathing are known to increase the risk of foot related fungal conditions.

A corn and/or callus was detected on the toe or metatarsal of 22% of athletes screened at the 2005 Summer Games and 16.3% of athletes screened four years later, very similar to the rate of detection reported at the 2003 World Games.

A nail abnormality (such as ingrown nails) was more likely to be detected in male athletes screened at the 2009 Summer Games, whereas female athletes were more likely to present with corns and/or calluses, plantar warts and bunions at the same event.

A foot abnormality was more likely to be detected in older athletes across the range of almost all conditions sampled for

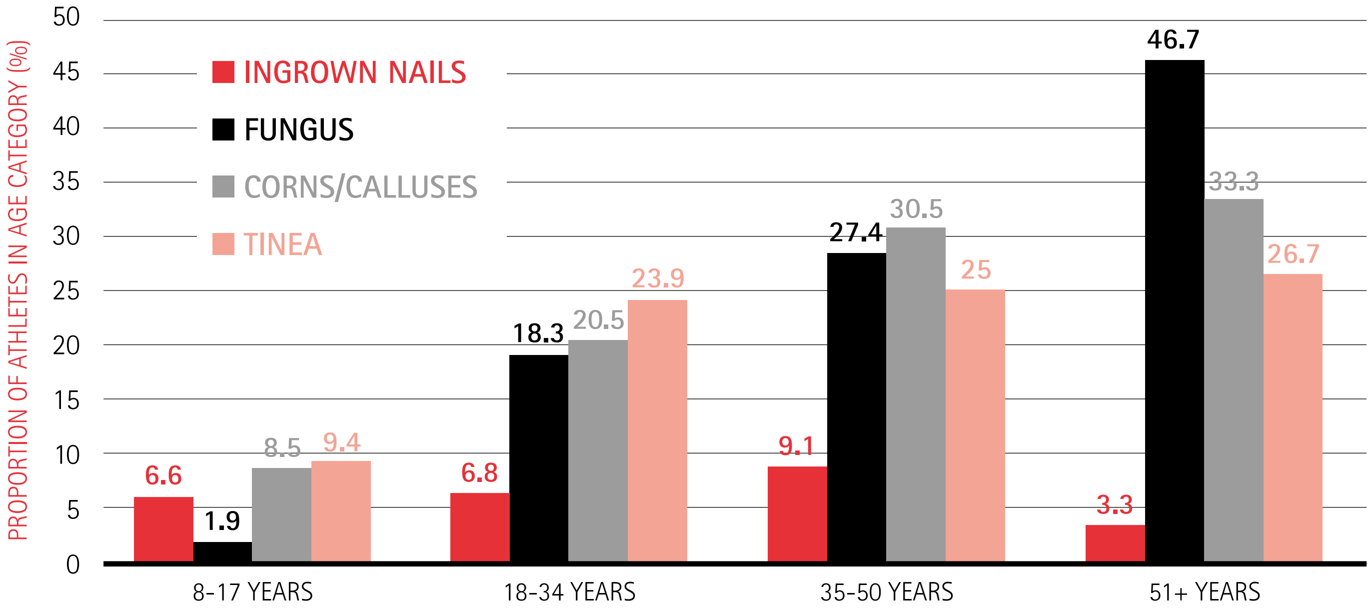


Figure 24 Foot and nail conditions detected in athletes screened at the 2005 Summer Games by age category

