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Lessons from obesity prevention for the prevention of mental disorders: the primordial prevention approach

Joshua Hayward^{1*}, Felice N Jacka², Elizabeth Waters³ and Steven Allender¹**Abstract**

Background: Emerging evidence supports a relationship between risk factors for obesity and the genesis of the common mental disorders, depression and anxiety. This suggests common mental disorders should be considered as a form of non-communicable disease, preventable through the modification of lifestyle behaviours, particularly diet and physical activity.

Discussion: Obesity prevention research since the 1970's represents a considerable body of knowledge regarding strategies to modify diet and physical activity and so there may be clear lessons from obesity prevention that apply to the prevention of mental disorders. For obesity, as for common mental disorders, adolescence represents a key period of vulnerability. In this paper we briefly discuss relationships between modifiable lifestyle risk factors and mental health, lifestyle risk factor interventions in obesity prevention research, the current state of mental health prevention, and the implications of current applications of systems thinking in obesity prevention research for lifestyle interventions.

Summary: We propose a potential focus for future mental health promotion interventions and emphasise the importance of lessons available from other lifestyle modification intervention programmes.

Keywords: Obesity prevention, Common mental disorders, Prevention, Intervention design, Complex intervention, Systems

Background

The common mental disorders (CMDs) depression and anxiety, are now presenting as major global public health problems. Recent burden of disease studies have attributed as much as 7.4% of global disability adjusted life-years to mental and behavioural disorders, with 2.5% attributable to major depressive disorder (MDD) alone [1]. Although a matter of some contention, the available data suggest an increase in the prevalence of CMDs [2], particularly in young people [3,4]. Importantly, recent evidence from large-scale prospective cohort studies suggest that physical inactivity and unhealthy diet, are related to the genesis of the CMDs [5-8].

The World Health Organization (WHO) framework for the causes of noncommunicable disease (NCD) proposes

that physical inactivity and unhealthy diet are among the key modifiable lifestyle risk behaviours that underlie most NCD's [9]. Recently, there has been an increasing focus on the potential for, and importance of, taking a preventive approach to mental disorders [10] and authors have suggested that programs which also view CMDs as lifestyle-informed NCDs, with population-level lifestyle modification components, may be useful in the prevention of CMDs [11]. In order to elucidate lessons for future CMD prevention, this commentary briefly discusses the relationships between modifiable lifestyle risk factors and CMDs, characteristics of successful preventive approaches to obesity that are of relevance to the prevention of mental disorders, and the role of systems thinking in strengthening lifestyle risk factor interventions.

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Discussion

Modifiable lifestyle risk factors and common mental disorders

Since 2009 emerging literature has demonstrated the importance of diet quality to the CMDs [11,12]. For example, the most recent meta-analysis in this field has reported a 30% reduction in the risk for depression in those with high adherence to a Mediterranean dietary pattern (RR = 0.68, 95% CI = 0.54–0.86), [13] while a 'healthy' diet pattern is also associated with a reduced likelihood of depression (OR: 0.84; 95% CI: 0.76, 0.92) [14]. Although dietary data to date have been largely observational in nature, a recent large-scale European intervention supports the contention that targeting dietary improvement can prevent some cases of CMDs [15]. Knowledge regarding the contribution of physical inactivity to depression risk has also increased; a recent systematic review with 30 included studies concluded that physical activity was negatively associated with a risk of subsequent depression [16]. Individual studies show that as little as 10–29 minutes of daily physical activity may be adequate to reduce relative risk of clinical depression in women (RR = 0.9; 95% CI: 0.84 - 0.96) [7]. A recent review by Sarris et al. [17] examined in detail the evidence for the use of lifestyle modification as a clinical treatment strategy for depression. The report concluded that physical activity, diet, and a range of other lifestyle factors (including mindfulness-based meditation, sleep regulation, social interaction and others) show clear relevance not only for the clinical management of depression, but also for potential population-level mental health promotion. These findings support the contention that diet and physical activity are shared risk factors for many physical and mental disorders and suggest that targeting lifestyle behaviours may be an effective strategy in the prevention of mental disorders.

