

socioeconomic inequality in Britain, which now places the country in the unenviable position of being one of the most inequitable industrialised countries in the world, will have adverse influences on the health and wellbeing of children, which will in turn undermine the future health of the nation.³²

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- 1 Britton M. Introduction. In: Britton M, ed. *Mortality and geography: a review in the mid-1980s*. London: HMSO, 1990:1-3.
- 2 Britton M, ed. *Mortality and geography: a review in the mid-1980s*. London: HMSO, 1990.
- 3 Engels F. *The condition of the working class in England*. Penguin, Harmondsworth, 1987 [1st edition 1845.]
- 4 Woolf B. Studies on infant mortality. Part II. Social aetiology of still births and infant deaths in county boroughs of England and Wales. *British Journal of Social Medicine* 1947;1:73-125.
- 5 Martin WJ. Distribution in England and Wales of mortality from coronary disease. *BMJ* 1956;i:1523-5.
- 6 Charlton J. Which areas are healthiest? *Population Trends* 1996;83:17-24.
- 7 Eames M, Ben-Shlomo Y, Marmot MG. Social deprivation and premature mortality: regional comparison across England. *BMJ* 1993;307:1097-102.
- 8 McCarron PG, Davey Smith G, Womersley JJ. Deprivation and mortality: increasing differentials in Glasgow, 1979-1992. *BMJ* 1994;309:1481-2.
- 9 Spencer N, James H, eds. *Uses and abuses of deprivation indices*. Warwick: University of Warwick, 1992.
- 10 Pocock SJ, Shaper AG, Cook DG, Packham RF, Lacey RF, Powell P, et al. British regional heart study: geographic variations in cardiovascular mortality, and the role of water quality. *BMJ* 1980;i:1243-9.
- 11 Simpson S. Coverage of the Great Britain census of population and housing. *Journal of the Royal Statistical Society* 1994;157A:313-6.
- 12 Phillimore P, Beattie A, Townsend P. Widening inequality of health in Northern England 1981-91. *BMJ* 1994;308:1125-8.

- 13 Britton M, Fox AJ, Goldblatt P, Jones DR, Rosato M. The influence of socio-economic and environmental factors on geographic variation in mortality. In: Britton M, ed. *Mortality and geography: a review in the mid-1980s*. London: HMSO, 1990:57-78.
- 14 Carstairs V, Morris R. *Deprivation and health in Scotland*. Aberdeen: Aberdeen University Press, 1991.
- 15 Bentham G, Eimermann J, Haynes R, Lovett A, Brainard J. Limiting long term illness and its associations with mortality and indicators of social deprivation. *J Epidemiol Community Health* 1995;49 (suppl 2):S57-64.
- 16 Ben-Shlomo Y, Davey Smith G. Deprivation in infancy or in adult life: which is more important for mortality risk? *Lancet* 1991;337:530-4.
- 17 Philo C, ed. *Off the map, the social geography of poverty in the UK*. London: Child Poverty Action Group, 1995.
- 18 Dorling D, Woodward R. Social polarisation 1971-1991: a micro-geographical analysis of Britain. *Progress in Planning* 1996;45:67-122.
- 19 Smith J, McLean I. The poll tax and the electoral register. In: Heath A, Jewell R, Curtice J, eds. *Labour's last chance? The election and beyond*. Dartmouth: Aldershot, 1994.
- 20 Davey Smith G, Egger M. Socioeconomic differentials in wealth and health. *BMJ* 1993;307:1085-6.
- 21 McLoone P, Boddy FA. Deprivation and mortality in Scotland, 1981 and 1991. *BMJ* 1994;309:1465-70.
- 22 Dorling D. Changing life chances in Britain. York: Joseph Rowntree Foundation (in press).
- 23 Phillimore P, Beattie A. *Health and inequality: the Northern Region, 1981-1991*. Newcastle: University of Newcastle upon Tyne, 1994.
- 24 MacRae K. Socioeconomic deprivation and health and the ecological fallacy. *BMJ* 1994;309:1478-9.
- 25 Pincherle G. Mortality of Members of Parliament. *Br J Prev Soc Med* 1969;23:72-6.
- 26 Macintyre S, MacIver S, Sooman A. Area, class and health: should we be focusing on places or people? *Journal of Social Policy* 1993;22:213-34.
- 27 Kaplan GA, Pamuk ER, Lynch JW, Cohen RD, Balfour JL. Inequality in income and mortality in the United States: analysis of mortality and potential pathways. *BMJ* 1996;312:999-1003.
- 28 Ben-Shlomo Y, White IR, Marmot M. Does the variation in the socioeconomic characteristics of an area affect mortality? *BMJ* 1996;312:1013.
- 29 Lena HF, London B. The political and economic determinants of health outcomes: a cross-national analysis. *Int J Health Serv* 1993;23:585-602.
- 30 Gough I, Thomas T. Why do levels of human welfare vary among nations? *Int J Health Serv* 1994;24:715-48.
- 31 Wilkinson R. *Unhealthy societies*. London: Routledge, 1996.
- 32 Davey Smith G. Income inequality and mortality: why are they related? *BMJ* 1996;312:987-8.

