EXERCISE & SPORTS SCIENCE AUSTRALIA

The House of Representatives Standing Committee on Health, Aged Care and Sport – Parliamentary Inquiry into Diabetes

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EXERCISE & SPORTS SCIENCE AUSTRALIA (ESSA) SUBMISSION

RE: STANDING COMMITTEE ON HEALTH, AGED CARE AND SPORT – INQUIRY INTO DIABETES

The House of Representatives Standing Committee on Health, Aged Care and Sport

Dear Committee Secretariat,

Thank you for the opportunity to provide feedback in relation to the House of Representatives Standing Committee on Health, Aged Care and Sport's Inquiry into Diabetes.

Exercise & Sports Science Australia (ESSA) is the peak professional association for exercise and sports science professionals in Australia, representing more than 11,000 members comprising university qualified Accredited Exercise Physiologists, Accredited Sports Scientists, Accredited High-Performance Managers and Accredited Exercise Scientists.

Rising rates of diabetes continue to pose clinical challenges globally [1] with type 2 Diabetes (T2D) being described as a "global pandemic" [2]. The importance of exercise in the context of diabetes prevention and management is well established. There is broad scientific consensus that exercise, and expert guidance is a crucial aspect of lifestyle therapy for preventing and managing T2D [3,4] and it should be part of *every patient's* T2D management plan [5]. Exercise is also essential in managing type 1 diabetes (T1D) [6].

ESSA acknowledges that the Inquiry into Diabetes aligns with the recently released Measuring What Matters Framework – Australia's first wellbeing framework, which advocates for the importance of delivering evidence-based physical activity and clinical exercise interventions that result in health and economic outcomes [7].

This submission highlights the importance of people at risk of diabetes and those with diabetes being able to access evidence-based physical activity and clinical exercise interventions delivered by university qualified health professionals to achieve optimal outcomes [8]. Furthermore, the submission will address all the Terms of Reference with a particular focus on prevention and management.

ESSA gives permission for this submission to be published in full or in part. We welcome the opportunity to provide further detail or appear before the House of Representatives Standing Committee if invited. Please contact ESSA on 07 3171 3335 or judy.powell@essa.org.au for further information arising from the following submission.

Yours sincerely

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1.0 ABOUT ACCREDITED EXERCISE PROFESSIONALS

ESSA Accredited Exercise Physiologists (AEPs) and Accredited Exercise Scientists (AES) play a crucial role in promoting physical health, managing chronic physical and mental health conditions, and improving overall well-being through personalised exercise programs and expert guidance. They are highly trained and trusted allied health care specialists focused on helping people to prevent, respond, adapt, recover, and improve health through managed physical activity and exercise [9, 10, 11].

Our members are university degree qualified, many with higher level qualifications and all required to undertake continuing professional development to maintain their accreditation. They help people make profound changes in their lives, improving health through exercise science and expert guidance.

ESSA Exercise physiology services are recognised by Australian compensable schemes, including Medicare, the National Disability Insurance Scheme (NDIS), Department of Veterans' Affairs (DVA), workers' compensation schemes and private health insurers. Australia's exercise physiology profession comprises over 8,000 AEPs.

ESSA Exercise Scientists work in numerous sectors spanning allied health as Allied Health Assistants (AHAs); the NDIS as Therapy Assistants; personal trainers in the fitness industry; strength and conditioning coaches in sporting organisations; and as program coordinators in education and corporate health. There are close to 1000 AES working in Australia today.

The National Diabetes Services Scheme data map [12] indicates there are 1,502,620 people residing in Australia with Diabetes Mellitus, of which 3.1% have Gestational diabetes (47,210); 0.8% have "Other Type" diabetes (12,190); 9.2% have Type 1 (138,410) and 86.8 % have Type 2 (1,304,810) [12].

