



Mass sporting and physical activity events are they bread and circuses or public health interventions to increase population levels of physical activity ?

Journal:	<i>Journal of Physical Activity & Health</i>
Manuscript ID:	draft
Manuscript Type:	Article
Date Submitted by the Author:	n/a
Keywords:	epidemiology, health promotion, physical activity, sport

powered by ScholarOne
Manuscript Central™

Mass sporting and physical activity events – are they “bread and circuses” or public health interventions to increase population levels of physical activity ?

Niamh M Murphy ^{1,2}, Adrian Bauman ²

¹ Department of Health, Sport and Exercise Science, School of Health Sciences,
Waterford Institute of Technology, Waterford, Ireland

² Centre for Physical Activity and Health, level 2 Medical Foundation Building K25,
School of Public Health, University of Sydney, Level 2 Medical Foundation Building,
NSW 2006, Australia

Key words: public health, mass events, evaluation, physical activity

Date of submission: 25th November 2005

Abstract word count: 135 words

Body of text word count: 4,075 words

Correspondence to:

Adrian Bauman, Centre for Physical Activity and Health, School of Public Health,
University of Sydney, Level 2 Medical Foundation Building, NSW 2006, Australia

Phone: 61 2 90363247

Fax: 61 2 90363184

e-mail: adrianb@health.usyd.edu.au

1 **Abstract**

2 Background: Large-scale, one-off sporting or physical activity events are often thought to
3 impact population physical activity levels. This paper reviews the evidence and explores
4 the nature of the effect.

5 Methods: A search of the published and grey literature was conducted to July 2005 using
6 relevant databases and web sources. Personal contacts yielded additional data. Impacts
7 are described at the individual, societal and community, and environmental levels.

8 Results: Few quality evaluations have been conducted. While mass sporting events
9 appear to influence physical activity related infrastructure, there is scant evidence of
10 impact on individual participation at the population level. There is some evidence that
11 events promoting active transport can positively affect physical activity.

12 Conclusions: The public health potential of major sporting and physical activity events is
13 often cited, but evidence for public health benefit is lacking.

15 **Introduction**

16

17 Large scale, one-off sporting events, ranging from global, elite “mega-events”, such as
18 the Olympic Games, to participatory “mass events”, such as city road races, are often
19 thought to have an impact on the physical activity behavior of the host population, or, in
20 the case of major media events, populations world wide. Anecdotally, there is a
21 perception that mega- events create euphoria amongst populations which translates into
22 motivation and enthusiasm for being active.

23

24 In the case of mega-events, the legacy of increased physical activity participation is often
25 quoted in the bidding process. For example, the 2012 Olympics in London will,
26 according to the candidate file of the recent successful bid, “inspire a new generation to
27 greater sporting activity and achievement, helping to foster a healthy and active nation”
28 (1). Newspaper reports following the Sydney Olympic Games claimed a “rising of the
29 couch potatoes” (2). If such effects do indeed occur, then the potential public health
30 impact of major sporting events may be considerable.

31

32 In the health promotion field, community-wide physical activity events are used to
33 encourage populations to adopt more active lifestyles, e.g. walk/ bike to school/ work
34 days, or activity events such as “Agita Galera” in Brazil(3). Considerable resources are
35 often targeted at such strategies, both in developed and developing countries (4). This
36 review explores the evidence for effects of these major events on population physical
37 activity.

38

39 **Scope of the review**

40

41 For the purpose of this review, an “event” is included if it is short-term, discrete, and
42 organized, rather than a longer term purposive communications campaign (5). Three
43 other event reviews examined sports development (6), travel-related campaigns and travel
44 behavior (7) and a recent review of the effectiveness of health-promotion events (8). The
45 latter review did include two physical activity-related media campaigns, which were
46 excluded in our review. The majority of the data presented in our paper were not
47 included in any of the previous review papers.

48

49 Our review focuses on identifying evidence for two categories of sporting event as well
50 as for health promotion events. These include:

- 51 i. elite sporting events, such as the Olympic Games, or World Cup soccer or rugby,
52 which have worldwide appeal and media coverage. The population is involved
53 primarily as spectators in such events.
- 54 ii. non-elite sports participants, such as mass city road races and biking events. Here,
55 the appeal of the event lies in its potential for community-wide participation.
- 56 iii. major health promotional events designed to increase physical activity behavior
57 amongst the population, such as Walk or Ride to Work Days.

