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**Paper title:** **Fast and Furious 3: illegal street racing, sensation seeking and risky driving behaviours in New Zealand**

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**Abstract (200 words):**

Illegal street racing is receiving increased media attention but there is little research in Australia and New Zealand to guide creative responses to this socially problematic behaviour. The paper investigates the relationship between interest in motor sport, illegal street racing and other risky driving behaviours amongst a sample of young male drivers in Christchurch. The study obtained questionnaire data from students in late high school, polytechnic college and university. The measured variables included a driving violations scale, attitudes to speeding, sensation seeking propensity, level of interest in motor sport and participation in illegal street racing. The results indicate that experience with motor sport was a significant factor in the explanation of both risky driving behaviour and the level of involvement in illegal street racing, taking into account the influence of sensation seeking. However, the way in which motor sport was linked with risky driving was different from the way it was linked with illegal street racing. Motor sport had a more direct influence on street racing, but influenced risky driving behaviour through the influence on attitude to speeding. The street racing group is characterised by high levels of sensation seeking and high levels of involvement in motor sport.

## **Illegal Street Racing**

Illegal street racing is receiving increased media attention but there is little research in Australia and New Zealand to guide creative responses to this socially problematic behaviour. Street racing involves cars reaching extreme speeds on public roads and can result in injury or death to participants, bystanders or passing motorists. However little is known as to what environmental or dispositional influences exist to encourage participation in illegal street racing. In particular the influence of involvement or interest in organised motor sport on specific types of dangerous driving practices such as street racing, and risky driving in general is not known. Motor sport provides an environment that can shape interest in cars and speeding and possibly could encourage spectators to act out risky behaviours when driving on public roads. A more extreme form of acting out would be to participate in illegal street racing.

Street racing involves a contest between two participants in which the aim is for one to out-accelerate the other. Although street racing involves risks while driving, it differs from measures of risky driving in the research since these refer to general driving behaviours. There are two distinct types of illegal street racing. First there are the highly organised races, usually staged at night. Often participants will go to great lengths to find isolated roads, and will use mobile phones to coordinate the activity in a pre-determined location, where spectators line the sides of the road. Second, there are more spontaneous races, often on straight sections of road with double lanes. Traffic signals can provide the starting signal for such races. Both of these types of illegal street racing occur in many Australian and New Zealand cities (Doherty, 2002; Calcott, 2002; Guthrie, 2002). A number of communities have attempted to control illegal street racing by providing access to legal race ways.

Research on the culture of illegal street racing in Sydney (Leigh, 1995) and in Christchurch (Falconer, 2002) indicated that street racers are mainly young males, typically aged between 18 and 25. In New Zealand, the street racers are typically referred to as 'boy racers'. Street racing is also a "transitory activity ... most people do not continue to race for more than 2-3 years" (Leigh, 1995, 388). At organised illegal race meetings, the majority are spectators. Yet Leigh (1995) argues that there are few significant differences between competitors and spectators. Many spectators may race on other nights.

Although the specific issue of street racing has received little research attention, there exists a comprehensive literature on risky driving behaviours. Demographic factors such as gender, age (Xie and Parker, 2002; Ripa, Hansen, Mortensen, Sanders, and Reinisch, 2001) and personality factors, particularly sensation seeking (Jonah 1997), have been identified as important predictors of risk when driving. The influence of environment has included driving experience (Deery, 1999) and psycho-social factors (Shope, Raghunathan, and Patil 2003; Parker, Lajunen, and Stradling, 1998). Otherwise environment has been treated as a criterion rather than a predictor variable. For instance sensation seeking has been viewed as a predictor of involvement in risky activity.

