Funding
This research was supported by a Career Development Award [NIH FIC 1K01TW008200-01A1] and the UNC Social Science Research on HIV/AIDS in China Program [NIH NICHD R24 HD056670-01].

References

Football matches and acute cardiac events: potential effects of a complex psychosocial phenomenon on cardiovascular health
From VIKTOR ĆULIĆ1,2

1Division of Cardiology, Department of Internal Medicine, University Hospital Split, Split, Croatia and 2Split University School of Medicine, Split, Croatia

Correspondence to: Division of Cardiology, Department of Internal Medicine, University Hospital Split, Šoltanska 1, 21000 Split, Croatia. E-mail: viktor.culic@st.t-com.hr

Football is a highly popular sport in many countries worldwide. Debate about the association of acute cardiovascular events with watching thrilling football matches goes on. In the latest contribution, Barone-Adesi et al.1 reviewed the literature on the issue and concluded that spectators are at negligibly increased or no particular cardiovascular risk whatsoever. However, a body of evidence clearly suggests the opposite. With the jury still out, we are awaiting eventual reports on the phenomenon during the World Cup in South Africa.

Research evidence
Although a recently published research with systematic review1 and accompanying commentary2 favours the hypothesis that the association between football matches and cardiovascular incidents, if any, is not important, a general overview of published studies suggests that this should perhaps not be the final conclusion. Among four studies of hospital admissions for acute cardiovascular diseases,3–5 two reported no association with the timing of football matches.1,4 In contrast, admissions for myocardial infarction were increased in England for 2 days after the penalty elimination of the national team.3 In the only prospective and otherwise methodologically superior German study,5 a 2.7-fold increase in the incidence of cardiac emergencies was observed when the national team played; the risk was particularly pronounced in men and among patients with pre-existing coronary disease, and peaked ~2 h after the start of the match.

More convincingly, among seven studies on cardiovascular mortality,6–12 four found an increased mortality, particularly for men,6,10–12 and one found such a trend in a match with a penalty shoot-out decision.6,12 A completely opposite association was observed during the 1998 World Cup when, in the finals, France...
defeated Brazil and the number of deaths from myocardial infarction on that day in France was decreased, particularly among men. The second French study, referring to the 1996 European championship, was the only research showing no association of football events with cardiovascular mortality whatsoever.7

Operating triggers

Acute emotional stress, the leading culprit for cardiovascular events occurring during watching football, through sympathetic arousal, provokes biomechanical, prothrombotic and vasoconstrictive triggering mechanisms,13 and doubles the risk of myocardial infarction for ~2 h after the exposure.14 Laterization of brain activity during emotional strain facilitates the development of ventricular arrhythmias, especially in those with pre-existing heart disease.15,16 In the aforementioned German study,5 an impressive 3.1-fold increase in incidence of cardiac arrhythmias causing major symptoms correlated with national team matches. A proarrhythmic effect of emotional upset may provide the first mechanism of increased cardiovascular mortality.

Acute emotional stress induces enhanced inflammatory and vasoconstrictive processes,17,18 which have been associated with the general prediction of a coronary incident.19 Time course and dynamics of this inducible response have not been established as yet, but the result could be a several hours-to-days delayed increase in individual vulnerability. Similar delayed vulnerability, induced by alcohol consumed on weekend days, could be a possible contributing mechanism for a slight Monday increase in the cardiovascular risk.20

Watching football is a situation when superimposition of triggers like excessive smoking, coffee consumption, binge drinking, heavy meals, drug use or having less sleep may enhance emotional upset and multiply the risk.1,5,6,21–23 The triggers may concurrently facilitate the onset of a cardiac event, or may worsen the outcome when event occurs. The latter may be the second underlying mechanism for the increased cardiovascular mortality during football matches.

Population at risk

Women could be more prone to emotional triggering of myocardial infarction14,23,24 and Takotsubo cardiomyopathy.25–28 Conversely, in the majority of studies, increased rates of cardiovascular incidents during football matches were observed exclusively or more apparently in men.3,5,6,10–12 The most plausible impression is that the link lies in men’s greater interest and emotional involvement.

Occasionally, we read or hear about tragic incidents when an excited husband gets carried away and violates his wife or throws a TV through the window because of a lost or ‘bad’ game, or because the wife was ironing in front of the TV, etc. A recent research on police reports of family violence on days when American professional football matches were played has shown that an unexpected loss in match where the home team was, with relative certainty, predicted to win, increases the home male-on-female violence by 8%. The violence occurs mainly after the match is over, and the effect on violence rates is more than twice as large for games against a traditional rival team in comparison with a non-rival team or when the team is still in a playoff contention.29 This could be the tip of the iceberg. Many more domestic arguments induced by watching a match probably do not escalate to the level of physical violence, but surely induce strong emotional upset.