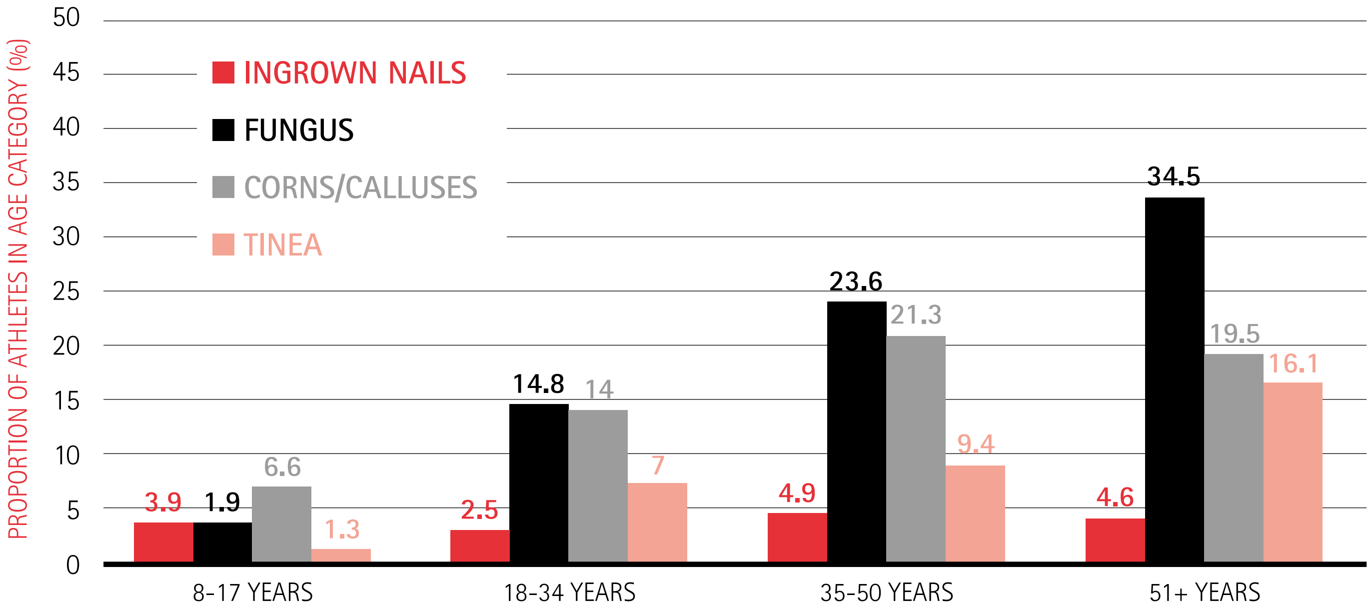


Figure 25 Foot and nail conditions detected in athletes screened at the 2009 Summer Games by age category

by the Healthy Athletes® Fit Feet screen. At the 2005 Summer Games, onychomycosis was detected in almost half of athletes screened aged over 50 years (46.7%), 25 times the proportion of athletes aged between 8-17 years (1.9%). Similarly, whereas corns and or calluses were detected in one out of every three athletes aged over 50 years, only 8.5% of athletes aged between 8-17 years presented with a corn and or callus.

In addition to corns and calluses, other skin conditions sampled for in the Fit Feet screen included the presence of red skin, warts, papules, hyperhydrosis, ulcers, dry, cracked or blistered skin and other dermatological conditions. Of the 830 athletes screened at the 2009 Summer Games, the most commonly detected skin conditions included unspecified other skin conditions (n=196, 23.6%), toe (n=111, 13.4%) or heel (n=84, 10.1%) calluses and dry skin (n=69, 8.3%).

One or more skin conditions, excluding bunions, were detected in over half of the athletes screened at the 2009 Summer Games (n=426, 51.4%), with two or more skin conditions observed in 17.2% of athletes screened. When the measure was widened to include the presentation of onychomycosis or ingrown toenails the proportion of athletes in whom one or more skin or nail conditions were detected increased to 58.6% of all athletes screened. Not surprisingly, the age of athletes made a statistically significant contribution to explaining variation in the likelihood that a skin or nail condition would be detected in athletes screened at the 2009 Summer Games. For every one year increase in an athlete's age, the odds of presenting with a skin or nail condition increased by 1.02 times.

5.3.2 Biomechanical conditions: Foot and leg

One or more biomechanical abnormalities were detected in eight out of every ten athletes (80.5%) screened at the 2009 Summer Games and 76.1% of athletes screened four years earlier.