In the current study, interest in motor sport (MS) is identified as a potential environmental predictor of participation in illegal street racing as well as other risky driving behaviour. There has been little research on the possible influence of motor sport on driver behaviour. However, available evidence suggests that such a link may exist (Tranter, 2003). When public roads and streets became a street racing circuit in Melbourne, accident rates increased dramatically on these roads, possibly due to drivers emulating Formula One racing drivers

(Bannerman, 2000). Accident levels (and speed of driving) were found to have significantly increased in South Australia around the time of the first Grand Prix in Adelaide (Arnold, Fischer, Hatch, and Paix, 1989). The current paper extends the previous research by considering the environmental influence of interest in motor sport, as well as the influence of personality, on involvement in illegal street racing and other risky driving behaviours.

### The personality variable of sensation seeking

Research has identified a number of personality variables predicting risky health behaviours in sports and recreational activities. Prominent amongst the personality variables studied has been the trait of sensation seeking. Zuckerman (1994, p. 27) defines this trait as “the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience” Sensation seeking is a biosocial dimension of personality characterized by “the need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experiences” (Zuckerman, 1979, p. 10). The trait of sensation seeking arises from the level of stimulation or arousal that is optimal for an individual (Ripa *et al*, 2001). The trait can affect behaviour directly as the individual seeks a desired level of arousal.

Higher levels of sensation seeking have been observed amongst “participants in high risk sports such as in hang gliding and auto racing” compared to participants in lower risk sports or those not participating in sport (O’Sullivan, Zuckerman, and Kraft, 1998, page 120). Sensation seeking is associated with the use of alcohol, cannabis and other drugs, speeding and driving whilst under the influence of alcohol, as well as a wider range of sexual experiences (Ripa *et al*, 2001). Based on a comprehensive review, Jonah (1997) concluded that sensation seeking typically was found to have a correlation in the range of 0.30 to 0.40 with such risky driving behaviours as speeding, driving above the blood alcohol limit and non-use of seatbelts.

### Sensation seeking and environmental effects

In the research on sensation seeking, environmental factors, if considered at all, tend to be treated implicitly as related criterion variables. Sensation seeking is used to predict interest or participation in activities in environments involving access to alcohol or drugs, or where risk is linked to manipulating some aspect of the environment (eg. mountaineering). There is little development of frameworks to explain the inter-relationship between traits such as sensation seeking and environmental variables.

In a review of the personality literature Funder (2001) suggests that explanations of behaviour would benefit by improving analysis of the contributions of both personality and situation. However, Funder (2001) notes that little is known about how to classify situations so as to examine the interaction of environmental influences and personality. Practically it can be difficult to specify important environmental variables. As well as the contingencies of the immediate situations, the social cognitive approach indicates that behaviour can also be influenced by generalised beliefs about the efficacy of different behaviours. These beliefs have been formed on the basis of prior learning and represent generalised beliefs about the environment. Possibly it could be worthwhile to consider a more generalised environmental influence on behaviour so as to explain risky driving behaviours. Examples of this approach

are found in other areas of research on health behaviour. For instance, Stahl *et al* (2001) note consistent findings of a strong positive association between level of social support and level of physical activity. Also, Wechsler, Devereaux, Davis, and Collins (2000) suggest ways in which the physical and social environment of a school can be shaped to promote healthy eating and greater physical activity. The social environment can also promote risky health behaviour. For instance, Lorente, Souville, Griffet and Grélot (in press) establish a relationship between sports involvement and higher level of alcohol use, although acknowledging potential variation if specific situational factors were compared

Spectators at motor sport events experience an environment that has a distinct set of social factors. They receive a bundle of messages containing evaluative information on attitudes, norms, and beliefs about speeding and risk taking whilst driving. The winners in motor sport are the drivers who are the fastest and who demonstrate the best control over volitional risk taking. The celebration of the winner, with much media fanfare, clearly conveys a message about the social desirability of being able to drive faster and more capably than other drivers.