Attendance at cultural events, reading books or periodicals, and making music or singing in a choir as determinants for survival: Swedish interview survey of living conditions

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Abstract

Objectives—To investigate the possible influence of attendance at cultural events, reading books or periodicals, making music or singing in a choir as determinants for survival.

Design—A simple random sample was drawn of 15 198 individuals aged 16-74 years. Of these, 85% (12 982) were interviewed by trained non-medical interviewers between 1982 and 1983 about cultural activities. They were followed up with respect to survival until 31 December 1991.

Setting—Swedish interview survey of living conditions comprising a random sample of the adult Swedish population.

Subjects—12 675 people interviewed between 1982 and 1983.

Main outcome measures—Survival of subjects after controlling for eight confounding variables: age, sex, education level, income, long term disease, social network, smoking, and physical exercise.

Results—6301 men and 6374 women were followed up; 533 men and 314 women died during this period. The control variables influenced survival in the expected directions except for social network for men; a significant negative effect was found when the analysis was made separately for men and women. We found an influence on mortality when the eight control variables were controlled for in people who rarely attended events compared with those attending

most often, the relative risk being 1.57 (95% confidence interval 1.18 to 2.09).

Conclusion—Attendance at cultural events may have a positive influence on survival. Long term follow up of large samples with confounders that are well controlled for and with the cultural stimulation more highly specified should be used to try to falsify the hypothesis before experiments start.

Introduction

The importance of stimulating activities is obvious, and there is hardly any need for medical arguments for attending a theatre, cinema, or sports events, for reading books and periodicals, or for making music. Cultural activity might be thought to increase resistance to a broad spectrum of diseases or be the impetus to start dealing with problems.

The mechanism for a positive effect could perhaps be that it is inspirational for handling everyday social problems, thus enhancing people's reflection on their life situation and enabling them to prepare for coming events in their mind. More importantly, such activity provides direct vicarious emotional arousal without damage or side effects in real life. And we know that the organism responds with changes in the humoral nervous system—for example, verbal expression of traumatic experiences through writing or talking improves physical health, enhances immune function, and is associated with fewer medical visits.¹ In addition, other gains have been documented in the therapeutic

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use of music in the treatment of autistic children,² as well as the treatment of cancer and other related pain.^{3,4} Pictures of works of art have been used to stimulate older people.⁵ Negative effects of cultural activities could be that people lose their sense of reality and identify with asocial models of behaviour and are themselves encouraged towards asocial behaviour.^{6,7}

Many of the selective factors determining attendance at different kinds of events are correlated with survival. Educational level is one such factor. Furthermore, disease itself influences the ability to take part in activities and the kinds of activities possible to pursue. Attending cultural events widens a social network and gives the feeling of belonging to a group, and this in itself could be the important determinant of survival. Perhaps cultural behaviour is so intermingled with life as a whole that it is impossible to discern its influence. We investigated the possible influence of cultural stimulation on survival.

Subjects and methods

A simple random sample was drawn of 15 198 people aged 16-74 years. Of them, 12 982 people (85%) were interviewed by non-medical interviewers between 1982 and 1983 in the Swedish annual survey of living conditions,⁸ which is an interview survey conducted on a random sample of about 8000 people a year. It covers several components of living conditions such as health, economic resources, education, employment, and housing. In the years 1982-3 the interview went into some depth about leisure time activities. Those interviewed were followed up for survival until 31 December 1991. Risks per person year at each year of follow up were computed. The interviews were mainly conducted in the interviewees' homes, but about 11% were telephone interviews.