Over-pronation is a biomechanical problem associated with foot arch collapses at the moment of weight bearing, leading to an exaggerated inward roll of the foot and ankle. Over half of the athletes screened at the 2005 (52.6%) and 2009 (57.3%) Summer Games were found to over-pronate. An outward orientation of the foot and ankle resulting in the outer edge of the sole carrying an athlete's weight (supination) was less commonly observed at screenings provided during the 2005 (14.9%) and 2009 (8.0%) Summer Games. Over-pronation is often present in people with low arch heights. Flat feet (pes planus) were detected in approximately one-third (32.1%) of athletes screened at the 2005 Summer Games and 28.1% of athletes screened four years later. Recent research has also implicated the presence of high arches (pes cavus) as contributing to over-pronation and abnormally high medial longitudinal arches were detected in 18.7% of athletes screened at the 2005 Summer Games and 10.5% of athletes screened at the 2009 Summer Games.

Statistically significant associations were found between the age of athletes and a range of biomechanical conditions. The prevalence of over-pronation was highest amongst younger athletes screened at the 2005 and 2009 Summer Games. Over-pronation was detected in 70.8% of athletes aged between 8-17 years compared to 50% of athletes aged between 35-50

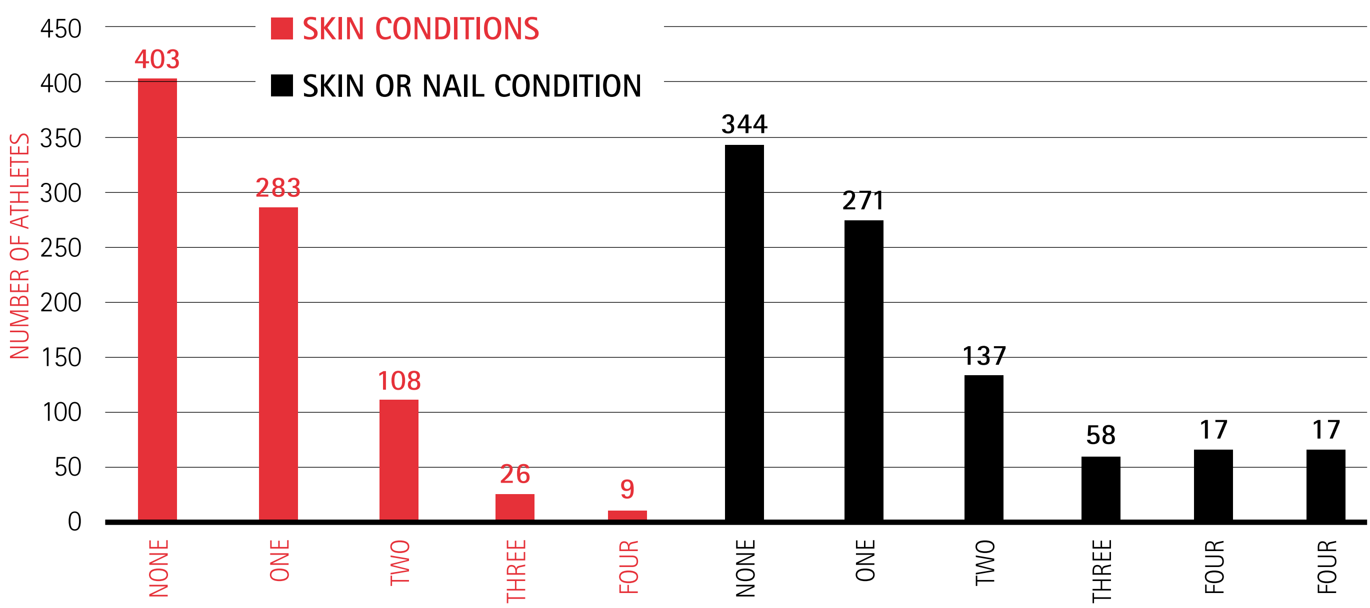


Figure 26 The number of skin and skin or nail conditions detected in athletes screened at the 2009 Summer Games

