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Sample Representation in a Psychological Treatment Study after Single Event Paediatric Trauma

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Abstract

Children and their families who attended an emergency department following a single traumatic incident and who agreed to participate in a psychological treatment study (N = 211) were compared with non-participants (*N* = 2333) on several measures of trauma and injury severity: duration of admission and heart rate in the emergency department, emergency transport and admission to hospital, injury severity score, and triage code. Within the non-participant population, those who requested further information about the study (*N* = 573) were exposed to more severe trauma or injury than other non-participants (*N* = 1760). In addition, participants were exposed to more severe trauma or injury than either group of non-participants. These observations indicate that those exposed to more severe trauma or injury do not avoid participation in psychological treatment studies. Findings can therefore be generalised to those with more severe exposure, but not to the population as a whole.

Key words: trauma, child, adolescent, accidents, injury severity, recruitment bias

Sample Representation in a Psychological Treatment Study after Single Event Paediatric Trauma

The recruitment of representative samples is fundamental to scientific research. If research samples represent the core characteristics of the population, results can be meaningfully generalised to that population. Unfortunately, researchers have often inadequately reported recruitment and participant characteristics (Betan, Roberts, & McCluskey-Fawcett, 1995) and this has extended to prospective studies within paediatric populations afflicted by single event trauma. For example, researchers have failed to compare characteristics of participants and non-participants (e.g., Daviss et al., 2000; Winston, Kassam-Adams, Garcia-Espana, Ittenbach, & Cnaan, 2003). Compared to prospective or survey studies, treatment samples are even less representative because the number of studies is limited (Adler-Nevo & Menassis, 2005) and half of them consist of small sample sizes (i.e., N = 13 to 26) or populations exposed to war and natural disasters. The community context and sample characteristics of populations exposed to such widespread and catastrophic events seem unlikely to generalise to the populations afflicted by single incident trauma (e.g., paediatric injury).

The symptoms of Posttraumatic Stress Disorder (PTSD) after exposure to a single event trauma consist of three core symptom domains: re-experiencing, avoidance, and hyper-arousal. As the name suggests, avoidance symptoms consist of efforts to avoid trauma-related images, thoughts, conversations, and memories that are likely to cause distress. Avoidance symptoms are therefore likely to reduce the level of participation and, more importantly, restrict the range of trauma symptoms among participants (i.e., those with greater distress would be less likely to participate). Similarly, research samples from traumatised (Erickson & Steiner, 2000) and non-traumatised populations (Lefkowitz & Tesiny, 1985; Weinberger, Tublin, Ford, & Feldman,

1990) have shown lower rates of distress than in non-participants, indicating that those with more severe symptoms are less likely to participate. The reluctance to participate in research among those with more severe symptoms is not surprising given that around 10% of participants in trauma research report increased levels of distress that can be directly attributed to the research itself (Jorm, Kelly, & Morgan, 2007; Kassam-Adams & Newman, 2005).

Although participants in trauma studies are likely to be less distressed than non-participants, this cannot be assessed in a direct manner (i.e., using face-to-face interview, self report, collateral information from teachers or parents, etc.) as non-participants have already withdrawn their consent to participate. Furthermore, even if non-participants were assessed (e.g., in an abbreviated fashion), they would immediately be redefined as participants, or at least partial participants, thereby setting them apart from true non-participants. The best analogue study is therefore to examine variables related to the degree of trauma exposure, particularly if such variables are routinely recorded during triage or emergency medical treatment. In the present study, the variables of interest were chosen because of their association with trauma-related distress or the level of trauma exposure. They consisted of the severity of injury, heart rate in the emergency department (Bryant, Salmon, Sinclair, & Davidson, 2007; Langeland & Olff, 2008), and the duration of hospital admission (Williams, Cercarelli, & Dye, 2005). Additional variables were examined because they were likely to correlate with injury severity (i.e., transport to hospital by ambulance and admission to hospital). Demographic variables that show some association with the severity of trauma symptoms were also investigated. For example, girls show higher rates of trauma symptoms than boys (Borse et al., 2008; Mytton, Towner, Brussoni, & Gray, 2009; Tolin & Foa, 2006) and the level of trauma-related distress is greater in younger than older children (Ellis, Stores, & Mayou, 1998).