Overall, 307 people were excluded from the analyses because they gave only partial responses about leisure time activities, leaving 12 675 (83%) for our analysis. The interviewees were not aware of our interest in the relation between leisure time activities and health. In all, 847 respondents, who were aged 16-74 at the time of the interviews, died during the follow up. Background covariates used for control were age, sex, educational level, income, disease prevalence, social network, smoking, and physical exercise. One independent variable was constructed out of attendance at various cultural and sports events such as cinema, theatre, concerts and live music, art exhibitions, other exhibitions or museums, sermons, or sports events. Another variable was an index based on the reading of books or periodicals. The third independent variable reflected making music and singing in a choir.

Age was controlled for in 10 year age bands. Educational level was described as at least college level (>12 years at school) or at least high school level (10-12 years at school). The reference group was those having only a primary education (≤9 years at school).

The income variable used was the disposable income per adult person in the family, children being weighted less. Three income levels in approximate quartiles were contrasted against the lowest (up to about \$5400). One question on social network and support was used to distinguish those who did or did not have weekly contacts with a near friend outside the family (with whom they could talk about anything). Long term disease, handicap, complaints after an accident or other ailments were used to distinguish those who did or did not have such a problem. Exercise was measured with two questions on frequency of exercise either outdoors or indoors. This was dichotomised into exercise at least once a month and exercise less often.

As the dose-response of smoking for total mortality is grossly linear, we classed smokers from their answers to

Table 1—Distribution of variables and numbers of deaths and risk years

Variable	Percentage (n = 12 675)	No of deaths	No of risk years
Sex:			
Female	50.1	314	56 329
Male	49.9	533	54 690
Age (years):			
16-44	56.0	77	65 027
45-64	30.5	306	32 595
65-74	13.5	464	13 397
Education (years):			
<9	41.8	532	45 729
10-12	41.6	254	46 730
>12	16.6	59	18 560
Disposable income:			
Low	22.3	162	25 616
Fairly low	24.1	324	26 534
Moderate	26.8	205	99 801
High	26.8	156	29 068
Social network:			
Weekly contact with friends	59.0	420	65 888
Seldom has contact/no friends	41.0	427	45 132
Long term disease:			
Yes	37.7	629	40 199
No	62.3	218	70 821
Smoking:			
No smoking	68.9	529	76 883
1-15 g/day*	12.6	141	13 851
>15 g/day*	18.4	175	20 285
Exercise:			
Inactive	51.0	681	55 119
At least once a month	49.0	166	54 691
Reading books or periodicals:			
Rarely	26.7	316	29 370
Occasionally	29.0	232	32 322
At least once a week	44.3	299	49 327
Making music:			
Sometimes	20.2	104	22 769
Rarely	79.8	743	88 251
Attending cultural events:			
Rarely (7-8 points)	23.6	399	24 941
Occasionally (9-12 points)	53.0	381	59 392
Often (>12 points)	23.5	67	26 687

*Women 1-10 g/day and >10 g/day.

the questions posed into sizeable and equal groups for men and women. This grouping was accomplished by the smokers being classified into two groups—namely, smoking up to 15 g and 10 g of tobacco a day for men and women respectively and those who smoked more. Non-smokers, including former smokers, were chosen as the reference group. The above variables were all seen as confounders.

Our three independent variables were an attendance index, a reading index, and a music-making index. The cultural events attendance index was constructed from attending a cinema, theatre, concert and live music, museum, art exhibition, sermon, or sports events as a spectator. The number of visits at each of these seven kinds of events was classified into four classes, with more than 20 visits per year giving four points. These scores in points were used to classify the cohorts into two low use groups (<9 points and 9-12 points). The most active group scored more than 12 points, making at least 80 visits per year, and constituted the reference group.