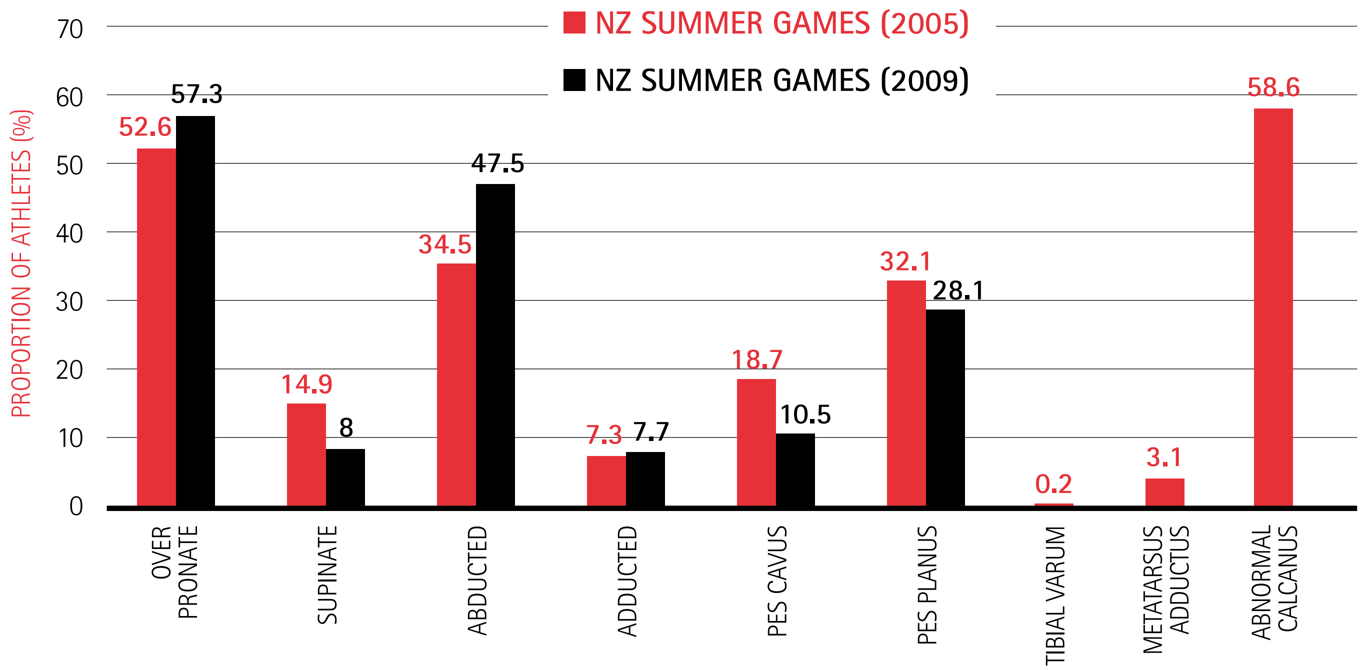


Figure 27 Foot and leg conditions detected in athletes screened at the 2005 and 2009 Summer Games

years screened at the 2009 Summer Games with a similar trend observed at the 2005 Summer Games. In both years the prevalence of over-pronation was higher in athletes aged under 51 years. Conversely, supination was more likely to be detected in older athletes. Athletes aged over 50 years were four times more likely to exhibit supination than athletes aged between 8-17 years, both at the 2005 and 2009 Summer Games. The prevalence of pes cavus (flat feet) also increased as athletes aged, with an association between age and the likelihood an athlete would present with flat feet found for athletes screened at the 2005 Summer Games.

Analysis of athlete gait also revealed a high incidence of abduction amongst athletes. Abduction occurs when the foot and leg are laterally rotated away from the midline of the body, and was detected in 34.5% of athletes screened at the 2005 Summer Games and 47.5% of athletes screened at the Summer Games four years later.

An abnormal orientation of the rear foot was detected in approximately three out of every five athletes for whom data was available following screening at the 2009 Summer Games. Calcaneal deformities were detected in the right heel of 291 of 454 athletes for whom data was available and the left heel of 297 athletes. Athletes were more likely to present with an outwardly angled rear foot with calcaneal valgus observed four times as frequently as calcaneal varus.

A calcaneal deformity was also more likely to be detected in female athletes. An abnormal calcaneal angulation was detected in 54.8% of male and 66.9% of female athletes for whom data was available with the association between sex and the likelihood an athlete would present with a calcaneal deformity found to be statistically significant.