Conceptually, the influence of both environment and personality on behaviour could be either direct or indirect. Much of the research has considered sensation seeking as a direct influence on behaviour (Ripa *et al*, 2001). Ulleberg and Rundmo (2003, p429) note that indirect effects are rarely studied and argue that this deficit in the research results in an underestimation of the influence of personality traits on behaviour. They present a data analysis to indicate that traits like sensation seeking can affect risky driving behaviour indirectly by influencing attitudes to traffic safety.

## Aims

In this paper, motor sport is identified as an environmental factor and sensation seeking as the personality trait of most relevance. It is predicted that involvement in motor sport will promote positive attitudes to speeding and that in turn these attitudes will be related to risky driving behaviours. It is expected that high sensation seeking will attend to the stimulating aspects of motor sport, in particular the speeding, and will absorb supportive attitudes, norms, and beliefs about speeding and risk taking whilst driving. In addition to these indirect effects, it is predicted that sensation seeking can also have direct effects on behaviour. Risk perception (the notion of illusory invulnerability based on self-assessment of both driving skill and likelihood of accident involvement) is also expected to influence favourable attitudes to speeding (Ulleberg and Rundmo, 2003) especially for young drivers.

Four specific hypotheses were identified by the researchers:

1. Involvement in motor sport will be associated with attitudes that support the acceptability of speeding on public roads.
2. Involvement in motor sport will be associated with more risky driving behaviours on public roads, measured by a standard “violations scale”.
3. Involvement in motor sport will be associated with involvement in illegal street racing.
4. Individuals with high levels of sensation seeking propensity will be attracted to both motor racing and to street racing. (If this is the case, then effects of sensation seeking will need to be separated from effects from motor racing.)

## Method

### Sample

A questionnaire was distributed amongst secondary and higher education students in Christchurch, New Zealand. The students comprised first year students at university, polytech motor vehicle engineering students and 5th-7th form (15-18 year olds) students from a boy's school. This aimed to produce a purposive sample in which a large percentage of the group would match the demographic of illegal street racers. A total of 260 questionnaires were returned (211 males, 49 females) and the analysis was restricted to males under 25 years of age ( $n = 180$ ). The median age of the males in the sample was 18 years of age (age range was 15 to 24 years) and a licence had been held for an average of three years.

### Measures

Sensation seeking was measured using the eight item Brief Sensation Seeking Scale - BSSS developed by Hoyle, Stephenson, Palmgreen, Lorch, and Donohew (2002), who report that the BSSS is psychometrically sound and is a suitable substitute for the longer Zuckerman's (1996) 40 item scale. Five-point scales were used: "strongly disagree", "disagree", "uncertain/ undecided agree", "agree", and "strongly agree". Cronbach's coefficient alpha was used to estimate the reliability of the scales. The higher the coefficient alpha the better a set of items measures a single underlying construct (e.g. sensation seeking). The coefficient alpha for the sensation seeking items was 0.80.

A measure of risky driving behaviours was based on the Manchester University Driver Behaviour Research Group's "Driver Behaviour Questionnaire" (DBQ) (Parker *et al*, 1998). In particular, the questionnaire examined "violations", a type of aberrant driving behaviour characterised as deliberately risky driving behaviours. Research has demonstrated that "self-reported commission of violations is significantly predictive of accident involvement, both retrospectively and prospectively" (Parker *et al*, 1998). The following seven questions were used to form a measure of risky driving behaviours: Drive especially close to the car in front as a signal to its driver to go faster or get out of the way, Cross a junction knowing that the traffic lights have already turned red, Disregard the speed limits late at night or early in the morning, Become impatient with a slow driver in the outer lane & overtake on the inside lane, Exceed the speed limit in built-up areas, Exceed the speed limit on open roads, Generally drive faster than the rest of the traffic. The last of these was added by the authors to the standard items used on the violations scale of the Driver Behaviour Questionnaire. Standard questions about seat belt use and drink driving were omitted from this measure of risky driving since the variable of interest was risky driving behaviour and Parker *et al*, (1998) found drink driving to load on its own factor in a factor analysis of the DBQ. A six-point, behaviourally anchored scale was used: Never, Hardly ever, Occasionally, Quite often, Frequently, Nearly all the time. The coefficient alpha was 0.81.