The aim of this study was to determine the degree to which those willing to participate in a trauma study differed from non-participants. The target population consisted of child and adolescent age groups who had been exposed to a diverse range of paediatric injuries (e.g., falls, anaphylaxis, physical assault, animal bites, burns etc.). A unique component of this study was the examination of a subgroup of non-participants who were sent information about the study but ultimately did not participate. The characteristics of this subgroup, defined as "initially interested non-participants" was of interest to determine if they exhibited features either of non-participants or participants, or elements of both. In view of the paucity of research in the area of sample representation and the equivocal nature of the findings, the present study was exploratory.

Method

Population Sample

The population consisted of all children aged six to 17 years (N=2780) who presented to the emergency department at Princess Margaret Hospital for Children, Perth, Western Australia, following single traumatic events (e.g., motor vehicle accident, dog bite, serious burn, near drowning, electrocution, fall) during a 21-month period from December 2003 to August 2005.

Exclusion Criteria

Exclusion criteria were identified from the emergency department database (see Table 1) and included: death, serious head injuries (e.g., skull fracture, scores in Accident and Emergency less than 12 on the Glasgow Coma Scale), past sexual or physical abuse, or serious (permanent) injury or death of a significant other in the accident. The exclusion criteria ensured that the sampled population were exposed to a single traumatic injury uncomplicated by head injury syndromes or the psychological sequelae of abuse or loss.

Sample Recruitment

The parents of patients meeting the parameters of the target population were contacted by phone one to three weeks (M = 14.31 $\pm$ 7.31 days) after their admission to the emergency department following an injury, and were asked whether they wished their child to participate in a psychological treatment study. The primary aims of the study were explained, namely: (a) to investigate the factors (particularly the role of various components of traumatic memories) in predicting persistent PTSD symptoms so that children at risk might be more easily identified in the future, and (b) to provide treatment for those children with persistent PTSD symptoms three months after their admission to the emergency department. Standard hospital resources such as patient transport were available upon request, but no additional incentives were offered to solicit participation.

If parents expressed interest in the study or agreed to participate, a brief screening for exclusion criteria was conducted and initial questions were addressed. Information about the study was then mailed and a follow up call was arranged in the subsequent week. During the follow-up call, any further questions were addressed and participation was confirmed. Reasons given for not participating were documented and subsequently coded for analysis (see Table 1).

Most (91.5%) of the population (N = 2544) were contacted by phone and offered a place in the study. Those who were unable to be contacted by phone no longer had the same phone number, their phone was disconnected, or they did not answer the phone or reply to multiple phone messages despite several attempts to make contact at different times during the day and evening. For those who could be contacted, the recruitment procedure resulted in three distinct groups: (a) study participants, who were initially sent information about the study and then attended the initial appointment (i.e., for the prospective investigation of PTSD symptoms; n = 211), (b) interested non-participants, who were initially sent information about the study but later

declined to participate (n = 573), and (c) non-participants, who declined to participate in the study and were therefore not sent the study information (n = 1760).

<<INSERT TABLE 1 ABOUT HERE>>

Measures

Injury cause. The hospital emergency department utilised Emergency Department Information Systems (EDIS) software, which included relevant demographic and medical details (i.e., triage details and final diagnosis) along with a detailed coding system for "injury cause." The latter consisted of 67 codes for injury cause that were collapsed into eight broad categories for this study (see Table 2).

<<INSERT TABLE 2 ABOUT HERE>>

Mode of transport to the emergency department. Mode of transport to the emergency department was coded within EDIS into five categories: private transport, ambulance, Royal Flying Doctor Service, helicopter, and "other." Due to the low number of patients in the latter three categories (i.e., n = 3, n = 2, and n = 1, respectively), Royal Flying Doctor Service and helicopter transport were coded as "ambulance," and "other" was coded as "missing."