The second independent variable was constructed out of the questions about reading books or periodicals. Two classes of low active readers were contrasted against a reference group of those reading books or periodicals at least once a week. The third independent variable index was constructed out of questions on how often the respondent played music or sang in a choir, and they were dichotomised into those doing

Table 2—Relative risks for mortality (95% confidence intervals) in proportional hazards models*

Variable	Model 0	Model 1
Education (years):		
≤9	1 Reference	1 Reference
10-12	0.80 (0.68 to 0.93)	0.92 (0.79 to 1.08)
>12	0.57 (0.43 to 0.75)	0.93 (0.68 to 1.26)
Disposable income:		
Low	0.88 (0.73 to 1.06)	0.85 (0.70 to 1.03)
Fairly low	1 Reference	1 Reference
Moderate	0.76 (0.64 to 0.91)	0.82 (0.68 to 0.98)
High	0.60 (0.49 to 0.73)	0.73 (0.59 to 0.90)
Social network:		
Weekly contact with friends	1.06 (0.93 to 1.22)	1.10 (0.96 to 1.26)
Seldom has contact/no friends	1 Reference	1 Reference
Long term disease:		
Yes	2.28 (1.94 to 2.67)	2.10 (1.78 to 2.46)
No	1 Reference	1 Reference
Smoking:		
No smoking	1 Reference	1 Reference
1-15 g/day†	1.96 (1.62 to 2.36)	1.76 (1.45 to 2.12)
>15 g/day†	1.83 (1.53 to 2.18)	1.69 (1.42 to 2.02)
Exercise:		
Inactive	1 Reference	1 Reference
At least once a month	0.60 (0.50 to 0.72)	0.78 (0.65 to 0.94)
Reading books or periodicals:		
Rarely	1.41 (1.20 to 1.65)	1.05 (0.88 to 1.25)
Occasionally	1.13 (0.95 to 1.34)	0.94 (0.79 to 1.14)
At least once a week	1 Reference	1 Reference
Making music:		
Sometimes	0.77 (0.63 to 0.94)	0.89 (0.72 to 1.10)
Rarely	1 Reference	1 Reference
Attending cultural events:		
Rarely (7-8 points)	2.38 (1.83 to 3.09)	1.57 (1.18 to 2.09)
Occasionally (9-12 points)	1.60 (1.24 to 2.08)	1.24 (0.95 to 1.63)
Often (>12 points)	1 Reference	1 Reference

*Model 0 was adjusted for sex and age (in 10 year bands) with one variable at a time; model 1 was adjusted for sex, age (age span 16-74), education, disposable income, social network, long term illness, smoking, exercise, reading books or periodicals, making music, and attending cultural events.

†Women 1-10 g/day and >10 g/day.

either at least "now and then" and those doing it less often than "now and then." The dependent variable was mortality after the interview. The cohort was followed up till 31 December 1991.

A proportional hazards model was used to estimate relative risks and 95% confidence intervals.⁹ The proportional hazards model's assumption was analysed by inspecting the log of the negative log of survival curves for parallelism, which they showed. Further-

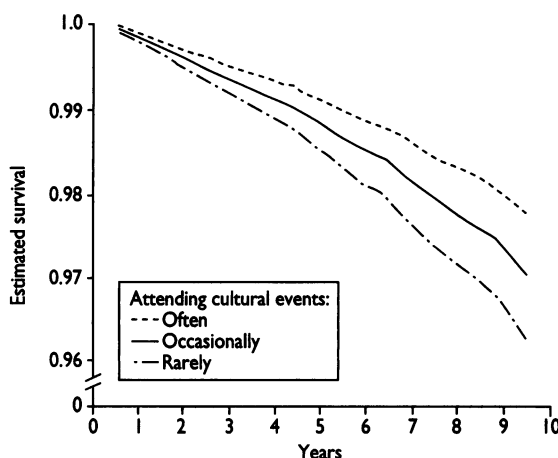


Fig 1—Estimated survival of people attending cultural events often, occasionally, or rarely. Eight confounders were controlled for (age, sex, weekly contacts with close friends, education, income, long term disease, smoking, and physical exercise)

more, age stratification resulted in the same estimates as including age in the model. Analysis of the first five and second four years separately resulted in roughly the same estimates. The null hypothesis was tested for the model and variables with the χ^2 test using the Wald criterion.

Results

In total, 6301 men and 6374 women aged 16-74 years at the interview in 1982-3 were followed up for survival until the end of 1991; 533 men and 314 women died during the period. The total person years at risk for both sexes was about 111 000 years. Table 1 shows the distribution of the different variables and numbers of deaths and risk years.