An association was also found between the presence or absence of a biomedical condition and the likelihood a skin or nail condition would be detected. A skin or nail condition was detected in 62.1% (n=373) of athletes in whom one or more biomechanical abnormalities were detected and only 49.3% of athletes (n=72) with a normal gait.

5.3.3 Biomechanical conditions: Range of motion

The prevalence of an abnormal range of motion in the four joints tested in the Fit Feet screen ranged from 19.8%-31.4% of athletes screened at the 2009 Summer Games. Atypically flexed or restricted movement was observed in the ankle joint of approximately one out of every three athletes screened with female athletes (35.2%) being less likely to record a normal range of motion than male athletes (29.3%).

The frequency with which an atypical range of motion was detected in the metatarsophalangeal, subtalar or midtarsal joints consistently approximated one-quarter of athletes screened and although an abnormal range of motion was more likely to be observed in female athletes across all joint types, no association between sex and atypical joint motion was found.

The proportion of athletes who presented with an atypical range of motion in all four joint types however, consistently increased with age and statistically significant associations were found between the age of athletes screened at the 2009 Summer Games and the range of abnormal motion detected in the ankle joints.

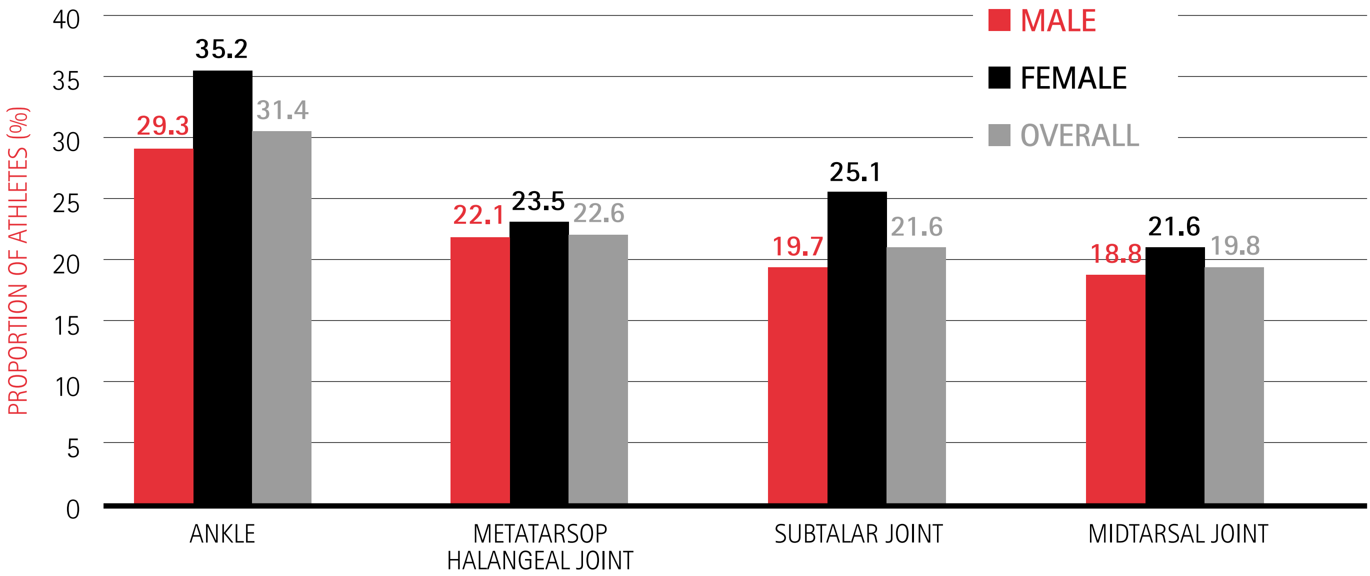


Figure 28 The proportion of male and female athletes who presented with an abnormal range of joint motion at the 2009 Summer Games