The engagement of AEPs in delivering services for people with diabetes is limited due to a range of factors, including poor referral from doctors and funding barriers. For example, utilisation of Medicare exercise physiology item numbers for T2D assessments (no. 81110) and group exercise (no. 81115) are low. Statistical data from MBS Online indicate that Item 81110 was used 9033 times in the last financial year meaning that less than 0.007% of people with T2D were assessed for entry into a group exercise program with an AEP. ESSA members cite issues related to referral and funding. **AEPs are an underutilised profession when it comes to treating this group and providing secondary prevention.**

2.0 SUMMARY OF RECOMMENDATIONS

Recommendation 1: Culturally informed and community led initiatives be available for Aboriginal and Torres Strait Islander people. This could include funding for Accredited Exercise Physiologists (AEPs) to provide culturally appropriate care in rural and remote communities.

Recommendation 2: AEPs and Accredited Exercise Scientists (AES) be engaged as key professionals to prevent, mitigate and manage diabetes, at the individual and societal level informing the development of strategies to reduce the overall burden of disease.

Recommendation 3: Referral mechanisms be established, and funding provided for social prescribing for AES and AEP services to reduce sedentary lifestyle, increase physical activity levels and reduce impacts of T1D and the risk of developing T2D.

Recommendation 4: AEPs and AES are funded as standard care for the prevention and management of diabetes.

Recommendation 5: MBS Assessment (no. 81110) and Group (no. 81115) item numbers are extended to enable access for people with prediabetes, Type 1 Diabetes (T1D) and gestational diabetes mellitus (GDM).

Recommendation 6: Allied health Chronic Disease item (Items 10950-1970) are increased from five (5) to 10, with the additional sessions for severe presentations.

Recommendation 7: Continuous Glucose Monitoring (CGM) devices are claimable through the MBS.

Recommendation 8: Representatives of ESSA, Australian Diabetes Educators Association and Dietitians Australia are engaged to provide formal advisory services to support the Commonwealth Government as part of a best practice multidisciplinary teams approach to diabetes prevention and management. For example, one such vehicle to enable this could be the establishment of a Diabetes Subject Matter Advisory Committee.

3.0 THE CAUSES OF DIABETES (TYPE 1, TYPE 2 AND GESTATIONAL) IN AUSTRALIA, INCLUDING RISK FACTORS SUCH AS GENETICS, FAMILY HISTORY, AGE, PHYSICAL INACTIVITY, OTHER MEDICAL CONDITIONS AND MEDICATIONS USED

Prediabetes

Family history, genetics and lifestyle factors appear to play an important role in the development of prediabetes [13]. The same factors linked to increased risk of T2D development are associated with increased risk of prediabetes. Insufficient physical activity is also a risk factor for prediabetes.

Type 1 Diabetes

T1D is caused by an autoimmune reaction, involving the destruction of insulin producing cells in the pancreas (beta cells), and resulting in an accumulation of blood sugar in the bloodstream [14]. In some individuals, there is a genetic component to T1D, however T1D can also be triggered by other factors such as viruses and environment [14]. The current scientific understanding is that lifestyle habits do not cause T1D [14].

Type 2 Diabetes

T2D was once considered to be a disease associated with older age, but now prevalence across the lifespan is increasing. In T2D, the body develops resistance to the normal effects of insulin and gradually the pancreas loses capacity to produce sufficient insulin [15]. Existing research indicates that there are both modifiable and non-modifiable risk factors, including strong genetic and family-related risk factors [15]. Lifestyle changes including dietary changes, increasing physical activity and reducing sedentary behaviour may slow or stop the progression of T2D [16]. Risk factors for T2D include overweight and obesity and insufficient physical activity [15].

Gestational Diabetes Mellitus

GDM develops in cases where the body is unable to produce sufficient insulin needed during pregnancy [17]. Risk factors for the development of GDM include being overweight, obese, and/or having a family history of diabetes [17].

Aboriginal and Torres Strait Islander Australians

Aboriginal and Torres Strait Islander Australians are four times more likely to be diagnosed with diabetes than non-Indigenous Australians [18]. Outcomes reported by the “Too Deadly for Diabetes” Indigenous Australian AEP led diabetes program are truly remarkable, with a range of participants reporting dramatic improvements in their diabetes management, overall stamina and quality of life [19].

Recommendation 1: Culturally informed and community led initiatives be available for Aboriginal and Torres Strait Islander people. This could include funding for Accredited Exercise Physiologists (AEPs) to provide culturally appropriate care in rural and remote communities.