58

59 A plethora of smaller events have been implemented by health professionals to promote
60 physical activity, e.g. health screening days, or “try it” days. These are generally targeted
61 at smaller population segments or communities and are omitted from this review.

62

63 **Measuring the impact of major events on physical activity**

64

65 Major events may result in community changes at many levels. For example, new
66 sporting facilities or improved existing facilities and improved transport access are
67 usually a tangible infrastructural legacy. Less tangible are the regularly cited societal and
68 community benefits, such as civic pride, social cohesion, and a strengthening of
69 community volunteerism (6, 9). Coaching or volunteer expertise is a human resource
70 which may enable physical activity involvement, and also build the capacity of
71 communities (6). The use of major sporting events to consolidate the national sporting or
72 physical activity identity or culture is also mentioned.

73

74 At the individual level, the primary measure of interest is physical activity participation
75 prior to, and following, the event. Less robust antecedent measures such as “intention to
76 be physically active” should also be considered. For the purposes of this review, a broad
77 view of physical activity has been adopted.

78

79 Theoretically, mass events might be an opportunity to increase awareness about the
80 benefits of moderate-intensity physical activity, and could be used to encourage
81 populations to trial the behavior or to access newly constructed facilities. Only a few
82 mass events are underpinned by specific behavior change theories (10). Few theories
83 have been proposed for mass sporting events, except perhaps the suggestion that elite
84 high profile events and athletic role models may have a “trickle down” effect on general
85 community participation (11, 12). Most of the support for this hypothesis is anecdotal.

86 Alternatively, elite events may have a “discouragement effect”, as people in the general
87 population see that level of performance as unattainable for them (13).

88

89 At the community level, the impact of major events is sometimes described in terms of
90 enhanced community spirit, civic pride, or social cohesion. This includes greater
91 volunteerism, an increased collective sporting identity or physical activity culture. It is
92 hypothesized that major events might encourage community sentiment which might be a
93 potential mediator of future physical activity involvement. At the environmental level,
94 availability of, and access to facilities is an influence on physical activity behavior (14).
95 The most tangible legacy of major sporting events is infrastructure development, which
96 might improve physical environments to support population level physical activity.

97

98 **Methods**

99

100 A search of the published literature was conducted using the SportsDiscus, Pubmed,
101 CINAHL, PsycInfo, Dissertation Abstracts, ISI Web of Science, Journals@Ovid and
102 Cochrane databases. Keywords were combinations of the following search terms:-
103 physical activity and/or sport and/or exercise or Olympics or Games; mega, mass, or
104 special event or campaign; health and/or health promotion; participation; population;
105 evaluation or impact; walk, cycle, active commuting. Sports agency, event, health
106 promotion and government websites were examined, as well as physical activity-related
107 conference abstracts for 2005. Personal contact was made with government agencies
108 responsible for sports development and evaluation, with university research centers in the

109 UK, Canada and Australia, and with directors of major sporting events to capture relevant
110 evaluations of a sports or activity-related nature.

111

112 **Effects of major events on physical activity-Individual level**

113

114 **Major Sporting Events**

115 In spite of the claims commonly made by mega-event organisers regarding post-event
116 increases in population physical activity or sporting involvement (1), few evaluations of
117 this nature have been conducted, and fewer still have been published.

118

119 National annual monitoring of physical activity was carried out each year in November in
120 Australia ; these telephone based surveys of representative population samples, were
121 compared before and after the September 2000 Olympic Games in Sydney (15). There
122 was no change in the proportion meeting the US Surgeon General recommended
123 guidelines for physical activity following the Olympics. The data, expressed as
124 continuous minutes of physical activity, also did not change.

125

126 Over the same time period, the Australian Bureau of Statistics carried out sport and
127 recreation participation surveys (13). These representative household surveys reported
128 quarterly on “any physical activity or sports participation in organized or unorganized
129 activity”. Survey responders recalled participation in any activities or sport in the
130 previous 12 months. The rates of ‘any participation in sport and physical activities’
131 declined from 59% of all adults in the August and November 1998 surveys, to 56 and

Mass events and population physical activity 8

132 54% in 1999, and 49 and 51% respectively in August and November 2000. There were
133 slight increases from August to November 2000 for females (44 to 47% participated)
134 compared to males (53.8 to 55%) but since both of these were reports of 12 month period
135 prevalences, the data are best compared with the same months in the previous year, and
136 were lower in 2000 than in 1999 and 1998. These data do not point to evidence for a
137 ‘trickle down’ effect or a ‘discouragement effect’ in the general population.