5.3.4 Athlete shoe size

As part of the final Fit Feet screen, a measurement is taken of an athlete's right and left foot and a comparison made with their shoe size to determine the appropriateness of the fit. A reliable comparison[5] could be made for the right foot of 581 athletes and left foot of 587 screened at the 2009 Summer Games. Two hundred and twenty-two athletes (38.2%) were found to be wearing shoes less than one size too big or too small for their right foot and 236 athletes (40.2%) found to be wearing shoes less than one size too big or too small for their left foot. Approximately one out of every four athletes screened, however were found to be wearing shoes on their right (22.4%) and left (24.9%) that were more than two sizes too big or small for their feet. Athletes were 2.0 times as likely to be wearing shoes that were too big for them than too small for them on their right foot and 2.6 times more likely to be wearing shoes that were too big for them than too small for them on their left foot

Female athletes were more likely to be wearing shoes that were at or beyond two sizes too big or too small than male athletes. No association was found between age and the likelihood that an athlete would be observed wearing shoes that were at or beyond two sizes too big or small for their feet either.

[5] Missing values and differences beyond 5 sizes were excluded from the analysis

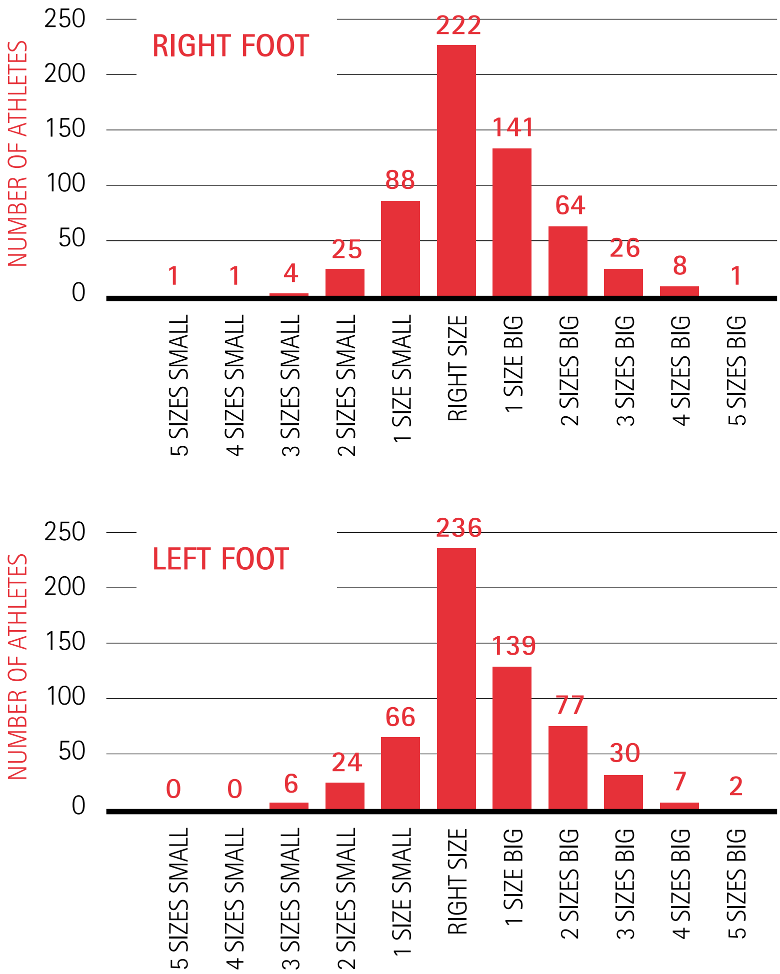


Figure 29 The difference between the measured right and left foot and actual shoe size for athletes screened at the 2009 Summer Games

6 CONCLUSION

6. Conclusion

Internationally, epidemiological studies have consistently demonstrated poorer health outcomes for children and adults who have intellectual disability. Despite general agreement that the results of these international studies are likely to be reflective of the health status and health needs of New Zealanders who have an intellectual disability, relatively few New Zealand studies have provided empirical evidence related to this issue. The current research goes some way toward addressing this gap by highlighting key findings across four health areas. The results are aligned with international research in so much as they document a high prevalence of visual, auditory, oral and podiatry health problems, and identify a cohort of athletes who experience multiple health needs. The analysis of HAS data provides an initial benchmark against which the success future Special Olympic health initiatives can be measured. The analysis can also contribute to a more comprehensive understanding of health status and health needs of New Zealanders with an intellectual disability who are not involved with Special Olympics.