Triage code. Upon arrival in the emergency department, each patient was screened by a trained emergency nurse to determine the degree of urgency for medical treatment. The Australasian Triage Scale (ATS) is a one to five rating that indicates the degree of urgency for medical treatment as follows: immediate (1), within 10 minutes (2), within 30 minutes (3), within 60 minutes (4), within 120 minutes (5) (Australian College of Emergency Medicine, 2000). The following terms also reflect the degree of urgency for the triage codes: resuscitative (1), emergency (2), urgent (3), semi-urgent (4), non-urgent (5) (Williams et al., 2005).

Injury severity score. Injury Severity Scores (ISS) were obtained using the Abbreviated

Injury Scale - 2005 (AIS-2005) (Association for the Advancement of Automobile Medicine [AAAM], 2005), which is considered the "gold standard" of anatomically based injury severity measures (Rutledge et al., 1997). Furthermore, ISS have outperformed other trauma scoring methods for predicting injury outcomes in paediatric patients (Narci et al., 2009). A Trauma Registry Officer with expertise in using the AIS-2005 provided training and cross-checked ISS to ensure that they were accurate.

ISS were calculated for a total of 602 patients consisting of all study participants (*n* = 211) and a random sample of 391 non-participants (i.e., interested non-participants, *n* =129; non-participants, *n* = 132; and those who could not be contacted, *n* = 130). This sample was selected using the 'Random sample of cases' option within the 'Select Cases' function of SPSS 13.0 for Windows. This number of non-participants corresponded with the maximum number of patients for whom data could be obtained by the researchers without compromising the resources of the patient records department. The distribution of injury severity scores was as follows: score of 0 = 58 (9.6%), mild (1-3) = 247 (41.0%), moderate (4-8) = 267 (44.4%), serious (9-15) = 26 (4.3%), severe (16-24) = 3 (0.5%), and critical (25-74) = 1 (0.2%).

Emergency department heart rate. Within this hospital, standard clinical care included the measurement and documentation of patient heart rates in the emergency department. This information was subsequently obtained for all study participants and the random sample of non-participants (as per ISS). Heart rates were included for analysis if they were taken within 12 hours of triage, although most (76.4%) were taken within one hour of triage. While numerous factors can affect post injury heart rate such as blood pressure, hormones, and personality (including a predisposition to anxiety) (Kraemer, Moergeli, Roth, Hepp, & Schnyder, 2008), heart rate in the emergency department is a well established predictor of trauma-related distress

six months after a trauma (Langeland & Olff, 2008) even after controlling for age, gender, and injury severity (Bryant et al., 2007).

Time spent in the emergency department. The EDIS database incorporated admission and discharge times from the emergency department, which permitted calculation of the time each patient spent in the emergency department.

Discharge status. The "destination" or discharge status of patients was coded within EDIS under several categories: (a) departed - treatment completed, (b) admitted to the ward - inpatient unit, (c) referred to another department (e.g., dental), (d) transferred to another public or private hospital, (e) did not wait, or (f) left at own risk. Due to the low numbers in four of these categories, those referred to another department (i.e., $n = 9$) or transferred to another hospital (i.e., $n = 7$) were coded as "admitted to ward" because further treatment was required. Those who "did not wait" ($n = 1$) or "left at their own risk" ($n = 1$) were coded as "missing."

Statistical Analysis

Inter-correlations. To determine if the variables examined in this study measured the intended construct (i.e., "the level of trauma exposure or injury severity"), Pearson inter-correlations were calculated between all variables within the population sub-sample (i.e., $n = 602$) and within the population as a whole ($N = 2780$) (see Table 3).

Participants versus non-participants. Two mixed design multivariate analyses of covariance were conducted to compare participants and non-participants in the two populations groups (i.e., population subsample and entire population). Both involved three levels for participation (i.e., participants and two groups of non-participants) with triage code and duration of time in the emergency department as one set of dependent variables and injury severity scores and heart rate as the other. As both age and gender were significantly inter-correlated with a

number of variables, these were entered as the main covariates (see Table 3). Other variables, such as injury severity scores and heart rate in the emergency department, were entered as additional covariates where appropriate. Where multivariate results were significant, univariate analyses of variance were conducted with a priori Helmert contrasts (i.e., study participants were compared with the two groups of non-participants combined, and then the two groups of non-participants were compared with each other).