4.0 NEW EVIDENCE-BASED ADVANCES IN THE PREVENTION, DIAGNOSIS AND MANAGEMENT OF DIABETES, IN AUSTRALIA AND INTERNATIONALLY

Prevention

Research has reported on the non-clinical dangers, including associations between physical inactivity, changes in metabolism and the development of T2D [20, 21, 22]. AES and AEP provide significant opportunity to prevent T2D and delay onset and the value of this workforce should be promoted to the public. Furthermore, AES and AEP are also well placed to facilitate social prescribing or non-clinical prescribing. Social prescribing is where doctors refer people to a range of local, non-clinical services to support their health and wellbeing. Doctors should refer to

accredited exercise professionals who can connect individuals with local community activities that increase their physical activity levels.

On average, 10-15 years of insulin resistance usually precedes a T2D diagnosis [23]. This means that there is a large window of opportunity before a person at risk of diabetes develops T2D, during which prevention initiatives, such as supervised exercise, could be delivered.

Physical activity interventions through accredited exercise professionals have high efficacy in preventing T2D. Lifestyle intervention was effective in reducing the development of T2D by up to 58% for people at risk as compared with 31% for people undergoing metformin treatment. This intervention included individualised treatment, science-based curriculum that taught behavioural self-management strategies for weight loss and physical activity, supervised sessions, adherence strategies, and extensive feedback and clinical support [24, 25, 26, 27].

Management – T1D

Systematic review and meta-analysis indicate that CGM improves glycaemic control in individuals with T1D, especially in individuals with poor glycaemic control [28]. In T1D, CGM can have significant effects on blood glucose levels [29]. In T1D, CGM can also improve patient safety and confidence when engaging in physical exercise as real time monitoring can alert the patient if hypoglycaemia is imminent [30]. Other research shows that when CGM is combined with physical activity, CGM improves scope for self-management [31]. AEPs have a significant role to play in providing guidance on safe exercise for people with T1D.

Management – T2D

Physical exercise is a crucial component for the maintenance of glycaemic control in people with T2D with exercise interventions under expert guidance providing positive results. Irregular and unsupervised training may not maintain these changes [8, 1].

AEPs use a biopsychosocial and person-centred approach to develop and deliver physical activity and clinical exercise interventions. **The work of AEPs in delivering clinical exercise treatment is also vital to mitigate the side effects of T2D medication Ozempic (Semaglutide), which has been associated with sarcopenia (muscle wastage) [32, 33].** A co-prescription of exercise (delivered by an AEP) can assist to mitigate the risk of developing these adverse effects.

Additionally, the use of wearable technologies provides feedback to people with diabetes and AES/AEP can monitor this providing advice and support. Exercise professionals assist in behavioural pathways to reduce/interrupt sedentary time with combinations of aerobic, resistance and other types of physical activity and exercise treatment. They have a role in providing personalised plans that are safe, effective, pragmatic, scalable and equitable.

Research also indicates that regular aerobic exercise training is associated with improved self-esteem and mental health among people with T2D [34].

Recommendation 2: AEPs and Accredited Exercise Scientists (AES) be engaged as key professionals to prevent, mitigate and manage diabetes, at the individual and societal level informing the development of strategies to reduce the overall burden of disease.

Recommendation 3: Referral mechanisms be established, and funding provided for social prescribing for AES and AEP services to reduce sedentary lifestyle, increase physical activity levels and reduce impacts of T1D and the risk of developing T2D.

5.0 THE BROADER IMPACTS OF DIABETES ON AUSTRALIA'S HEALTH SYSTEM AND ECONOMY

A recent systematic review of the economic benefits of physical activity interventions for T2D management found that physical activity interventions are a worthwhile investment for T2D management [35]. Four of the included studies demonstrated that **physical activity interventions were cost-saving**, six studies showed cost-

effectiveness, and two studies reported cost-utility [35]. This supports the cost effectiveness of AEP services for diabetes prevention and management.