While the current analysis identified specific health issues related to the visual, auditory, oral and podiatry health status and health needs of Special Olympic athletes, it also facilitated the identification of other factors that impacted on a person's health. Age emerged as an important predictor of the health status of Special Olympic athletes across all four screens. While there is general and widespread acknowledgement that people with an intellectual disability face many barriers to maintaining good health as they age, little New Zealand evidence has been available to guide policy and practice in this area.

The impact of geography was also identified as a potential predictor of a person's health outcomes in this research. Evidence of an identifiable geography to poorer health outcomes experienced by Special Olympic athletes was observed to a greater or lesser extent across all HAS screens. These results highlight the need to learn more about prevalence of health conditions and their relationship with access to affordable and culturally and disability appropriate specialist services. In New Zealand, District Health Boards (DHB's) currently are responsible for providing health and disability services. Furthermore, DHB's are expected to work to reduce health outcome disparities between various population groups within defined districts. Future analysis of Special Olympics HAS data that incorporates athlete region has the potential to contribute information relevant to the aim of reducing health disparity for people with an intellectual disability.

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8. Appendix 1

The demographic profile of athletes who completed Healthy Athlete Health screens at the 2005 and 2009 Summer Games

HAS Screen	Event Year	Male	Female	Not Recorded	Athletes (n)	Age (Min)	Age (Max)	Age (M)	Age (SD)
SOLCI Opening Eyes	2005	500	273	18	791	9	69	29.3	11.78
	2009	413	244	0	657	10	80	33.6	13.08
	Overall	914	517	18	1448	9	80	31.3	12.58
Healthy Hearing	2005	533	286	0	819	9	80	29.7	11.99
	2009	456	249	0	705	10	80	33.6	13.25
	Overall	989	535	0	1524	9	80	31.6	12.75
Special Smiles	2005	449	243	7	699	10	69	39.6	11.76
	2009	558	337	1	926	9	79	32.7	12.89
	Overall	1007	580	8	1595	9	79	31.4	12.52
Fit Feet	2005	440	241	6	687	10	63	29.2	11.19
	2009	533	297	0	830	9	79	32.9	12.88
	Overall	973	538	6	1517	9	79	31.3	12.29

The region of origin of athletes screened at the 2005 and 2009 Summer Games

	Opening Eyes		Healthy Hearing		Special Smiles		Fit Feet			
Region	2005	2009	2005	2009	2005	2009	2005	2009	Total	Prop (%)
Northland	24	21	25	24	19	37	19	33	202	4.1
Auckland	94	132	225	164	95	206	65	182	1163	23.8
Coromandel	5	12	9	12	7	17	1	16	79	1.6
Waikato	36	22	46	22	29	36	11	39	241	4.9
Bay of Plenty	5	23	23	17	14	31	5	31	149	3.1
Central Plateau	14	20	17	23	16	21	9	23	143	2.9
Hawkes Bay	19	43	22	44	9	46	12	41	236	4.8
Taranaki	31	35	36	34	31	41	15	42	265	5.4
Manawatu-Whanganui	50	91	61	111	46	128	27	80	594	12.2
Wellington	47	74	61	73	44	103	16	101	519	10.6
Nelson	10	21	12	27	7	41	3	41	162	3.3
Marlborough	13	16	15	16	11	21	7	23	122	2.5
West Coast	6	0	18	0	14	0	8	0	46	0.9
Canterbury	35	72	50	65	36	101	11	102	472	9.7
Otago	43	48	51	47	43	58	6	50	346	7.1
Southland	18	14	20	25	17	24	15	7	140	2.9
Total	450	644	691	704	438	911	230	811	4879	
International athletes	119	0	125	0	122	0	17	0	383	
Missing	222	0	1	0	139	15	440	19	863	

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