The chi square and multivariate analyses that were used to compare participants and non-participants incorporated calculations of means, standard deviations, and percentages for the key variables (see Table 4). Variables were also compared by gender and age group with repeated and Helmert contrasts to investigate differences between age groups (6 to 8 years, 9 to 11 years and 12 years and above).

Reasons for non-participation. Within the non-participant group, separate mixed design multivariate analyses of covariance (controlling for age and gender) were conducted for each population group to examine the reason for non-participation (perceived as coping versus declined to participate for other reasons).

<<INSERT TABLES 3 AND 4 ABOUT HERE>>

Results

Inter-correlations

As demonstrated in Table 4, most indices of injury severity were significantly, although weakly, inter-correlated. Within the subsample, injury severity scores were not significantly correlated with transport to hospital by ambulance or duration of time spent in the emergency department.

Participants versus Non-participants

While study participants did not differ from non-participants by age, participants consisted of a smaller proportion of boys (55.5% versus 66.5%), X^2 (1, N = 2780) = 10.53, p = .001. They also had higher rates of transport to the emergency department by ambulance (36.5% versus 27.5%; X^2 [1, N = 2778] = 7.71, p < .01) and higher rates of admission to hospital (53.8% versus 41.8%; X^2 [1, n=2778] = 11.40, p = .001). Within the non-participants, those who were initially sent information about the study but later declined to participate had higher rates of transport to the emergency department by ambulance than those who declined to participate in the first instance and were not sent information (34.0% versus 24.5%; X^2 [1, N = 2331] = 19.92, p < .001) and a higher hospital admission rate subsequent to their emergency treatment (46.4% versus 40.1%; X^2 [1, N = 2333] = 7.21, p < .01).

The results of the mixed design multivariate analyses of covariance were significant for participation group for triage code and time spent in the emergency department, F(4, 5078) = 8.76, p < .001, and for heart rate and injury severity score, F(4, 858) = 2.82, p < .05. Subsequent univariate results were significant for triage code (F[2, 2539] = 17.38, p < .001) and heart rate (F[2, 429] = 4.24, p < .05), but not for time spent in the emergency department or injury severity score (see Table 5). Helmert contrasts confirmed that study participants had significantly lower (more urgent) triage codes (p < .001) than non-participants. Furthermore, within the non-participant group, those who were sent information about the study also had significantly lower triage codes than those who declined to participate from the outset (p = .001). Study participants had higher heart rates than non-participants and this remained the case when the injury severity score was entered as a covariate in addition to gender and age.

The various findings in relation to age and gender are catalogued in Tables 4 and 6. In summary, the population consisted of significantly more boys than girls. In comparison to boys,

girls had significantly higher heart rates in the emergency department (with age, triage code, and injury severity score as covariates) and significantly lower injury severity scores (with age, triage code, and emergency department heart rate as covariates). Rates of transport to hospital by ambulance increased significantly with progressive increases in age group. Mean triage codes and heart rates decreased as age group increased. However, mean injury severity scores and duration of time spent in the emergency department did not differ between age groups.

Reasons for Non-participation

The two mixed design multivariate analyses of covariance (controlling for age and gender) within the non-participant group (perceived as coping versus declined to participate for other reasons) were significant for triage code and time spent in the emergency department, $F(2, 2451) = 9.37$, $p < .001$, but not for heart rate or injury severity score. Subsequent univariate results were significant for triage code, $F(1, 2565) = 25.17$, $p < .001$, but not for time spent in the emergency department, heart rate, or injury severity score. A chi square analysis also confirmed significantly lower rates of transport to the emergency department by ambulance for those perceived as coping compared to those who did not participate for other reasons (23.4% versus 34.9%; $X^2 (1, N = 2211) = 26.95$, $p < .001$). The rate of hospital admission did not differ between groups.