> **"*…there is clear evidence to demonstrate that lifestyle interventions, as delivered by accredited exercise physiologists, are effective for the prevention and management of type 2 diabetes. Consequently, it is expected that there would also be substantial cost savings for individuals and society as a whole, through a reduced need for health care services and improved quality of life for people with type 2 diabetes or pre-diabetes.*" [36].**

Medicare Benefits Schedule (MBS) statistics highlights the growing demand for diabetes-related services. However, the absence of well-funded and dedicated Item Numbers for AEP services directly related to address all types of diabetes limits their integration into the diabetes care pathway. Medicare Item Numbers would encourage more AEPs to specialise in diabetes care in the primary care setting, thereby expanding the expertise available to manage this complex chronic condition. Through the provision of AEP services, prevention and delaying of the onset of diabetes-related complications would be achieved, **reducing the financial strain on the healthcare system by decreasing hospitalisations and emergency care utilisation**. The 'Measuring What Matters' statement by the Treasury emphasises the **importance of investing in preventive healthcare measures to alleviate the economic burden of chronic diseases** [7]. Recommendations in this submission align with this strategy by focusing on early intervention through AEP services, which can contribute to reduced healthcare costs and improved health outcomes.

6.0 ANY INTERRELATED HEALTH ISSUES BETWEEN DIABETES AND OBESITY IN AUSTRALIA, INCLUDING THE RELATIONSHIP BETWEEN TYPE 2 AND GESTATIONAL DIABETES AND OBESITY, THE CAUSES OF OBESITY AND THE EVIDENCE-BASE IN THE PREVENTION, DIAGNOSIS AND MANAGEMENT OF OBESITY

Overweight and obesity are established risk factors for both T2D and GDM [15, 17]. A person's risk of developing T2D is heightened by several factors including overweight or obesity, high blood pressure, insufficient physical activity, and unhealthy diet [37]. Exercise prescribed by a suitably qualified exercise professional such as an AEP, helps to reduce disease progression, improve physical function, quality of life and manage diabetes in the following ways:

1. Maintain a healthy weight
2. Make insulin work more effectively
3. Reduce your risk of heart disease
4. Lower your blood pressure
5. Reduce stress [37]

The 2017/18 National Health Survey results indicated that 35.7% of Australian adults were overweight, while 31.3% were classified as obese [38, 39]. As such obesity is a genuine health concern in Australia, specifically in relation to the prevention and management of diabetes. The role of physical activity in weight management and the prevention and management of obesity and associated comorbidities is well established [40]. Current evidence indicates that 150 to 300 minutes of moderate intensity aerobic activity per week is required to prevent weight and adiposity gain [40]. It is also noted that **physical activity has been associated with metabolic and cardiovascular health benefits irrespective of weight, and irrespective of weight change** [40].

Recommendation 4: Accredited exercise professionals <u>are funded as standard care</u> for the prevention and management of diabetes.

7.0 THE EFFECTIVENESS OF CURRENT AUSTRALIAN GOVERNMENT POLICIES AND PROGRAMS TO PREVENT, DIAGNOSE AND MANAGE DIABETES.

Opportunities exist to break down silos and improve the multidisciplinary approach to diabetes care through a variety of mechanisms including the MBS. The 2023–24 Federal Budget provides a significant $6.1 billion investment in Medicare, which represents opportunity for significant reforms.

Strong evidence has emerged to support the multidisciplinary team approach to diabetes management [41, 42, 43, 44, 45]. The Australian Diabetes Educator Association's (ADEA's) diabetes care pathways represent the gold standard in multidisciplinary diabetes care. The care pathways reflect the importance of ensuring that all people with diabetes be referred to a multidisciplinary team including Endocrinologist/Diabetes Physician, Credentialled Diabetes Educators (CDEs), AEPs and Accredited Practising Dietitians (APD). Evidence presented in a collaborative position statement released by ESSA, ADEA, Dietitians Australia (DA) and the Pharmaceutical Society of Australia (PSA) on the screening and management of prediabetes in adults in Australia further supports the ADEA diabetes pathways, particularly the merits of a multidisciplinary team approach [41].