Of the control variables, age, smoking, long term disease, and exercise had an influence in the expected directions. As the influence of education on survival has long been known, it was included as a confounder. In the seven dimensions of our analysis the influence of education was not significant in the final model, although income was. Income and education might be correlated, and we investigated the importance of this correlation for our analysis. When we removed income, education did not influence survival, but when education was removed the influence of income was still significant. It seems, therefore, that education is not an important confounder. To control for social circumstances from the generation before, the father's occupation was introduced in the model; but the results hardly changed at all. For men having a social network was a slight risk factor, and for women a lack of a social network was a slight risk factor. The interaction was analysed and found to be of no importance for the coherence of cultural consumption and survival.

The above mentioned variables are seen here as confounders; our focus of interest was on cultural stimulation measured by our three indices: attendance at events, reading, and making music. We found an influence on mortality when we controlled our seven control variables for rare attendance at events and a trend towards influence for occasional attendance compared with often attending events. Relative risks were 1.57 (95% confidence interval 1.18 to 2.09) and 1.24 (0.95 to 1.63) respectively (table 2, fig 1). As some of the sports events included in attendance at events might be negatively socioeconomically skewed, going to sports events was analysed separately. The risk ratio was 0.86 (0.72 to 1.02).

Discussion

Our results show that people attending cultural events seem to live longer than those who attend rarely. Our analysis of the influence of cultural stimulation, however, took advantage of a standard of living study that was not originally designed for such a purpose. Therefore the frequencies of visits or activities could be seen as only crude measures of such stimulation because the emotional responses to or perceptions of the visits are unknown. Much of the culture may not give inspiration for handling the everyday problems of life. Neither will it stimulate the immune system or whatever other mechanisms might influence mortality. Some films and television programmes are suspected to stimulate violence instead.^{6,7} These objections are obviously valid, and the to ignore them risks not detecting true influences of cultural stimulation. Many of the confounders were crudely measured. Long term disease was measured with only one question in the interview and social network with only two. It would have been of benefit if the dependent variables, the classification of low and high consumers of cultural stimulation, had

been conformed among the three indices; but this was not possible with the data at hand.

The reference group of the index for visits to cultural events could be viewed as extreme. The people in this group attended events at least 80 times a year—more than every fourth day. Perhaps they were extremely healthy, and therefore the index possibly measures only an active-passive personality trait responsible for the covariation we found. However, they comprised nearly a quarter of the sample, and physical exercise was among the confounders we controlled for. We could have anticipated a more distinct influence in the groups that were more active making music or singing in a choir than in the more passive activities; perhaps this grouping was not homogeneous enough. Going to some sports events could be negatively socioeconomically skewed, but we could not find a negative influence on survival of this unspecified variable when we controlled for other factors.

POSSIBLE CONFOUNDING

All available cultural indicators covered in the whole sample were used and so no more were examined with respect to mortality. The hypotheses were expressed beforehand. The modelling of confounders was made by one of us (LOB), who was not familiar with what data were available. All but alcohol consumption were covered by the data. As smoking was among the control variables, alcohol use probably was indirectly controlled for to a great extent. Alcohol consumption among men might lie behind the negative influence on mortality of a social network, but the influence of social network on mortality was anyhow negligible in both sexes. The interaction was furthermore of no importance for the coherence of attending events and survival. Analysis of data showed that not attending cultural events influenced mortality, possibly in a dose-response manner. This result was also seen after controlling for age, sex, education, income, social network, long term disease, smoking, and physical exercise—that is, most of the confounders that are controlled for in this type of study. It is important to remember, however, that the effect of attending cultural events was attenuated in the latter model. It is conversely interesting to see that the crude relative risk, only controlled for age, did not change much when the whole model was applied as regards the variables of disease, smoking, and physical exercise; the influences of the variables education and disposable income were less robust in this respect. Perhaps cultural stimulation underlies some of the notorious social class differences in survival.