Discussion

Given the relatively low rates of participation in trauma research and the prospect that this may result from the very nature of trauma symptoms (i.e., avoidance and fears that participation will exacerbate symptoms), the degree to which findings can be generalised to the population could be overstated. However, if sample bias occurs in the opposite direction (i.e., if participants were more traumatised than the population) findings could be usefully generalised to

clinical populations, but not others. Despite these implications, sample representation has attracted little research attention. A key reason for this might be that the direct assessment of non-participants is impossible. That is, once non-participants have declined to participate they have permanently withdrawn their consent and cannot be interviewed or surveyed. The present study therefore compared participants and non-participants on several variables that were likely to reflect the degree of trauma exposure or injury severity, or to indirectly reflect the degree of distress. In addition, a sample of initially interested non-participants was investigated to determine if there was a gradient effect across the various levels of participation.

Several variables of interest in the present study were weakly, but significantly, inter-correlated and therefore shared some common variance indicative of the degree of exposure to trauma or injury. Subject to replication and further confirmation of construct validity, these indirect measures appear useful in determining sample representation for paediatric populations following injury or trauma. The present study confirmed that within a population of children and adolescents exposed to a diverse range of single paediatric injuries, those who were willing to participate in a psychological treatment study were exposed to more severe trauma or injury than non-participants. In comparison to non-participants, participants had significantly higher post injury heart rates, were more frequently transported to hospital by ambulance, were more urgently in need of medical care (i.e., had lower triage codes), and were more frequently admitted to hospital following their treatment in the emergency department. Participants were also more likely to be girls than non-participants, consistent with the higher levels of trauma-related distress among girls compared to boys (Tolin & Foa, 2006). The sample bias toward more severe trauma exposure or injury severity among participants allays concerns that the more trauma-exposed members of the population avoid participating in research due to their trauma-

related distress. Of course, the direct role of PTSD symptoms such as avoidance was not assessed among non-participants and, as noted previously, such an assessment is impossible because non-participants can never be directly surveyed or assessed.

The other component to this study was to determine whether there was a selection gradient or intermediate level of trauma exposure or injury severity among non-participants who were initially interested in participating in the study, but ultimately declined. This group did indeed show higher levels of trauma exposure and injury severity than non-participants with no interest in participating from the outset. In addition, both participants and initially interested non-participants showed higher rates of transport to hospital by ambulance, lower triage codes, and higher rates of admission to hospital than other non-participants. It was clear that initial interest in participation and actual participation were related to higher levels of trauma exposure or injury severity. The presence of a selection bias was further confirmed when those non-participants who indicated that they were coping with their injury were found to be less frequently transported to hospital by ambulance and required less urgent medical treatment (i.e., had higher triage codes) than those who declined to participate for other reasons.

The association between help seeking and higher levels of PTSD following other single traumatic events (de Vries et al., 1999; Pina et al., 2008) may offer a simple explanation for the sample bias toward more severe trauma exposure or injury among participants (or at least their parents). Alternatively, this finding could relate to higher rates of trauma symptoms among parents (Landolt, Vollrath, Timm, Gnehm, & Sennhauser, 2005; Ostrowski, Christopher, & Delahanty, 2007) or the use of more adaptive coping strategies by parents or children (Greening & Stoppelbein, 2007; Stallard & Smith, 2007) in line with the cognitive model of PTSD (Elhers & Clark, 2000).

Participants did not differ from non-participants on injury severity scores or the duration of time spent in the emergency department, perhaps because of the characteristics of the population and inherent weaknesses of these measures. For example, the subsample of injury severity scores was restricted in range because 95% of scores were at or below moderate levels. Furthermore, injury severity scores focus on the degree of threat to life rather than injury severity per se; hence, the level of injury or 'dose' of exposure to trauma can be quite high, but is not necessarily reflected by the injury severity score. For example, an injury resulting in fractured bones in each arm (e.g., fractured left humerus, ulna, and radius and fractured right humerus and radius) is scored the same (i.e., a score of 2) as an injury resulting in a single fracture to one arm (e.g., left ulna). For this reason, injury severity scores based on the Abbreviated Injury Scale (AAAM, 1998, 2005) have been deemed inappropriate for use with children (Beattie, Currie, Williams, & Wright, 1998). Injury severity scores have also been criticised for failing to reflect the seriousness of traumatic events that do not result in injury such as near drowning or anaphylaxis (Beattie et al. 1998).