Experience with motor sport was measured using the following seven items: How many motor sports events have you watched on television over the last 12 months (for 30 minutes or more)?, How many motor sports events have you attended over the last 12 months?, Have you ever been a driver (or rider) in any official motor sport event?, Have you ever attended an official drag racing event, In the last 5 years, have you ever attended any motor sport event at Ruapuna Park/Woodford Glen (the local raceway). As a child I was interested in motor

sports?, I am interested in motor sports? The coefficient alpha was 0.82. Involvement in street racing was measured using the following four items: Have you ever taken part in an illegal street race? Have you ever witnessed an illegal street race? Have you ever gone out of your way to watch an illegal street race? Do you get involved with unofficial 'races' with other drivers? The coefficient alpha was 0.76. Different scales were used to form measures of motor sport and street racing involvement. Scores from each scale were added to form a total measure.

Risk perception (a sense of invulnerability) was measured by two items: I am a skilful driver, and I am unlikely to ever be involved in a serious road accident. The coefficient alpha was 0.49. Attitude to speeding was measured using the following five items: New Zealand speed limits are so restrictive that it is understandable that they are disobeyed, Driving over the speed limit is acceptable if you drive a good car, Choosing a safe speed, should, to a larger extent, be up to the individual driver, Driving over the speed limit is acceptable if road conditions are good, Driving over the speed limit is acceptable if you are a skilful driver. The coefficient alpha was 0.82. Five-point scales were used for risk perception and attitude to speeding “strongly disagree”, “disagree”, “uncertain/ undecided agree”, “agree”, and “strongly agree”.

### Statistical analysis

As far as the authors are aware, no previous study has been able to use quantitative data to demonstrate statistically the likely impact of interest in motor racing on driver behaviour. Two criterion measures (risky driving behaviours, participation in street racing) are predicted using the same set of variables (sensation seeking, participation in motor sport, attitude to speeding, risk perception). A separate path analysis is provided for each criterion measure. The covariance matrix was entered into a LISREL program (Joreskog and Sorbom, 1993). Missing cases were deleted listwise (reducing the sample size from 180 to 158). In Analysis 1 sensation seeking, motor sport participation, risk perception, attitude to speeding, were used to predict risky driving whilst in Analysis 2 the same measures were used to predict participation in street racing.

### Results

Means and standard deviation for each variable is presented in Table 1 and the correlation matrix is presented in Table 2.