Modifiable lifestyle risk factors in obesity prevention

Obesity prevention research now has a 25-plus year history of targeted lifestyle behaviour interventions, beginning in the 1980's [18]. The "core" of the obesity problem has long been conceptualised as the result of prolonged energy imbalance, driven by the same lifestyle risk factors discussed in relation to CMD above (physical inactivity and unhealthy nutrition). Recently, obesity prevention research has begun to understand the complex nature of the relationships and interdependencies between physical inactivity and unhealthy nutrition, concluding that these behaviours can be resistant to change if targeted in isolation [19]. Recent work in the obesity prevention field therefore provides valuable insights into how CMD prevention may similarly target these lifestyle risk factors and in this paper we examine this in relation to a particularly high risk time of development; that of adolescence.

Waters et al. [20] have reviewed the childhood obesity prevention intervention literature focusing on studies including controlled designs since 1997. The most recent update included 55 obesity interventions that took place between 1993 and 2010. The review located 8 interventions which specifically targeted 13–18 year olds, and reported that all programs targeted physical activity outcomes, and that six of the eight targeted a range of nutrition-related targets. Several studies within this subgroup reported significant increases in the measured lifestyle outcomes, with three studies reporting significant dietary improvements [21–23] and five studies reporting increased indicators of physical activity [21,24–27], however in some interventions these effects were not sustained over time [23].

Some key limitations were noted within these studies. The majority of the evidence reviewed was derived from interventions with short-term funding, based on strategies that optimally require long-term funding support for effect longevity (school-based programs requiring direct funding from investigators, etc.). Accordingly, the overall effectiveness of these interventions was modest (–0.15 (95% CI –0.21, –0.09) BMI-z points, [20]). Leaders in obesity prevention suggest these modest results reflect a failure to anticipate the complexity of drivers of population lifestyle behaviours, the potential plasticity of risk factors when addressed in isolation, and post-intervention effect dropoff. The review noted that the most promise seems to lie with programs which comprehensively target multiple risk factors, coupled with psychosocial support and environmental change [20].

A second theme emerging from obesity prevention is the Community Capacity Building (CCB) approach, an innovative method of developing sustainable skills, resources, and organisational structure, around a shared health promotion goal, within the community itself [28]. This approach addresses complex, interrelated risk factors by using broad community engagement to tailor intervention approaches to the specific set of social and environmental circumstances that exist within that community.

There have been recent interventions drawing on this framework, including the "It's Your Move" (IYM) project in the Barwon South-West region of Victoria, Australia [29]. The intervention focussed on community engagement to foster flexible intervention strategies across multiple community sectors and organisational levels. The program was deemed to have successfully reduced overweight and obesity in adolescents, and although some nutritional behaviours remained unchanged, the program did observe increases in active transport in the intervention group [29]. Recent analysis suggested that schools which had large increases in readiness for change throughout the intervention demonstrated significant BMI decreases at followup [30].

Complex interventions in CMD prevention

The importance of taking complex, multi-component approaches to prevention is also increasingly recognised in CMD research. A review by Weare and Nind highlighted several characteristics of successful school-based mental health promotion programmes, finding that universal programmes, which are embedded within the school curriculum and culture, as well as build teacher capacity and knowledge, and involve the wider community, have demonstrated a wide range of benefits to children's mental health, social, and educational outcomes [31].

An Australian example of this approach was the Gatehouse Project, a group randomised trial employed to address risky health behaviours and improve emotional well-being in secondary school aged children [32]. This approach embedded strategies within the school curriculum to improve students' emotional management and interpersonal communication skills, while promoting inclusiveness within the classroom. This intervention was successful in reducing risky health behaviours, including substance use and antisocial behaviours. Although this intervention was not successful in directly reducing students' symptoms of emotional problems [33], the complex strategies employed to achieve improvements in risky health behaviours in this study have been adopted widely around the globe in both high and low income settings. Existing observational data on Australian adolescents supports the contention that using such multi-component, integrated strategies to address lifestyle-related behaviours may result in positive benefits for mental health outcomes in this age group [5,34].