Betting is usually less emotionally intense than gambling, but the excitement may rise with a profound loss or win. Gambling has been implicated as a trigger of apical ballooning syndrome26 and ventricular arrhythmias.30 US casinos were recognized as an ambient of an increased cardiovascular risk and were supplied with automatic defibrillators, which proved useful and life saving.31 The sport betting industry has rapidly increased worldwide, at least partly spurred by the economic crisis. Even people who do not routinely follow sports look for some extra income, and we cannot exclude betting as a trigger of a small proportion of events, especially during the games with unexpected results or sudden turnovers.

Methodological issues

The majority of available studies is retrospective, observational and with diverse methodology regarding the hazard periods, the number of matches evaluated, diagnostic criteria and cardiovascular endpoints. Only the German study accounted for some chronobiological and meteorological confounders; barometric pressure, Tuesday and Sunday were positively associated, whereas Saturday was negatively associated with the matches. Short-term fluctuation in air pollutants may additionally confound the association, but match-associated emotional upset along with concomitant situational triggers probably highly outweighs environmental factors.

Emotional stress-induced inflammatory and vasoconstrictive response may produce an increase in plaque, blood or myocardial vulnerability with a certain lag. Stress associated with family violence, commonly occurring after the matches, may be an additional cause for a delay in effect, as observed for 2 days4 and 12 h after the match.5 In contrast to the opinion expressed in a recent review, perhaps prospective investigation of other hazard periods may reveal detectable associations.
Left ventricular ballooning syndrome, whose clinical presentation cannot be distinguishable from an acute coronary syndrome, is commonly precipitated by a stressful event and its diagnosis is based on the absence of obstructive atherosclerosis on coronary angiography.\textsuperscript{27,28} None of the studies on association of cardiac emergencies with football matches included data on coronary angiography, and left ventricular ballooning syndromes, misinterpreted as myocardial infarctions, might have contributed to the excess incidence in some studies.

A number of factors may influence both the magnitude of audience and the intensity of individual emotional involvement or response. Whether a team is still in competition, duration of ‘resolving’ period, penalty shots, traditional rivalry, fans’ attachment to a particular team and importance of a match or football in the region are some of them. Violence-prone men seem to be more drawn to watch the match when the home team is expected to win, while the home violence rises by 1% for each per cent of increase in number of households watching the match.\textsuperscript{29} Bauman and colleagues proposed that, compared with Europeans, higher rates of motivational deficiency disorder could make Australians less susceptible to stress associated with watching football.\textsuperscript{4} Chronic emotional disorders, such as anxiety, depression, anger and affective disorders, or general psychological profile may indeed influence the psychophysiological response. For example, healthy hostile individuals may have heightened or prolonged cardiovascular and neuroendocrine responses to acute mental stress,\textsuperscript{33} whereas in patients with advanced coronary disease, hostility correlates with emotional stress-induced increases in sympathetic activation and inflammation.\textsuperscript{34}

Conclusions

The association between watching football matches and hospital admissions for acute cardiovascular diseases is still questionable. Evidence on increased cardiovascular mortality appears more convincing, and may be linked to proarrhythmic effect of emotional stress and multiple triggering circumstances. At present, the most plausible conclusion is that watching football sometimes brings an additional risk of a cardiovascular event for some people. Recommendations for preventive measures could be warranted only in limited and defined populations such as hostile individuals with vulnerable coronary disease. A before-the-match and clear-minded consideration of possibility that their team may lose, taking enhanced regular anti-anginal or additional anxiolytic medication, and avoidance of concomitant triggers, alcohol and drugs in particular, could be a reasonable way of watching important matches for such patients. However, even when a match starts, cardiovascular risk and consequences cannot be predicted because of multiple interactions among the course of match, individual and circumstantial factors. Such complex psychosocial phenomena are primarily upsetting for male fans, but atypical and exaggerated behaviour may affect many others. So, is it ‘just a game’?

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Authors’s Response to: Football matches and acute cardiac events: potential effects of a complex psychosocial phenomenon on cardiovascular health

From FRANCESCO BARONE-ADESÍ,* FRANCO MERLETTI and LORENZO RICHIARDI

Cancer Epidemiology Unit, CeRMS and CPO-Piemonte, University of Turin, Turin, Italy

*Corresponding author. Servizio di Epidemiologia dei Tumori, Via Santena 7, 10126 Torino, Italy.
E-mail: baroneadesi@yahoo.it

Dr Čulic’s review of the literature on the cardiovascular effects of watching football matches reached different conclusions than our recent review of the issue. He based his arguments on several points that are, in our opinion, incorrect.

The approach used by Dr Čulic to summarize evidence in favour of or against the hypothesis that watching football matches is associated with an increased risk of acute cardiovascular events is questionable. Simple counts of positive and negative studies can be seriously misleading, especially if the sample sizes of the studies vary from 45 to 4395 events, as we found in our review.

We disagree with Dr Čulic’s claim that the results of Wilbert-Lampen et al. have a higher validity and should therefore receive more emphasis. Indeed, as discussed in the accompanying editorial, an important source of bias was probably present in the German study, possibly explaining the surprisingly high increase in the risk of myocardial infarction on the day of matches involving the German team. It is also incorrect that only the German study reported...