Improved integration between members of the multidisciplinary team and across public and private settings would allow clinical practices to better support the specific needs of people with T1D, T2D and GDM. An emphasis on a collaborative approach helps to target prevention efforts at higher risk or more underserved population groups and reduce overall health care burden.

Research shows that diet and physical activity interventions are more effective when delivered together, than when delivered as separate offerings [46]. Research has demonstrated the benefits of physical exercise in the context of chronic disease management, however **physical activity advice is often a neglected component of care** [47]. AEPs specialise in the provision of clinical exercise support in the context of complex chronic conditions such as T2D and as such, can provide supervised and safe exercise training to people with T2D [47].

ESSA corroborate the points proffered in the submission by ADEA, which asserts that the current limit of five (5) chronic disease MBS rebated visits per calendar year is grossly insufficient and there is a need to increase the number of allied health visits claimable via MBS beyond the current limit of five (5), to 10 as standard, and to make additional sessions accessible for severe presentations. **People with diabetes that are high risk are understood to need access to a minimum of 17 allied health appointments annually. The current MBS assessment item number (no. 81110) and group exercise item number (no. 81115) is only accessible for people with T2D. This needs to be accessible for people with all diabetes diagnoses, including T1D, people with prediabetes and potentially people with GDM.**

Sustained AEP engagement is highly predictive of patient outcomes (once a patient ceases attending AEP sessions, their progress stagnates) [8]. Currently people with T2D have access to eight (8) group exercise sessions per year through MBS item number 81115 and this presents a case for an increase in the number of group exercise sessions accessible via the MBS. Investment is required in prediabetes services, including education and support for self-management. ESSA members would welcome the opportunity to engage in formal advisory work, to support the federal and state governments as part of a best practice multidisciplinary teams' approach to diabetes prevention and management.

Recommendation 5: MBS Assessment (no. 81110) and Group (no. 81115) item numbers are extended to enable access for people with prediabetes, Type 1 Diabetes (T1D) and gestational diabetes mellitus (GDM).

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8.0 CONCLUSION

ESSA acknowledges that this inquiry represents a valuable opportunity to evaluate the scope and trajectory of diabetes prevention and management in Australia, informed by multidisciplinary perspectives with the view to improving health outcomes for individuals and communities. From a policy perspective, access, affordability and availability are three key issues. This includes availability of affordable health services and removal of financial barriers to access.

In summary:

- Engagement of Accredited Exercise Professionals in the prevention and management of diabetes is low.
- Diabetes Mellitus is a complex condition requiring a multidisciplinary care team approach, within which AEPs, CDEs and APDs provide an essential service.
- Given that overweight and obesity are established risk factors for both T2D and GDM, physical exercise interventions are a vital part of diabetes prevention and management approaches, due to evidenced physical and mental health benefits.
- Better funding for and expansion of Medicare Item Numbers for AEP services associated with diabetes to include prediabetes, T1D and GDM in addition to T2D would increase AEP workforce engagement, strengthen multidisciplinary care teams and enhancing health outcomes for Australians. Given that there is generally a 10-15 year period during which insulin resistance precedes T2D diagnosis, MBS options for prediabetes and social prescribing are particularly important.
- Additional sessions in the MBS per year for allied health as well as for Aboriginal and Torres Strait Islander people are also recommended.

9.0 ACKNOWLEDGEMENT OF CONTRIBUTORS

Dimitri Batras, Brendan Bond, Prof. Jeff Coombes, Dr. Emily Cox, Ali Curtis, Dr. Paddy Dempsey, Prof. David Dunstan, Emily Foenander, Devlin Higgins, Dr. Shelley Keating, Scott Quigg.