The systems perspective: new frameworks for working at scale

As understanding of the complexity of lifestyle risk factor interventions has increased, prevention science is observing a gradual shift from individual risk-factor approaches, through multiple risk-factor approaches, community capacity and multi-level approaches, to a recent emphasis on systems thinking as a framework for addressing complexity.

The systems perspective acknowledges not only the existence of the multiple causal factors which drive complex health problems, but highlights their interrelated and "dynamic" associations as an important consideration for any intervention program [35]. Systems thinking has gained some traction in obesity research, being highlighted as the underpinning theory behind population level intervention programmes in Victoria, Australia [36]. The lack of significant inroads into preventing either obesity or CMDs in adolescence supports the need for an alternate approach more able to deal with these complex drivers.

Summary

A systems perspective, which posits that complex problems lack simple or obvious solutions, shows that prevention efforts must be based in a deeper understanding of the dynamic complexity of modifiable lifestyle risk-factors [19,35]. Current complex, multi-component approaches to CMD prevention have had mixed success but show promise for further development. To capitalise on lessons learned from the obesity prevention sphere, significant collaboration with existing complex population-level lifestyle interventions appears critical.

Abbreviations

BMI: Body mass index; CCB: Community capacity building; CMD: Common mental disorder; CVD: Cardio vascular disease; DALY: Disability adjusted life year; IYM: It's your move; MDD: Major depressive disorder; NCD: Non communicable disease; NHANES: National Health and Nutrition Examination Survey; WHO: World Health Organization.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

JH, conceived the paper, composed the initial drafts, oversaw drafting and editing of contributions from other authors and managed the MS to submission. SA, FJ & EW contributed to subsequent drafts and provided expert knowledge in the fields of NCD, CMD and KT & E respectively. All authors read and approved the final manuscript.

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References

1. Murray CJL, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, Ezzati M, Shibuya K, Salomon JA, Abdalla S, Aboyans V, Abraham J, Ackerman I, Aggarwal R, Ahn SY, Ali MK, Alvarado M, Anderson HR, Anderson LM, Andrews KG, Atkinson C, Baddour LM, Bahalim AN, Barker-Collo S, Barrero LH, Bartels DH, Basáñez MG, Baxter A, Bell ML, Benjamin EJ, et al: Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21

- regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012, **380**(9859):2197–2223.
2. Fu TS, Lee CS, Gunnell D, Lee WC, Cheng AT: **Changing trends in the prevalence of common mental disorders in Taiwan: a 20-year repeated cross-sectional survey.** *Lancet* 2013, **381**(9862):235–241.
 3. Collishaw S, Maughan B, Goodman R, Pickles A: **Time trends in adolescent mental health.** *J Child Psychol Psychiatr* 2004, **45**(8):1350–1362.
 4. Twenge JM, Gentile B, DeWall CN, Ma D, Laceyfield K, Schurtz DR: **Birth cohort increases in psychopathology among young Americans, 1938–2007: A cross-temporal meta-analysis of the MMPI.** *Clin Psychol Rev* 2010, **30**(2):145–154.
 5. Jacka FN, Kremer PJ, Berk M, de Silva-Sanigorski AM, Moodie M, Leslie ER, Pasco JA, Swinburn BA: **A prospective study of diet quality and mental health in adolescents.** *PLoS One* 2011, **6**(9):e24805.
 6. Akbaraly TN, Brunner EJ, Ferrie JE, Marmot MG, Kivimaki M, Singh-Manoux A: **Dietary pattern and depressive symptoms in middle age.** *Br J Psychiatry* 2009, **195**(5):408–413.
 7. Lucas M, Mekary R, Pan A, Mirzaei F, O'Reilly EJ, Willett WC, Koenen K, Okereke OI, Ascherio A: **Relation between clinical depression risk and physical activity and time spent watching television in older women: a 10-year prospective follow-up study.** *Am J Epidemiol* 2011, **174**(9):1017–1027.
 8. Sánchez-Villegas A, Delgado-Rodríguez M, Alonso A, Schlatter J, Lahortiga F, Serra Majem L, Martínez-González MA: **Association of the mediterranean dietary pattern with the incidence of depression: the seguimiento universidad de navarra/university of navarra follow-up (sun) cohort.** *Arch Gen Psychiatry* 2009, **66**(10):1090–1098.
 9. World Health Organization: **Global status report on noncommunicable diseases.** In *WHO Library Cataloguing-in-Publication Data*. Edited by Alwan A. Geneva: WHO Press; 2010.
 10. Jacka FN, Reavley NJ, Jorm AF, Toumbourou JW, Lewis AJ, Berk M: **Prevention of common mental disorders: what can we learn from those who have gone before and where do we go next?** *Aust NZ J Psychiatr* 2013, **47**(10):920–929.
 11. Jacka FN, Mykletun A, Berk M: **Moving towards a population health approach to the primary prevention of common mental disorders.** *BMC Med* 2012, **10**(1):149–154.
 12. Jacka FN, Ystrom E, Brantsaeter AL, Karevold E, Roth C, Haugen M, Meltzer HM, Schjølberg S, Berk M: **Maternal and early postnatal nutrition and mental health of offspring by age 5 years: a prospective cohort study.** *J Am Acad Child Adolesc Psychiatry* 2013, **52**(10):1038–1047.
 13. Psaltopoulou T, Sergentanis TN, Panagiotakos DB, Sergentanis IN, Kostis R, Scarmeas N: **Mediterranean diet, stroke, cognitive impairment, and depression: a meta-analysis.** *Ann Neurol* 2013, **74**(4):580–591.
 14. Lai JS, Hiles S, Bisquera A, Hure AJ, McEvoy M, Attia J: **A systematic review and meta-analysis of dietary patterns and depression in community-dwelling adults.** *Am J Clin Nutr* 2014, **99**(1):181–197.
 15. Sánchez-Villegas A, Martínez-González M, Estruch R, Salas-Salvadó J, Corella D, Covas M, Arós F, Romaguera D, Gómez-Gracia E, Lapetra J, Pintó X, Martínez JA, Lamuela-Raventós RM, Ros E, Gea A, Wärnberg J, Serra-Majem L: **Mediterranean dietary pattern and depression: the PREDIMED randomized trial.** *BMC Med* 2013, **11**(1):208.
 16. Mammen G, Faulkner G: **Physical activity and the prevention of depression: a systematic review of prospective studies.** *Am J Prev Med* 2013, **45**(5):649–657.
 17. Sarris J, O'Neil A, Coulson C, Schweitzer I, Berk M: **Lifestyle medicine for depression.** *BMC Psychiatry* 2014, **14**(1):107.
 18. Glenny AM, O'Meara S, Melville A, Sheldon TA, Wilson C: **The treatment and prevention of obesity: a systematic review of the literature.** *Int J Obes (Lond)* 1997, **21**(9):715–737.