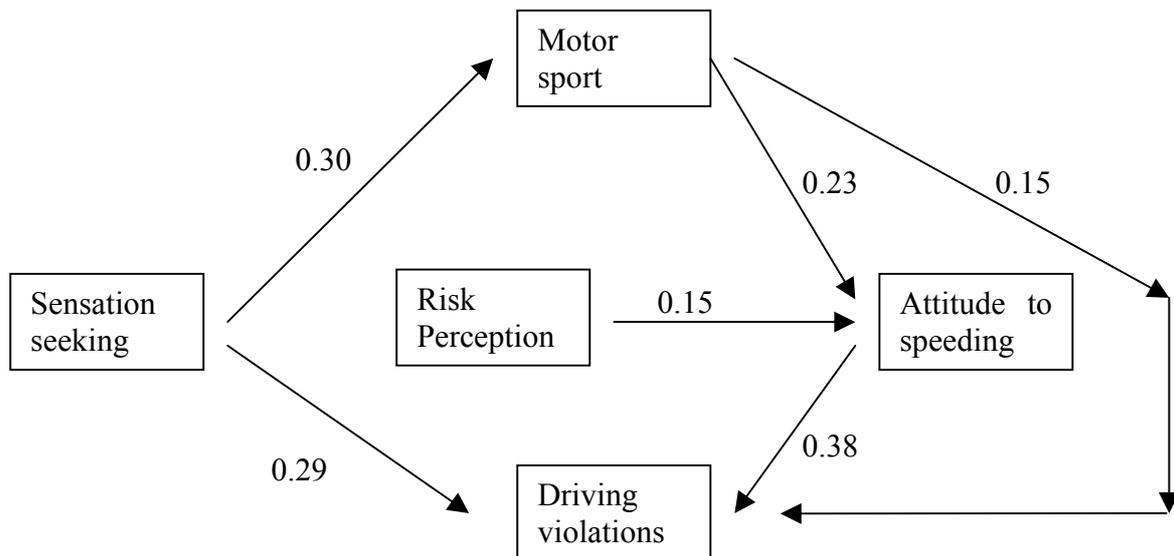
The fit measures indicated that the model fitted the data well: chi square ( $df=3$ ) = 4.36 ( $P = 0.23$ ), root mean square error of approximation (RMSEA) = 0.054, standardized root mean square residual = 0.044, goodness of fit index (GFI) = 0.99, adjusted goodness of fit index (AGFI) = 0.95, comparative fit index (CFI) = 0.98, expected cross-validation index (ECVI) = 0.25. The model predicted 32% of the total variance in risky driving behaviour. Sensation seeking was directly associated with risky driving and indirectly through motor sport. Involvement in motor sport was directly associated with risky driving and indirectly through attitudes to speeding.

**Table 1: Means and standard deviations**

	Mean	Standard Deviation
Experience with motor sport	16.2688	5.51125
Sensation seeking	29.3719	5.84906
Attitude to speeding	14.1906	4.20985
Risk perception	6.4250	1.56535
Driving violations	21.3406	6.40690
Involvement in street racing	6.9500	2.48973

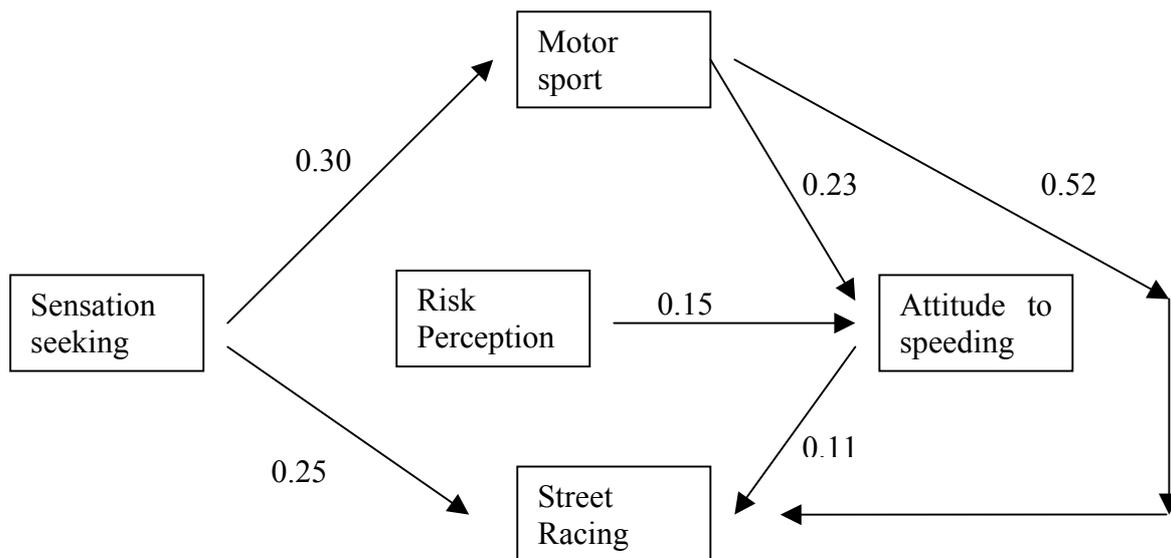
**Table 2: Correlation matrix for all variables**