138

139 It appears that only one other evaluation directly measured population physical activity
140 post-event. Face to face interviews in 2002 and one year later in 2003 with a
141 representative cross-section of 3600 local adults showed that the Manchester
142 Commonwealth Games had no impact on participation in sports activities, which
143 excluded walking, 4+ times in the last 4 weeks, or at least once in the last 12 months (16).

144

145 Another outcome measure might be the numbers of adults and children enrolling in
146 sporting clubs resulting from mass events. Following the 1992 Winter Olympics
147 (Albertville) and Summer Olympics (Barcelona), officials from 35 clubs across 6
148 Olympic sports in Christchurch, New Zealand were surveyed as well as national sports
149 organizations (11). Of 35 clubs, 24 indicated that club membership numbers had not
150 increased as a result of the Games, and 6 indicated that they had experienced an increase
151 in membership enquiries. The 1994 soccer World Cup finals in the USA reportedly
152 increased soccer club membership substantially in that country (17). The U.S. Youth
153 Soccer Association reported that in the follow-up to the World Cup its membership

154 increased by 9% to 2.1 million, and the American Youth Soccer Association reported that
155 their membership increased by 14% to half a million.

156

157 There were reports in the popular press in Australia following the Sydney Olympics
158 regarding the “rising of the couch potatoes” (2); this report described interviews with
159 senior executives and sports development officers who attested that sports associations
160 enquiries and membership had increased. No objective data were reported to verify this
161 anecdotal observation.

162

163 Recently, Sport Scotland assessed the Scottish women’s curling teams 2002 Winter
164 Olympic gold medal (18). A range of quantitative and qualitative surveys suggested that
165 visits to ice rinks for curling increased by 6% between 2001/02 and 2002/03, while club
166 membership increased by 3%. This is a low prevalence sport, so did not impact
167 population physical activity levels.

168

169 **Mass participation events**

170 There is a paucity of research on the impact of mass participation sporting events on
171 subsequent sport and physical activity involvement. Some events, such as the London or
172 Boston Marathons, for example, are heavily over-subscribed. The London marathon
173 draws spectator numbers in the range of 300,000 to 500,000 and television coverage is
174 sold to over 100 countries (19), so it is possible that the event may have a wide impact. It
175 is likely that participants are selected, as those who participate are already at least
176 somewhat active prior to the event.

177

178 Of more public health potential is the recent observation that marathons and road races
179 have attracted an increased percentage of walkers (close to 40% of participants in the
180 Honolulu Marathon, for example, walk the event) which suggests that such events are not
181 just for the fittest segment of the population and have mass reach potential. There are no
182 evaluations which have assessed pre-event PA patterns, or tracked the post-event physical
183 activity involvement of participants.

184

185 **Health promotion events**

186 Considering the long-term existence of mass physical activity events in health promotion,
187 there is a surprising dearth of evaluative studies. Recently, evaluation data have been
188 reported following mass events designed to promote active travel. For example,
189 Australia's Walk to Work Day event was evaluated amongst a randomly sampled
190 population-based cohort of 1100 adults in Australia's major metropolitan areas (20).
191 Changes from pre-post campaign in total minutes spent walking increased by 16
192 min/week among employed participants ($p < .05$) and by 21 min/week among passive
193 commuters (i.e. no active transport habitually used). There was no significant change in
194 vigorous physical activity.

195

196 Another paper by the same research group evaluated the effect of Walk Safely to School
197 Day (WSTSD) among New South Wales (NSW) elementary schoolchildren (21). The
198 number of participating schools increased (from 2001 to 2004), i.e. 496, 717, 708 and 751
199 respectively. In 2002 a telephone survey was conducted during the 2 weeks following the

200 event with randomly selected eligible households (912 eligible households, 812
201 interviewed, 89% response rate). At a population level, WSTSD increased the prevalence
202 of walking to school by 6.8%. Thus, WSTSD had a small short-term behavioral effect on
203 children who did not normally walk to school, consistent with findings from the adult-
204 targeted Walk to Work Day campaign described previously (20).