It is important to note that the measures of injury severity were recorded during the course of medical treatment; hence a degree of error is expected. While measures such as emergency department heart rate and duration of admission do not require clinical judgement, they are influenced by several factors unrelated to injury severity. For example, the duration of an emergency admission is affected by the type of medical treatment required, the level of demand for services, and availability of resources such as medical staff, treatment beds, specialists, and operating theatres. Heart rate is influenced by factors such as the time of day, temperature, weight, and fitness level. Nonetheless, the finding that heart rate was greater in participants than non-participants suggests that level of trauma-related distress was associated

with desire to participate in a psychological treatment study.

In the process of investigating sample representation, several population characteristics were noted with respect to gender and age differences. First, significantly more boys than girls presented to the emergency department following their exposure to an injury or trauma. Second, girls had significantly lower injury severity scores than boys (adjusted for age, triage code, and heart rate in the emergency department), yet their heart rates in the emergency department (adjusted for age, triage code, and injury severity scores) were significantly higher than boys. This is consistent with the pattern observed in healthy children (Silvetti, Drago, & Ragonese, 2001), children under laboratory stress (Kudielka, Buske-Kirschbaum, Hellhammer, & Kirschbaum, 2004; Matthews & Stoney, 1988) and traumatised populations (Langeland & Olff, 2008). Furthermore, there is an increased level of autonomic reactivity at the commencement of puberty (Salameh et al., 2008; Silvetti et al., 2001) which occurs earlier for girls than boys (Euling et al., 2008) and this coincides with the mean age of the present population. Third, the younger age groups showed significantly higher triage codes and lower rates of transport to hospital by ambulance. Fourth, those in the younger age groups recorded heart rates in the emergency department that were significantly higher than older age groups, even when adjusted for gender and injury severity scores. This finding is not surprising given the decrease in basal and ambulatory heart rate (Salameh et al., 2008) and heart rate reactivity (Matthews & Stoney, 1988) that occurs with increasing age until the onset of puberty, at which point there appears to be a general dampening of autonomic reactivity (Alkon et al., 2003; Matthews & Stoney, 1988). Although these findings account for some of the population variance, it may have been useful to investigate additional demographic characteristics because in a comparable study of injured Australian children, the proportion with married and grade 12 educated parents was above the

level expected in the general population (Davey et al., 2005).

In conclusion, the use of several correlates of trauma exposure and injury severity has proven useful in identifying sample bias among trauma study participants. The inclusion of novel comparison groups (i.e., non-participants with an initial interest in participation, non-participants who perceived they were coping and those who did not participate for other reasons) has added to the convergent validity of the present findings, which support the notion that participants are self selecting on the basis of legitimate perceptions of trauma exposure and injury severity.

The present findings suggest some convergence between indices of injury severity and trauma-related psychological symptoms. It is important to reiterate that trauma-related psychological symptoms were not assessed directly in the present study. Nonetheless, a major strength of this study was the use of several indirect measures of injury severity across a diverse range of single traumatic injuries or events. Subject to replication and further construct validation, these measures suggest that the generalisation of trauma study data is appropriate for clinical purposes (i.e., because the more trauma-exposed members of the population appear to be well represented) but may overstate the level of pathology in epidemiological or normal populations. While the findings suggest that there is a positive self selection bias related to increasing levels of injury severity, it is important to note that the use of exclusion criteria may have distorted the results. In particular, some of the most traumatised populations afflicted by single traumatic events (e.g., those involving the death or serious injury of a significant other, serious head injury, and sexual or physical abuse) were not sampled. Whether this particular group is under- or over-represented in single-trauma treatment studies warrants further investigation.