	1	2	3	4	5	6
1. Experience with motor sport	1.000	0.275	0.255	-0.032	0.309	0.567
2. Sensation seeking	0.275	1.000	0.217	0.042	0.394	0.394
3. Attitude to speeding	0.255	0.217	1.000	0.145	0.464	0.208
4. Risk perception	-0.032	0.042	0.145	1.000	0.020	0.018
5. Driving violations	0.309	0.394	0.464	0.020	1.000	0.495
6. Involvement in street racing	0.567	0.394	0.208	0.018	0.495	1.000

**Figure 1: Analysis 1 variables predicting risky driving behaviour with standardised path coefficients**

**Table 3: Direct, indirect and total effects of sensation seeking and involvement in motor sport on risky driving behaviour (standardized coefficients)**

	Sensation seeking		Motor Sport
Direct	0.29	Direct	0.15
Indirect via motor sport and attitudes	0.07	Indirect via attitudes	0.01
Total	0.36	Total	0.24

**Figure 2: Analysis 2 variables predicting participation in street racing with standardised path coefficients**

The fit measures indicated that the model fitted the data well: chi square ( $df=3$ ) = 3.75 ( $P = 0.29$ ), root mean square error of approximation (RMSEA) = 0.040, standardized root mean square residual = 0.039, goodness of fit index (GFI) = 0.99, adjusted goodness of fit index (AGFI) = 0.95, comparative fit index (CFI) = 0.99, expected cross-validation index (ECVI) = 0.25. The model predicted 45% of the total variance in illegal street racing behaviour. Sensation seeking and involvement in motor sport were directly associated with involvement in street car racing. This analysis indicates that motor sport has a strong direct effect on the likelihood of involvement in street racing, independent of any effect of sensation seeking propensity. Also, interest in motor sport produces more problematic attitudes to speeding, but this does not appear to influence involvement in street racing.

**Table 4: Direct, indirect and total effects of sensation seeking and involvement in motor sport on street car racing behaviour (standardized coefficients)**

	Sensation seeking		Motor Sport
Direct	0.25	Direct	0.49
Indirect via motor sport and attitudes	0.14	Indirect via attitudes	0.01
Total	0.39	Total	0.50

## Discussion

The results of the path analysis indicate that involvement in motor sport has an impact on driving behaviour. This produces a negative effect for road safety. However, the manner in which motor sport influences behaviour depends on whether the focus is on ‘violations’ (general driving behaviours) or on illegal street racing. Risky driving is a different type of problem to street racing. The antecedents of risky driving are attitudes and social norms (flowing from involvement in motor sport) whereas the antecedents of street racing is a ‘need for speed’ (measured by sensation seeking) and opportunity to observe how to do it (attendance at motor sport events).

Involvement in motor racing increases the likelihood that drivers will report violations (and hence increase their chance of involvement in an accident). The most important causal mechanism for this is through the effect of motor racing on attitudes to speeding. Motor racing enthusiasts (e.g. those who are more likely to attend motor racing events) are more likely to believe that speed limits are too restrictive or that driving over the speed limit is acceptable if you are a skilful driver. This effect is independent of the influence of sensation seeking propensity. This finding is consistent with other research. Ulleberg and Rundmo (2003) report risky driving behaviour being influenced by attitudes to speeding. Also research in the US has found that racing car drivers were more likely to have been fined for speeding and to have been involved in accidents than other drivers. The racing drivers were clearly more skilful than the average driver, but this skill may have led them to believe that speeding was acceptable because they had the skills to make it safe. Data on their accident involvement indicates that they over-estimated their driving skill.