205

206 The participation of Canadian schools in International Walk to School Day on October 8th
207 2003 was evaluated by Go for Green (22). A total of 1,932 schools registered in 2003,
208 which was an increase on 1,432 in 2002 and 1,082 in 2001. Limited evaluation data on
209 individual-level participation was collected among participating schools.

210

211 In Switzerland, car-free human powered mobility (HPM) events have taken place since
212 2000, with a total of 220,000 participants counted at 7 events in 2004 (23). An evaluation
213 was undertaken at 3 events in 2004 and between 37% and 82% participated for the first
214 time. Amongst those who were insufficiently active, 30.1% indicated a likelihood of
215 walking or cycling more in daily life. Amongst those who had participated in earlier
216 events, 53.5% reported that this had motivated them to become more active.

217

218 Another Australian active commuting event, the Ride to Work Day in Victoria in 2004,
219 has been evaluated (10). In 2004, registered participation reached 5,577 (60% male, 40%
220 female), an increase of 66% from the previous year and a 296% increase over two years.
221 In 2003 and 2004, 16.4% and 22%, respectively, were first time riders. A survey of

Mass events and population physical activity 12

222 registered first time participants 5 months after Ride to Work Day 2003 demonstrated that
223 23% were still riding to work (the Ride to Work and Beyond! Project) (10).

224

225 One other small-scale evaluation was the California Bike Commute Week (24). It is the
226 largest event of it's kind in the U.S. , with 25,000 participants, and 35% first-time riders
227 to work. According to the website, 70% of these first time riders will continue to bike to
228 work, but no there are no details of the methodology used. Other events encouraging
229 cycling may attract those who already cycle and are sufficiently active for health (25, 26).

230

231 **Mass health promotion events**

232 Several mass single-day health promotion events target physical activity behavior change.
233 For the most part, such events are embedded within broader campaigns, with multiple
234 strategies and community-wide initiatives. This is true also of developing countries:-
235 mass events are used as a component of the national physical activity promotion strategy
236 in the Philippines, Malaysia, Fiji, Thailand and Brazil (4). One good example is the Agita
237 Galera (active community day), the largest event in the Agita Sao Paulo communitywide
238 physical activity program (27). It is a yearly mega-event. The major assessment is
239 through the population reach of the initiative, with over 6000 public elementary and high
240 schools and more than 6 million children involved. The program is comprised of a group
241 discussion about the importance of physical activity, followed by a 30 min walk to a
242 neighborhood open space. The event is supported by school PE committees, manuals,
243 posters, banners, a web site and other resources, and it attracts large amounts of unpaid
244 media. An evaluation of physical activity behavior change has been conducted in one

245 school (28) , but this was in response to a year-long initiative and not to the one-off Agita
246 Galera day.

247

248 **Effect of major events on physical activity-Societal and Community level**

249 Whilst environmental legacies are the most obvious post-event benefit, there may be
250 social and community benefits following major events. Such benefits might include skill
251 development within communities, increased social interaction and social capital, or the
252 development of physical activity or sporting “culture” (9). The 1988 Winter Olympics in
253 Calgary were cited where a feeling of civic pride and social cohesion was reported by
254 citizens (9). In theory, volunteer programs might attract new people into sport or physical
255 activity, and contribute to social regeneration and social capital (29), but data from
256 Manchester indicate that the program attracted mostly Caucasian volunteers (92%) who
257 already were active (30).

258

259 Communities may benefit from the associated physical activities that often take place
260 around major events. Passport 2k was an activity program for young people which
261 capitalized on Manchester’s hosting of the Commonwealth Games in 2002 (31). Passport
262 2k targeted 11-15 year olds from disadvantaged communities across the north west,
263 usually offering 2 weeks of activities during the summer holiday period. By 2003,
264 programs were operating in 16 areas across the north west, involving 5,390 young people.
265 Young people were signposted from the summer activities onto permanent programs in
266 their local community. According to the post games report (32) curriculum packs were
267 sent to 33,000 schools, and 95 schools participated in further coaching initiatives.

268

269 Major sporting events are often regarded as a showcase for the sporting prowess of a
270 host nation, and a chance to consolidate the national sporting identity or culture (33).
271 Thus, the potential of major events to consolidate the sporting or physical activity culture
272 is worth considering, although no attempts have been made to measure it.