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Table 1

Recruitment Data for the Population

Participation Level	**Number of Cases**	**Percentage of population**
Non-Participants		
Could not be contacted	236	8.5%
Contacted but declined to participate		
No comment about reason for non-participation *(e.g., "no thanks", "our son doesn't want to do it", "we're not interested")*	333	12.0%
Child perceived as coping *(e.g., "s/he's fine", "he's not bothered at all by it", "no thanks, she's back to her usual self")*	1702	61.2%
Child/parent too busy *(e.g., "s/he's got too much else on", "we're too busy," or "we don't have time")*	185	6.6%
Exclusion criteria identified *(e.g., sexual or physical abuse, death of significant other, serious head injury noted in medical records, currently receiving intensive medical or psychological treatment, "our son has severe ADD")*	60	2.2%
Logistical problems *(e.g., "it's too inconvenient", "it's too far to come", parents both employed so it's too difficult to attend, unable to attend second assessment, lack of child care support, assessment times unsuitable)*	53	1.9%
Participants	211	7.6%
Totals	2780	100.0%

Table 2

Broad Categories of Injury Cause

Injury Category	**Examples**
(a) General injury or fall	Caught hand in machine, fall from bicycle, wall, tree, play equipment, fall through window and laceration
(b) Assault by an animal	Kicked by horse, stung or bitten by a spider, snake, fish, bee or dog.
(c) Assault by a person	Punched, kicked or stabbed
(d) Sporting injury	Tackled, collision with another player, hit by cricket bat, golf stick etc., fall during netball, soccer, rugby, gymnastics etc.
(e) Burn	From hot liquid, steam or chemicals
(f) Breathing threat	Near drowning, choking or anaphylaxis
(g) Unintentional injury by another person	Accidentally kicked, hit, elbowed or pushed, accidentally stuck with a stick or other implement, hit by a projectile such as a rock or ball, someone fell on them
(h) Motor vehicle accident	Car rollover; car, truck or bus versus car, motor cycle, bicycle or pedestrian

Table 3

Correlation Matrix for Age, Gender, Injury Severity Scores, and Indices of Injury Severity

Variable	Injury Severity Score	Heart Rate in Emergency Department	Transport to Emergency by ambulance	Triage Code	Duration (minutes) of Emergency Admission	Hospitalised after Emergency Department
	N = 602		N = 2780			
Age	.03	-.19**	.08**	-.10**	.01	.01
Gender	.04	.15**	.02	.04*	.00	.08**
Injury Severity Score	1.0	.19**	.12	-.22**	.04	.30**
Transport to Emergency by ambulance	.12	.13**	1.0	.31**	.08**	.19**
Triage Code	-.22**	-.26**	.31**	1.0	-.11**	.28**
Heart Rate in Emergency Department[a]	.19**	1.0	.13**	-.26**	.08*	.09*
Duration (minutes) of Emergency Admission	.04	.08*	.08**	-.11**	1.0	.12**
Hospitalised after Emergency Department	.30**	.09*	.19**	.28**	.12**	1.0

Note. [a]$N = 543$ for heart rate in the emergency department
** $p \leq .05$ ** $p < .01$

Table 4

Demographic Data and Indices of Trauma Severity for the Population and Subsample

Variable	**Mean (*SD*)**
Population	N=2780
Age	10.70 (2.71)
Gender	
Number of Males (%)[a]	1825 (65.6%)***
Number of Females (%)	955 (34.4%)
Number transported to the Emergency Department by ambulance (%)	784 (28.2%)
Triage Code	3.29 (0.70)
Number of minutes spent in the Emergency Department	166.4 (144.4)
Number admitted to hospital after attending the Emergency Department (%)	1187 (42.7%)
Population Subsample	N=602[b]
Injury Severity Score	2.95 (2.72)
Girls[c]	2.69 (2.53)**
Boys	3.12 (2.81)
Emergency Department heart rate	89.45 (15.74)
Girls[d]	93.61 (15.80)***
Boys	86.87 (15.16)

[a]There were significantly more males than females [X^2 (1, N = 2780) = 272.3].
[b]There were 59 subsample participants for whom Emergency Department (ED) heart rate data was missing however, when these participants were compared with those for whom their was data (N = 543), Injury Severity Scores were not significantly different [t(100.52) = -0.71, p > .05].
[c]Injury Severity Scores were significantly lower for girls compared with boys (even when age, triage code and ED heart rate were entered as covariates).
[d]ED heart rates were significantly higher for girls compared with boys.
** $p \leq .01$. *** $p < .001$.