 19. Finegood DT, Merth TDN, Rutter H: **Implications of the foresight obesity system map for solutions to childhood obesity.** *Obesity (Silver Spring, Md)* 2010, **18**(Suppl 1):S13–S16.
 20. Waters E, de Silva-Sanigorski A, Hall BJ, Brown T, Campbell KJ, Gao Y, Armstrong R, Prosser L, Summerbell CD: **Interventions for preventing obesity in children.** *Cochrane Database Syst Rev* 2011, **(12)**:CD001871.
 21. Haerens L, Deforche B, Maes L, Cardon G, Stevens V, De Bourdeaudhuij I: **Evaluation of a 2-year physical activity and healthy eating intervention in middle school children.** *Health Educ Res* 2006, **21**(6):911–921.
 22. Ebbeling CB, Feldman HA, Osganian SK, Chomitz VR, Ellenbogen SJ, Ludwig DS: **Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: a randomized, controlled pilot study.** *Pediatrics* 2006, **117**(3):673–680.
 23. Singh AS, Paw MJ, Brug J, van Mechelen W: **Short-term effects of school-based weight gain prevention among adolescents.** *Arch Pediatr Adolesc Med* 2007, **161**(6):565–571.
 24. Pate RR, Ward DS, Saunders RP, Felton G, Dishman RK, Dowda M: **Promotion of physical activity among high-school girls: a randomized controlled trial.** *Am J Public Health* 2005, **95**(9):1582–1587.
 25. Peralta LR, Jones RA, Okely AD: **Promoting healthy lifestyles among adolescent boys: the Fitness Improvement and Lifestyle Awareness Program RCT.** *Prev Med* 2009, **48**(6):537–542.
 26. Patrick K, Calfas KJ, Norman GJ, Zabinski MF, Sallis JF, Rupp J, Covin J, Cella J: **Randomized controlled trial of a primary care and home-based intervention for physical activity and nutrition behaviors: PACE + for adolescents.** *Arch Pediatr Adolesc Med* 2006, **160**(2):128–136.
 27. Webber LS, Catellier DJ, Lytle LA, Murray DM, Pratt CA, Young DR, Elder JP, Lohman TG, Stevens J, Jobe JB, Pate RR, TAAG Collaborative Research Group: **Promoting physical activity in middle school girls trial of activity for adolescent girls.** *Am J Prev Med* 2008, **34**(3):173–184.
 28. Waters E (Ed): *Preventing childhood obesity: evidence, policy and practice.* Chichester, West Sussex; Hoboken, NJ: Wiley-Blackwell: BMJ Books; 2010.
 29. Millar L, Kremer P, de Silva-Sanigorski A, McCabe MP, Mavoja H, Moodie M, Utter J, Bell C, Malakellis M, Mathews L, Roberts G, Robertson N, Swinburn BA: **Reduction in overweight and obesity from a 3-year community-based intervention in Australia: the 'It's Your Move!' project.** *Obes Rev* 2011, **12**:20–28.
 30. Millar L, Robertson N, Allender S, Nichols M, Bennett C, Swinburn B: **Increasing community capacity and decreasing prevalence of overweight and obesity in a community based intervention among Australian adolescents.** *Prev Med* 2013, **56**(6):379–384.
 31. Weare K, Nind M: **Mental health promotion and problem prevention in schools: what does the evidence say?** *Health Promot Int* 2011, **26**(Supplement 1):i29–i69.
 32. Patton GC, Glover S, Bond L, Butler H, Godfrey C, Pietro GD, Bowes G: **The Gatehouse Project: a systematic approach to mental health promotion in secondary schools.** *Aust NZ J Psychiatr* 2000, **34**(4):586–593.
 33. Bond L, Patton G, Glover S, Carlin JB, Butler H, Thomas L, Bowes G: **The Gatehouse Project: can a multilevel school intervention affect emotional wellbeing and health risk behaviours?** *J Epidemiol Commun H* 2004, **58**(12):997–1003.
 34. Jacka FN, Kremer PJ, Leslie ER, Berk M, Patton GC, Toumbourou JW, Williams JW: **Associations between diet quality and depressed mood in adolescents: results from the Australian Healthy Neighbourhoods Study.** *Aust NZ J Psychiatr* 2010, **44**(5):435–442.
 35. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M: **Developing and evaluating complex interventions: the new Medical Research Council guidance.** *Int J Nurs Stud* 2013, **50**(5):587–592.
 36. Victorian State Government: *Strengthening Victoria's prevention system.* Melbourne: Department of Health; 2014.

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