273 Sugden and Tomlinson (17) reviewed the impact of the 1994 soccer World Cup finals
274 upon contemporary USA sports culture and “space”. They utilized a multi-method
275 approach including survey databases, media representation of the sport, participant
276 observation, and sponsorship data. The authors described how soccer culture reached
277 “only partially and unevenly into the sports cultures and space of the USA”(p.255), and
278 the authors concluded that the impact of the successful USA staging upon USA sports
279 culture and upon soccer itself was minimal.

280

281 According to Waitt (34) “euphoric mass consciousness” was generated amongst
282 Sydneysiders before and during the 2000 Olympic Games, and a sense of belonging to a
283 national and Sydney “community” was the most commonly expressed reward from
284 hosting the Games. No details are given on the methodology used for obtaining the
285 qualitative data quoted, and there is no evidence whether these feelings translated into a
286 longer-term impact on any physical activity-related behaviors. Waitt described the impact
287 on collective identity, emotion and consciousness. He likened the Games to the ancient
288 Roman formula of “bread and circuses” where social unrest was controlled by providing
289 the public with appropriate sites, signs and symbols. Again, no measures to indicate
290 changes in population levels of collective identity were provided.

291

292 Effect of major events on physical activity at the environmental level

293 The long term benefits or residual effects of hosting a major event are frequently referred
294 to as the “legacies” from the event. The most common types of legacies are physical
295 facilities, supporting infrastructure and financial resources. Brown (35) analysed how the
296 winter Olympics enriched community legacies for recreational open space in selected
297 European and American Olympic sites. In general, the recreational infrastructure of the
298 areas studied had been improved and had been a catalyst for other important
299 improvements. The legacy of the 2002 Commonwealth Games in Manchester lies mainly
300 in facilities and supporting transport infrastructure which has been developed (36, 37).
301 Interviews with major stakeholders identified these new facilities as being amongst the
302 key benefits (38). Similarly, following the 1988 Winter Olympics in Calgary, 21% of
303 Calgarians (400 interviewees) cited the Olympic facilities as one of the key benefits for
304 citizens and the city (39). The infrastructural legacy of hosting the 1999 Rugby World
305 Cup for Wales, and Cardiff were the Millenium Stadium, the accelerated development of
306 transport services and pedestrian improvements in the city centre, and a redevelopment of
307 the river walk area adjacent to the stadium (40). An historical perspective by Chalkley
308 and Essex (41) confirms that the infrastructural legacy, both in terms of sporting
309 facilities, and urban development and transport, has been experienced by most host cities
310 of major events.

311

312 There have been no analyses of the post-event impact of these environmental changes on
313 the subsequent physical activity participation of host communities. Data on facility usage

Mass events and population physical activity 16

314 following the Manchester 2002 Commonwealth Games appear to provide the only proxy
315 measure of post-event population physical activity. In the first year of operation at the
316 Aquatics Centre, some half million swimming sessions were sold, exceeding the
317 anticipated target by about 10% (32). Sixteen schools were using Sportcity facilities
318 under the school sport coordinator project in 2003(37).

319

320 Brown (42) has highlighted that the creation of new stadia does not necessarily deliver
321 expected economic and social benefits. New infrastructure can antagonize and alienate
322 communities as well as benefit them, and there is no guarantee that the money could not
323 be better spent elsewhere. The development of major sporting facilities may also draw
324 funding away from smaller projects in communities or schools (43). Overall, resident
325 satisfaction in Manchester with provision of, and access to, recreation and leisure
326 facilities and services, including children's play areas and parks/green spaces, increased
327 greatly between 1999 and post-Games in 2002. The elite athletic facility, Sportcity, has
328 reportedly played an important role in enabling local people to access leisure and
329 recreational facilities (43).