POSSIBLE MECHANISMS

The mechanisms may be immunoregulatory.¹⁰ One route linking the brain to the immune system is the innervation of lymphoid organs, another is the outflow of pituitary hormones. The nerve fibres form junctions with lymphatic organs and release neurotransmitters that lymphocytes, macrophages, and granulocytes have receptors for. Growth hormones and prolactin enhance immunity; glucocorticoids may protect from autoimmune disease. The interaction may provide the means by which emotional states influence infections and autoimmune and neoplastic disease.¹¹

There might be other routes of influence. The number of glucocorticoid receptors in the hippocampus is increased by environmental enrichment,¹² and this could be important in depressive diseases.¹³ But how the physical matter in the brain causes subjective states is still a mystery.¹⁴

Key messages

- Attendance at cultural events, reading, and listening to or making music may influence a person's wellbeing, but little is known about the influence of cultural activities on other measures of health
- When other determinants of survival were controlled for, this study found that people attending cultural events often had a better chance of survival than those attending rarely
- Education unexpectedly had no significant influence on survival when other variables were controlled for
- Long term follow up of large samples with confounders that are well controlled for may provide empirical evidence to support experiments on the effects of cultural stimulation on people not attending events

Theatre has historically been widely used in European psychiatry,¹⁵⁻¹⁸ and in the United States,¹⁹ and similar effects perhaps can be expected in the public theatre. Attending sports events is sometimes dramatic and could have medical effects.²⁰

CONCLUSIONS

We conclude that this is probably a fruitful line of research. Long term follow up of large samples in which confounders are well controlled and the types of cultural stimulation are well specified should be used to try to falsify the hypothesis before experiments start.

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- 1 Berry DS, Pennebaker JW. Non verbal and verbal emotional expression and health. *Psychother Psychosom* 1993;59:11-9.
- 2 Evers S. Music therapy in the treatment of autistic children. Medico-sociological data from the Federal Republic of Germany. *Acta Paedopsychiatria* 1992;55:157-8.
- 3 Beck SL. The therapeutic use of music for cancer-related pain. *Oncol Nurs Forum* 1991;18:1327-31.
- 4 Scholar JA. Music and pattern change in chronic pain. *Advances in Nursing Science* 1993;15:27-36.
- 5 Wickström B-M, Theorell T, Sandström S. Medical health and emotional effects of art stimulation in old age. *Psychother Psychosom* 1993;60:195-206.
- 6 Synder S. Movies and juvenile delinquency: an overview. *Adolescence* 1991;26:121-32.
- 7 Centerwall BS. Television and violence. The scale of the problem and where to go from here. *JAMA* 1992;267:3059-63.
- 8 Statistics Sweden. *Technical Report. Appendix No 7 to the 1982-3 surveys of living conditions*. Stockholm: Statistics Sweden, 1986. [In Swedish.]
- 9 Kleinbaum DG. *Survival analysis*. New York: Springer, 1995.
- 10 Watkins AD. Perceptions, emotions and immunity: an integrated homeostatic network. *Q J Med* 1995;88:283-94.
- 11 Ader R, Cohen N, Felten D. Psychoneuroimmunology: interactions between the nervous system and the immune system. *Lancet* 1995;345:99-103.
- 12 Olsson T, Mohammed AK, Donaldson LF, Seckl JR. Transcription factor AP-2 gene expression in adult rat hippocampal regions: effects of environmental manipulations. *Neurosci Lett* 1995;189:113-6.
- 13 Sekl JR, Olsson T. Glucocorticoid hypersecretion and the age-impaired hippocampus: cause or effect? *J Endocrinol* 1995;145:201-11.
- 14 Searle JR. The mystery of consciousness: Part II. *New York Review* 1995 Nov: 54-62.
- 15 Drees L, Brade J. Group therapy of chronic psychiatric patients with theatre playing. *Nervenarzt* 1969;40:517-21. [In German.]
- 16 Schacherl P. Theatre as social psychotherapy. *Rivista Sperimentale Freniatria* 1970;94:801-4. [In Italian.]
- 17 Struyf D. Theatre and psychiatry. *Acta Psychiatr Belg* 1983;83:443-50. [In French.]
- 18 Thoret Y, Attigui P. Artistic mediation by the theatre. *Soins Psychiatria* 1994;162:29-33. [In French.]
- 19 Nuetzel EJ. Unconscious phenomena in the process of theater: preliminary hypotheses. *Psychoanal Q* 1995;64:345-52.
- 20 Proctor RC, Eckerd WM. "Toot-toot" or spectator sports. Psychological and therapeutic implications. *Am J Sports Med* 1976;4:78-83.