Table 5

Demographic Data and Indices of Trauma Severity for Participants and Non-Participants in the Population and Subsample

	Participants	**Non-Participants**	
Variable		**Initially Interested**	**Not Interested**
Population (*N*=2544)	*n*=211	*n*=573	*n*=1760
Age	10.44 (2.64)	10.83 (2.65)	10.71 (2.74)
Gender (percent)			
Number of Males	117 (55.5%)[a]***	371 (64.7%)[c]	1181 (67.1%)[c]
Number of Females	94 (44.5%)	202 (35.3%)	579 (32.9%)
Transported to the Emergency Department by ambulance	77 (36.5%)[a]**	195 (34.0%)[b]***	431 (24.5%)
Mean Triage Code (*SD*)	3.09 (0.74)[a]***	3.23 (0.73)[b]***	3.34 (0.67)
Mean number of minutes spent in the Emergency Department (*SD*)	180.11 (145.09)	167.13 (149.65)	166.36 (142.96)
Admitted to hospital after attending the Emergency Department	113 (53.8%)[a]***	266 (46.4%)[b]**	705 (40.1%)
Population Subsample (*N*=434)[d]	*n*=200	*n*=115	*n*=119
Injury Severity Score	3.06 (2.90)	3.26 (2.98)	2.58 (1.97)
Heart Rate in Emergency Department	92.10 (16.21)[a]*	88.68 (12.83)	86.71 (15.21)

[a]Significant difference between participants and the two non-participant groups (i.e., initially interested and not interested) combined.
[b]Significant difference between the two non-participant groups (i.e., initially interested and not interested).
[c]There was a significantly higher proportion of boys than girls within each non-participant group (initially interested non-participants [X^2 (1, N = 573) = 49.84, p < .001)] and not interested non-participants [X^2 (1, N = 1760) = 205.9, p < .001)], but not in the participant group.
[d]*N* differs from previous tables because non-participants who were unable to be contacted (*n* = 109) were excluded.
***** $p \leq .05$. ****** $p \leq .01$. ******* $p < .001$.

Table 6

Demographic Data and Indices of Trauma Severity for Each Age Group in the Population and for the Subsample

	Age Group		
Variable	**6 to 8 years**	**9 to 11 years**	**12 years+**
Population (*N*=2780)	N=882	N=904	N=994
Gender (percent)			
Number of Males	579 (57.7%)[ac]***	569 (62.9%)[bc]***	747 (75.2%)[c]
Number of Females	373 (42.3%)	335 (37.1%)	247 (24.8%)
Transported to the Emergency Department by ambulance	216 (24.5%)[a]**	237 (26.2%)[b]***	331 (33.4%)
Mean Triage Code (*SD*)	3.36 (0.68)[a]***	3.30 (0.71)[b]*	3.21 (0.70)
Mean time (minutes) spent in the Emergency Department (*SD*)	169.49 (163.02)	164.28 (132.50)	165.53 (136.41)
Admitted to hospital after attending the Emergency Department	382 (43.4%)	382(42.3%)	423 (42.6%)
Population Subsample (*N*=602)	*n*=192	*n*=212	*n*=198
Injury Severity Score (*SD*)	2.81 (2.53)	3.06 (2.88)	2.97 (2.71)
	n=170	*n*=190	*n*=183
Emergency Department heart rate (*SD*)[d]	92.99 (13.88)[a]***	90.21 (16.25)[b]**	85.39 (15.98)

[a]Significant difference between the youngest age group and the older age groups combined.
[b]Significant difference between the middle age group (i.e., 9-11yrs) and older age group.
[c]Chi Square analyses were significant for the proportion of boys within each age group; i.e., 6 to 8yrs [X^2 (1, N = 882) = 20.97, p < .001)], 9 to 11 yrs [X^2 (1, N = 904) = 60.57, p < .001)] and 12 yrs and older [X^2 (1, N = 994) = 251.5, p < .001)]
[d]Due to missing values, N=543 for Emergency Department heart rate.
* $p \leq .05$. ** $p \leq .01$. *** $p < .001$.