330

331 **Discussion**

332

333 Our search indicated that there is much rhetoric but limited evidence that major or mass
334 sporting events impact physical activity participation at the individual, community or
335 environmental level. This concurs with the Whitelaw and Watson review of events and
336 campaigns in the wider health promotion field (8) . There are some good examples of

337 evaluations of travel behavior change (20, 21), and these have demonstrated a small but
338 positive event effect on physical activity. Evaluations of the impact of major sporting
339 events on physical activity behavior are scarce, and suggest either a modest effect (13), or
340 no effect (15) on physical activity behavior. There are some data investigating whether
341 major events had an effect on sporting club membership, but methodologies have
342 generally been poor. There is better evidence of the environmental infrastructure
343 development resulting from major sporting events, but, with the exception of evaluations
344 following the Manchester 2002 Commonwealth Games, no data supporting the
345 translation of greater facility provision. There are limited data suggesting an impact of
346 major events at the community or societal level in terms of human resources, community
347 programs, volunteer programs and capacity building (9, 37). Mass events are usually
348 assessed in terms of the economic impact of the event itself with a piecemeal and
349 fragmentary approach to research and analysis with some attention to tourism-related
350 image of the event host, urban regeneration and community pride (19, 44-46). Although
351 benefits and costs are incurred immediately and over the longer term, evaluations are
352 usually short-term (45).

353

354 The problem may be a lack of coordination between the sport sector organizers of these
355 mass events and public health decision makers. Even if major events had the potential to
356 make a difference, they generally have failed to engage with the health sector to take the
357 opportunity to promote the moderate intensity physical activity message. The ancillary
358 media attention and community focus could also have been channeled into improving

Mass events and population physical activity 18

359 public awareness about physical activity and health, in both developed and developing
360 countries (47).

361

362 The myriad of claims by hosts of major sporting events about the physical activity-related
363 spin-offs for host populations need to be considered with caution. There are undoubtedly
364 methodological difficulties in measuring the impact of major events on physical activity
365 outcomes, but such designs, as with the evaluation of any mass campaign, are possible
366 and can provide reasonable evidence for specific intervention effects (48).

367

368 It may be that the primary agenda of mass sporting events is not a serious public health
369 opportunity, and that events are more in the arena of short term public entertainment, as
370 'bread and circuses', rather than a missed public health opportunity. Although some civic
371 infrastructure results, this has not been shown to relate to population physical activity
372 levels. No examples from mass events, with shared interagency planning and a clear
373 public health agenda can be identified to counter this view.

374

375 Whenever mass events might have had some impact on physical activity, the event has
376 been embedded in a broader, strategic developmental approach, e.g. the Manchester 2002
377 Commonwealth Games (37), and Bike to Work (10) or Walk to Work or School days (20,
378 21). Such events use an interagency planning approach, including public health input and
379 direct consideration of community physical activity. Organized and well resourced inter-
380 agency campaigns, supported by community-wide programs, coherent policies and
381 facilitative environments may be required to increase participation levels (49). Similarly,

382 Coalter (29) has suggested that the 2012 Olympic Games in London may act as a catalyst
383 within a broader social strategy (including changing outcomes such as public attitudes,
384 government investment in schools, and developing local infrastructure). It would require
385 direct commitment to evaluate this approach, and clear epidemiological designs to
386 evaluate all of these outcome variables at the population level.

387

388 Given the considerable claims made by the hosts of some major events regarding an
389 impact on population physical activity or sports participation and hence, a contribution to
390 a broader health or social agenda, and the effort which is invested by professionals in, for
391 example, active travel events, it is imperative that a greater evidence base support the
392 effectiveness of such an approach. The public health potential of mass participation
393 events for physical activity promotion remains to be realized. If we are to move beyond
394 'bread and circuses', future events should plan for integrated physical activity and sport-
395 related events, and invest in research that provide a much better evidence base that
396 currently exists for this approach.

397

For Peer Review

15 References

16

17 1. London 2012 Candidate File. Available at

18 [www.london2012.org/en/news/publications/Candidate file/](http://www.london2012.org/en/news/publications/Candidate_file/). Accessed November 15th

19 2005

20 2. Gordon D, Hart J. The rising of the couch potatoes. *Adelaide Advertiser* 2001; 32.

21 3. Matsudo SM, Matsudo VR, Andrade DR, et al. Physical activity promotion:

22 experiences and evaluation of the Agita Sao Paulo Program using the ecological model.

23 *JPAH* 2004;1:81-97.

24 4. WHO. Review of best practice in interventions to promote physical activity in

25 developing countries. KOBE2. Beijing; 2005 24-27 October 2005.

26 5. Cavill N, Bauman A. Changing the way people think about health enhancing

27 physical activity - do mass media campaigns have a role ? *J Sports Sci* 2004;22:771-90.