10.0 REFERENCES

1. Aloke, C., Egwu, C. O., Aja, P. M., Obasi, N. A., Chukwu, J., Akumadu, B. O., Ogbu, P. N., & Achilonu, I. (2022). Current Advances in the Management of Diabetes Mellitus. Biomedicines, 10(10), 2436. https://doi.org/10.3390/biomedicines10102436

2. Tan, E., Khoo, J., Gani, L.U., Malakar, R.D. Tay, T.L., Tirukonda, S.P., Kam, J.W., Tin, A.S. & Tang, T.Y. (2019). Effect of multidisciplinary intensive targeted care in improving diabetes mellitus outcomes: a randomized controlled pilot study – the Integrated Diabetes Education, Awareness and Lifestyle modification in Singapore (IDEALS) Program. Trials, 20, 549. https://doi.org/10.1186/s13063-019-3601-3

3. Zahalka SJ, Abushamat LA, Scalzo RL, et al. The Role of Exercise in Diabetes. [Updated 2023 Jan 6]. In: Feingold KR, Anawalt B, Blackman MR, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK549946

4. Centres for Disease Control (CDC). (2022a). Get Active! Retrieved from: https://www.cdc.gov/diabetes/managing/active.html#:~:text=If%20you%20have%20diabetes%2C%20being,heart%20disease%20and%20nerve%20damage

5. Williams A, Radford J, O'Brien J, Davison K. Type 2 diabetes and the medicine of exercise: The role of general practice in ensuring exercise is part of every patient's plan. Australian Journal of General Practice. 2020 Apr;49(4):189-193. https://doi.org/10.31128/ajgp-09-19-5091.PMID: 32233344.

6. Riddell MC, Gallen IW, Smart CE, Taplin CE, Adolfsson P, Lumb AN, et al. Exercise management in type 1 diabetes: A consensus statement. Lancet Diabetes Endocrinol (2017) 5(5):377–90. https://doi.org/10.1016/s2213-8587(17)30014-1

7. Commonwealth of Australia. (2023). Measuring What Matters. Retrieved from: Measuring What Matters Statement | Treasury.gov.au