Interest in motor sport also increases the likelihood of involvement in illegal street racing, even controlling for sensation seeking. However, the likely causal effect appears to operate in a different way. Interest in motor sport had a more direct effect on street racing than on risky driving in general. This may have been a case of vicarious learning, learning by observation, particularly if the motor sport involved was a drag racing event.

### Implications for policy

The findings of this research suggest that it is important to counteract the pro speeding messages (glorification of speed and risky driving behaviour) emanating from motor sport in order to shape attitudes about driving behaviour on public roads and to reduce risky driving behaviour on public roads, and to address driver’s perception of risk in relation to driver’s own level of confidence in their own driving skill. This indicates the value of interventions

based on social cognitive assumptions for risky driving behaviour. In other words, there is support for the notion that people's attitudes (in this case to speeding) do shape their behaviour, in this case measured by driving violations.

The direct relationship between sensation seeking and risky driving behaviour poses greater difficulty for designing appropriate road safety interventions. However sensation seeking is not necessarily linked to illegal behaviour. Hansen and Breivik (2001) found associations between a range of risky behaviours amongst adolescents that could be classified as socially deviant or acceptable (eg. ski downhill at high speed). In interviews with the Christchurch street racers, a number suggested that easy accessibility to legal facilities for burn-outs would reduce the incidence of illegal activities. The attraction to street racing was expressed as "chicks and fast cars" rather than a desire to engage in illegal activity. The important theme here is that a road safety intervention cannot change personality (sensation seeking) but can control potential environments in which it will be expressed.

One policy direction could be to shift interest from the sport of motor racing to other sports that have less social impact (e.g. mountaineering, sky diving or mountain bike riding). Mountain bike trails could be constructed in and around Christchurch, diverting risk taking into other highly stimulating and arousing activities. A problem with motor racing as a sport is that spectators who wish to emulate the behaviour of the motor racing drivers, can only emulate this behaviour on public roads. This then redistributes the burden of risk onto other road users who may happen to be in the vicinity of any illegal racing activity (either organised or spontaneous).

The difficulty with shifting interest from motor sport is the passion that many young people (particularly males) direct towards their cars. Therefore, they are more likely to act out their desire for sensation seeking through their cars. The broader response to this requires de-glorifying the car, and one way to do this is to ensure that motor sport events are never allowed to be staged in significant public spaces, as this signifies that such events are an accepted part of the culture of a city or society (Tranter and Keeffe, 2004).

Given that those young males in the study sample who were involved in motor racing were identified as a higher risk group compared to other young males, this might provide an opportunity for road safety education targeting. Road safety leaflets or messages through loud speakers could be broadcast at the motor racing events. Designing such material to appeal to high sensation seekers could improve its effectiveness. Stephenson, Hoyle, Palmgreen, and Slater (2003, p 285) report that an anti-drug campaign was made more successful by targeting the arousal needs of high sensation adolescents with messages that were visually, aurally, and emotionally stimulating.

Future research on the impact of motor sport on driver behaviour and illegal racing could include a sample with a wider age range and larger numbers of female drivers. The sample for this study was a purposive one, deliberately focussed on the groups most likely to be represented in illegal street racing. However, some older drivers and some females are involved in this racing, and it would be useful to ascertain whether the same impact of motor racing was evident for these groups. It would also be useful to conduct more qualitative research with the street racers themselves, to explore the links between legal motor sport and illegal racing activity. Also, longitudinal research is needed to track changes in behaviour over time and to precisely analyse the relationship between enforcement, attitudinal change campaigns and improvements in driver behaviour. While such research would be

operationally difficult, and may pose some interesting ethical questions, it is necessary to more fully understand the issues involved. In particular, the issue of the short term versus longer term impact of motor sport needs to be investigated. Some research suggests that when legal drag racing events are held, there is little illegal activity on that night (Leigh, 1995). However, the question remains whether a reduction in illegal activity for one night is outweighed by a possible increase in interest in motor sport, and a possible consequent increase in illegal racing at other times.

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