28 6. Brown A, Massey, J. The impact of major sporting events. The sports

29 development impact of the Manchester 2002 Commonwealth Games: initial baseline

30 research. London: UK Sport; 2001.

31 7. Rose G. Event based behaviour change: a literature review focusing on transport

32 applications: Institute of Transport Studies, Monash University; 2003 16 May 2003.

33 8. Whitelaw S, Watson, J. Whither health promotion events? A judicial approach to

34 evidence. *Health Educ Res* 2005;20(2):214-25.35 9. Ritchie JRB. Turning 16 days into 16 years through Olympic legacies. *Event*36 *Management* 2000;6:155-65.

37 10. Bicycle Victoria. Ride to Work Day 2004 Post-event report; 2005.

- 38 11. Hindson A, Gidlow, B., Peebles, C. The "trickle-down" effect of top-level sport:
39 myth or reality? A case-study of the Olympics. *Aus J Leisure Recreation* 1994;4(1):16-
40 24.
- 41 12. Hogan K, Norton K. The 'price' of Olympic gold. *J Sci Med Sport* (Belconnen,
42 ACT) 2000;3(2):203-18.
- 43 13. Vanden Heuvel A, Conolly L. The impact of the Olympics on participation in
44 Australia: trickle down effect, discouragement effect or no effect?: National Centre for
45 Culture and Recreation Statistics, Australian Bureau of Statistics, Adelaide, SA; 2001.
- 46 14. Bauman AE, Sallis JF, Dzewaltowski DA, Owen N. Toward a better
47 understanding of the influences on physical activity. The role of determinants, correlates,
48 causal variables, mediators, moderators and confounders. *Am J Prev Med* 2002;23(2S):5-
49 14.
- 50 15. Bauman A, Ford I, Armstrong T. Trends in population levels of reported physical
51 activity in Australia 1997, 1999 and 2000.: Australian Sports Commission; 2001.
- 52 16. MORI. The sports development impact of the Commonwealth Games 2002-post-
53 Games research. Research Study conducted for UK Sport in Greater Manchester,
54 Blackburn, Congleton and Liverpool: MORI; 2004.
- 55 17. Sugden J, Tomlinson, A. What's left when the circus leaves town? An evaluation
56 of World Cup USA 1994. *Sociology Sport J* 1996;13:238-58.
- 57 18. sportscotland. Curling success and its impact on participation. Edinburgh:
58 sportscotland; 2004.
- 59 19. Coleman R. Flora London Marathon 2000-the economic legacy. *J Hospitality*
60 *Tourism Mgt* 2003;10 (Supplement):51-73.

- 61 20. Merom D, Miller, Y., Lymer, S., Bauman, A. Effect of Australia's Walk to Work
62 Day Campaign on Adults' Active Commuting Behavior. *Am J Health Prom*
63 2005;19(3):159-62.
- 64 21. Merom D, Rissel, C., Mahmic, A., Bauman, A. Process evaluation of the New
65 South Wales Walk Safely to School Day. *Health Prom J Aus* 2005;16(2):100-6.
- 66 22. Go for Green. International Walk to School Day Summary Report: Go for Green,
67 Canada; 2003.
- 68 23. Martin-Diener E, Ackermann G, Dey C, Leupi D. First results about the potential
69 of car-free HPM-events in Switzerland to reach less active individuals. In: *Walk21*
70 *Satellite Symposium on Transport-related Physical Activity and Health Satellite*
71 *Symposium to the 6th International Conference on Walking in the 21st century; 2005*
72 *September 18-20 2005; Magglingen, Switzerland: Swiss Federal Office of Sports; 2005.*
- 73 24. California Bike Commute Week. Available at (www.calbike.org). Accessed Sept
74 27th 2005
- 75 25. McManus A, Smith J, McManus J, MacDonald E. Evaluation of the Department
76 of Planning and Infrastructure's Bikewest: "Bike to Work Breakfast" 2004: Western
77 Australian Centre for Health Promotion Research, Curtin University of Technology;
78 2004.
- 79 26. McManus A, McManus J, MacDonald E, MacDonald M. Evaluation of the
80 Department of Planning and Infrastructure's Bike to Work Breakfast 2005: Western
81 Australian Centre for Health Promotion Research, Curtin University of Technology;
82 2005.