8. Gajanand, T., Keating, S. E., Brown, W. J., Hordern, M. D., Fassett, R. G., & Coombes, J. S. (2020). Comparing the Efficacy of Supervised and Unsupervised Exercise Training on Glycaemic Control in Type 2 Diabetes: A Systematic Review. Current diabetes reviews, 16(6), 570–579. https://doi.org/10.2174/1573399815666190212120404
9. Exercise and Sport Science Australia (ESSA). (2022a). Retrieved from : https://www.essa.org.au/Public/Public/Professional_Standards/ESSA_Scope_of_Practice_documents.aspx
10. Exercise & Sports Science Australia, Accredited Exercise Physiologist Scope of Practice. 2021.
11. Exercise & Sports Science Australia, Accredited Exercise Scientist Scope of Practice. 2022.
12. National Diabetes Services Scheme. (NDSS). (2023). Diabetes Map. Retrieved from: https://map.ndss.com.au/#!/
13. Mayo Foundation for Medical Education and Research (MFMER) (2022). Prediabetes. Retrieved from: https://www.mayoclinic.org/diseases-conditions/prediabetes/symptoms-causes/syc-20355278
14. Centres for Disease Control (CDC). (2022b). What is Type 1 Diabetes? Retrieved from: https://www.cdc.gov/diabetes/basics/what-is-type-1-diabetes.html#:~:text=What%20Causes%20Type%201%20Diabetes,years%20before%20any%20symptoms%20appear.
15. Australian Institute of Health and Welfare. (2023). Diabetes: Australian Facts. Retrieved from: https://www.aihw.gov.au/reports/diabetes/diabetes/contents/diabetes-risk-factors
16. Diabetes Australia. (2022). Type 2 diabetes. Retrieved from: https://www.diabetesaustralia.com.au/about-diabetes/type-2-diabetes/
17. National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). (2017). Symptoms & Causes of Gestational Diabetes. Retrieved from: https://www.niddk.nih.gov/health-information/diabetes/overview/what-is-diabetes/gestational/symptoms-causes
18. Exercise & Sports Science Australia, (ESSA). (2015a). Managing Diabetes in Aboriginal & Torres Strait Islander populations. Exercise Right. Retrieved from: https://exerciseright.com.au/managing-diabetes-aboriginal-torres-strait-islander-populations/
19. Too Deadly for Diabetes. (n.d.). Too Deadly for Diabetes. Retrieved from: https://toodeadlyfordiabetes.com.au/
20. Le Roux, E., De Jong, N.P., Blanc, S., Simon, C., Bessesen, D.H. and Bergouignan, A. (2022), Physiology of physical inactivity, sedentary behaviours and non-exercise activity: insights from the space bedrest model. J Physiol, 600: 1037-1051. https://doi.org/10.1113/JP281064
21. Hamburg, N. M., McMackin, C. J., Huang, A. L., Shenouda, S. M., Widlansky, M. E., Schulz, E., Gokce, N., Ruderman, N. B., Keaney, J. F., Jr, & Vita, J. A. (2007). Physical inactivity rapidly induces insulin resistance and microvascular dysfunction in healthy volunteers. Arteriosclerosis, thrombosis, and vascular biology, 27(12), 2650–2656. https://doi.org/10.1161/ATVBAHA.107.153288
22. Pinto, A. J., Bergouignan, A., Dempsey, P. C., Roschel, H., Owen, N., Gualano, B., & Dunstan, D. W. (2023). The physiology of sedentary behavior. Physiological Reviews. https://doi.org/10.1152/physrev.00022.2022
23. Freeman, A.M., Pennings, N. (2022). Insulin Resistance. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK507839/
24. Hordern, M. D., Dunstan, D. W., Prins, J. B., Baker, M. K., Singh, M. A., & Coombes, J. S. (2012). Exercise prescription for patients with type 2 diabetes and pre-diabetes: a position statement from Exercise and Sport Science Australia. Journal of science and medicine in sport, 15(1), 25–31. https://doi.org/10.1016/j.jsams.2011.04.005
25. National Institute of Diabetes and Digestive and Kidney Diseases. (2022). Diabetes Prevention Program (DPP). Retrieved from: https://www.niddk.nih.gov/about-niddk/research-areas/diabetes/diabetes-prevention-program-dpp
26. Diabetes Australia. (2021). Position Statement: Type 2 diabetes remission, A.D.E.A. Australian Diabetes Society, Editor. Diabetes Australia.
27. Diabetes Prevention Program (DPP) Research Group (2002). The Diabetes Prevention Program (DPP): description of lifestyle intervention. Diabetes care, 25(12), 2165–2171. https://doi.org/10.2337/diacare.25.12.2165
28. Teo, E., Hassan, N., Tam, W. & Koh, S. (2022).Effectiveness of continuous glucose monitoring in maintaining glycaemic control among people with type 1 diabetes mellitus: a systematic review of randomised controlled trials and meta-analysis. Diabetologia, 65, 604–619. https://doi.org/10.1007/s00125-021-05648-4
29. Diabetes Victoria. (2023). Physical activity for type 1 diabetes. Retrieved from: https://www.diabetesvic.org.au/Physical-activity
30. Houlder, S. K., & Yardley, J. E. (2018). Continuous Glucose Monitoring and Exercise in Type 1 Diabetes: Past, Present and Future. Biosensors, 8(3), 73. https://doi.org/10.3390/bios8030073
31. Cox, D. J., Banton, T., Moncrief, M., Conaway, M., Diamond, A., & McCall, A. L. (2020). Minimizing Glucose Excursions (GEM) With Continuous Glucose Monitoring in Type 2 Diabetes: A Randomized Clinical Trial. Journal of the Endocrine Society, 4(11), bvaa118. https://doi.org/10.1210/jendso/bvaa118
32. Ida, S., Kaneko, R., Imataka, K., Okubo, K., Shirakura, Y., Azuma, K., Fujiwara, R., & Murata, K. (2021). Effects of Antidiabetic Drugs on Muscle Mass in Type 2 Diabetes Mellitus. Current diabetes reviews, 17(3), 293–303. https://doi.org/10.2174/1573399816666200705210006
33. Zhang, X., Zhao, Y., Chen, S., & Shao, H. (2021). Anti-diabetic drugs and sarcopenia: emerging links, mechanistic insights, and clinical implications. Journal of cachexia, sarcopenia and muscle, 12(6), 1368–1379. https://doi.org/10.1002/jcsm.12838
34. Gilani, S. R. M., & Feizabad, A. K. (2019). The effects of aerobic exercise training on mental health and self-esteem of type 2 diabetes mellitus patients. Health psychology research, 7(1), 6576. https://doi.org/10.4081/hpr.2019.6576

35. Barbosa, A., Whiting, S., Ding, D., Brito, J., & Mendes, R. (2022). Economic evaluation of physical activity interventions for type 2 diabetes management: a systematic review. European journal of public health, 32(Suppl 1), i56–i66. https://doi.org/10.1093/eurpub/ckac074
36. Exercise & Sports Science Australia (ESSA) (2015b). Value of Accredited Exercise Physiologists in Australia. Deloitte Access Economics Pty Ltd. Retrieved from: https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-value-exercise-physiologists-Australia.pdf
37. Exercise & Sports Science Australia, (ESSA). (2021). Exercise Right for type 2 diabetes – Movement is medicine! Retrieved from: Exercise Right for type 2 diabetes – Movement is medicine! (essa.org.au)
38. Australian National Preventive Health Agency (ANPHA). State of Preventive Health 2013. Report to the Australian Government Minister for Health. Canberra; 2013
39. Australian Bureau of Statistics. National Health Survey: First Results Canberra 2014–15. Available from: http://www.abs.gov.au/ausstats/abs@.nsf/mf/4364.0.55.001
40. Johnson, N.A., Sultana, R.N., Brown, W.J., Bauman, Gill, T. (2021). Physical activity in the management of obesity in adults: A position statement from Exercise and Sport Science Australia. Journal of Science and Medicine in Sport, 24 (12). Pp. 1245-1254, ISSN 1440-2440, https://doi.org/10.1016/j.jsams.2021.07.009
41. Bell, K., Shaw, J. E., Maple-Brown, L., Ferris, W., Gray, S., Murfet, G., Flavel, R., Maynard, B., Ryrie, H., Pritchard, B., Freeman, R., & Gordon, B. A. (2020). A position statement on screening and management of prediabetes in adults in primary care in Australia. Diabetes research and clinical practice, 164, 108188. https://doi.org/10.1016/j.diabres.2020.108188
42. Bain, S.C., Cummings, M.H., McKay, G.A. (2019). Multidisciplinary Approach to Management and Care of Patients with Type 2 Diabetes Mellitus. European Medical Journal, 7(1), 73-81. https://doi.org/10.33590/emjdiabet/10314374
43. Taïeb, A., Gaëlle, L., Roxane, D., Perrine, W., Marion, A., Fleur, B., Zoé, L., Aurélie, L., Solen, D., Patricia, D., & Véronique, A. (2022). Efficiency of a multidisciplinary team care approach through a short hospitalization of patients with poorly controlled diabetes mellitus: a 12 months prospective monocentric study. The Pan African medical journal, 41, 192. https://doi.org/10.11604/pamj.2022.41.192.23965
44. Tan, H. Q. M., Chin, Y. H., Ng, C. H., Liow, Y., Devi, M. K., Khoo, C. M., & Goh, L. H. (2020). Multidisciplinary team approach to diabetes. An outlook on providers' and patients' perspectives. Primary care diabetes, 14(5), 545–551. https://doi.org/10.1016/j.pcd.2020.05.012
45. Abdulrhim, S., Sankaralingam, S., Ibrahim, M.I.M., Diab, M.I., Hussain, M.A.M., Raey, H.A., Ismail, M.T., Awaisu, A. (2021). Collaborative care model for diabetes in primary care settings in Qatar: a qualitative exploration among healthcare professionals and patients who experienced the service. BMC Health Services Research, 21, 192. https://doi.org/10.1186/s12913-021-06183-z
46. Jakicic, J.M., Rogers, R.J., Davis, K.K., Collins, K.A. (2018). Role of Physical Activity and Exercise in Treating Patients with Overweight and Obesity. Clinical Chemistry, 64(1). p. 99-107. https://doi.org/10.1001/jama.2016.12858
47. Soan, E. J., Street, S. J., Brownie, S. M., & Hills, A. P. (2014). Exercise physiologists: essential players in interdisciplinary teams for noncommunicable chronic disease management. Journal of multidisciplinary healthcare, 7, 65–68. https://doi.org/10.2147