Mass events and population physical activity 6

- 83 27. Matsudo SM, Matsudo, V.R., Andrade, D.R., Araujo, T.L., Andrade, E.,
84 deOliveira, L., Braggion, G. The Agita Sao Paulo Program as a model for using physical
85 activity to promote health. *Pan Am J Pub Health* 2003;14(4):265-72.
- 86 28. Matsudo V, Andrade, D., Matsudo, S., Arango, T., Andrade, E., Figueira, A.,
87 Oliveira, L. Impact of a community-school intervention program on physical activity
88 behavior of male and female adolescents. *Med Sci Sports Exerc* 1999;31(5
89 Supplement):S272.
- 90 29. Coalter F. London 2012: a sustainable sporting legacy? In: Mean M, Tims C,
91 Vigor A, eds. *After the Goldrush: a sustainable Olympics for London*. London: ippr and
92 Demos; 2004.
- 93 30. International Centre for Research and Consultancy for the Tourism and
94 Hospitality Industries. Sports development impact of the Commonwealth Games: study
95 of volunteers (pre-games). London: UK Sport; 2003.
- 96 31. Passport 2k. Available at: www.gameslegacy.com. Accessed Sept 6th 2005
- 97 32. Cambridge Policy Consultants. The impact of the Manchester 2002
98 Commonwealth Games. Final report. Manchester: Manchester City Council; 2002.
99 Available at: www.gameslegacy.com. Accessed Sept 6th 2005
- 100 33. The Sports Factor. The Sports Factor: Radio National, Australian Broadcasting
101 Corporation; 2000.
- 102 34. Waitt G. A critical examination of Sydney's 2000 Olympic Games. In: Yeoman
103 Iea, ed. *Festival and events management: an international arts and culture perspective*.
104 Oxford: Butterworth Heinemann; 2004:391-408.

- 105 35. Brown JA. How the winter Olympics enrich community legacies for open
106 recreational space. Logan, Utah: Utah State University; 2003.
- 107 36. Fauber Maunsell, Vision Consulting, Roger Tyms and Partners. Commonwealth
108 Games Benefits Study: final report to the North West Development Agency; 2004.
109
- 110 37. Manchester 2002 Commonwealth Games Available at: www.gameslegacy.com.
111 Accessed 23rd August 2005
- 112 38. Spring C. The social impact of regeneration. *Recreation* 2003(July/August):36-8.
- 113 39. Ritchie JRB, Lyons, M. Olympulse VI: A post-event assessment of resident
114 reaction to the XV Olympic Winter Games. *J Travel Research* 1990;23(3):14-23.
- 115 40. Jones C. Mega-events and host-region impacts: determining the true worth of the
116 1999 rugby world cup. *Int J Tourism Res* 2001;3:241-51.
- 117 41. Chalkley B, Essex S. Urban development through hosting international events: a
118 history of the Olympic Games. *Planning Perspectives* 1999;14:369-94.
- 119 42. Brown A. Who wins when stadiums come to town? *Regeneration and Renewal*
120 2001;23 November.
- 121 43. Newby L. The extent to which the Commonwealth Games accelerated the social,
122 physical, and economic regeneration of East Manchester [MSc dissertation]; 2003.
- 123 44. Hiller HH. Assessing the impact of mega-events: a linkage model. *Current Issues*
124 *in Tourism* 1998;1(1):47-57.
- 125 45. Clarke A. Evaluating mega-events: a critical review. In: The impact and
126 management of tourism-related events; 3rd DeHaan Tourism Management Conference;
127 2004; Nottingham University Business School: Tourism and Travel Research Institute,
128 Nottingham University Business School; 2004.

- 129 46. Sherwood P. Triple bottom line evaluation of special events: does the rhetoric
130 reflect reporting?: Victoria University; 2005.
- 131 47. Bauman A, Craig C. The place of physical activity in world health - policy
132 reflections on the WHO Global Strategy on Diet and Physical Activity. *Int J Behav Nutr*
133 *Phys Act* 2005;2(1):10.
- 134 48. Bauman A, Smith B. Evaluation of mass media campaigns for physical activity.
135 *Eval Prog Planning* 2006;in press.
- 136 49. Bauman A, Bellew B, Owen N, Vita P. Impact of an Australian mass media
137 campaign targeting physical activity in 1998. *Am J Prev Med* 2001;21:41-7.
- 138
- 139