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# Can a Didactic Intervention Influence Adolescent Attitudes to Acquired Brain Injury?

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A number of large-scale programs in the USA and Australia use didactic educational intervention in an effort to diminish the incidence of pre-adult brain injury. The present study examined the effects of a short-term brain-injury prevention program on the attitudes of a sample of high-school students in Queensland, Australia. Students gave self-report responses to items requiring them to rank conceptually distinct sets of items, respond to Likert scale items, estimate the magnitude of their response, and provide open-ended responses. The program was run as an experimental study, in that separate classes of students were assigned to a control group, a video group, a one-hour program group, and a video plus program group. Results suggest that, while the video and program had an immediate influence on student attitudes, these returned to pre-test levels within 2 months. Also, interestingly, males continued to rate their risk of brain injury higher than did females before and after the intervention. One way to view this set of outcomes is that longer-term evaluation of the efficacy of such programs is required. Another is to note that, regardless of exposure to the video and program, the students realistically assessed males as at greater risk of acquired brain injury, with this assessment providing insight into the "starring role" played by adolescent culture in mediating decision-making about risk avoidance.

## Preventing brain injury

Health promotion and injury prevention are socially important topics for community education, which extends into school-based education (Bogat & Jason, 1997; Johnson, Nicklas, Webber, & Berenson, 1997). Every child is subject to random risk. Pedestrian injuries are increasing risks for children, and drowning and driving are increasing risks to adolescents (Durlak, 1997). Environmental risks may lead to greater than expected problems for some children and adolescents. For example, high-risk neighbourhoods have higher rates of admission to critical care (Durlak, 1997). Life-threatening rebellious and antisocial behaviours also elevate individual risk.

At the macrolevel, it is recognised that education about community health has outstripped evaluation and that educational programming needs to include a mandatory evaluation component integrated into the planning and design of the program to ensure public accountability and program effectiveness (Flinders Institute of Public Policy and Management, 1999). At the school level, programs to improve child safety in the school have been focused on protection against infectious illness and reduction of physical

injury (e.g., Eichel & Goldman, 2001). The main aim of these programs is teaching, with considerable energy and resources directed to the design and implementation of curriculum materials and ways to engage students in learning the lessons and, then, it is hoped, applying these lessons to their lives.

Unintentional brain injury is not only an unpredictable source of acquired disability and death but also an opportunity for prevention (Gregg, & Appleton, 1998; Grossman, 1999). While health education is aimed to increase protective competencies and coping skills to avert future challenges to well-being, injury prevention is aimed to reduce future rates of problem behaviours and to replace these behaviours with more positive forms in order to decrease risk for future difficulties. Many aspects of daily life (walking, swimming, etc.) might not be regarded as closely linked to risks of brain injury: The risk is low, but the consequences can be catastrophic. When injury is preventable but risks are not anticipated or neglected, then educational intervention is indicated.

Child-focused programs are often based on a hopeful rationale of preventive inoculation before adolescence (Greene, Barnett, Crossen, Sexton, Ruzicka, & Neuwelt, 2002; see, also Wright, Rivara & Ferse, 1995). A short-term pretest-posttest study (Greene et al., 2000; see, also Wright et al., 1995) showed improved Years 2 and 3 students' knowledge of injury prevention but did not provide follow-up evaluation of knowledge retention. Morrongiello, Miron, and Reutz (1998) stated that, although many education intervention programs have been developed to prevent head and spinal cord injuries (Richards, 1990), their effectiveness is generally unknown. Moreover, Morrongiello et al. (1998) reported that the available results were either negative or mixed (Frank, Bouman, Cain, & Wats, 1992a, b) and that monitored changes in knowledge did not extend changes in risky behaviours (Englander, Cleary, O'Hare, et al., 1993; Richards, Hendricks, & Roberts, 1991).

In recent years, there has been some increase in the evaluative component of the proliferating programs in general health and safety programs for primary school children. One widespread program, which combined safety issues, music education, and community service learning, reported positive staff recommendations as the main outcome (Eichel & Goldman, 2001). Another evaluative study reported gains in 10-11-year-olds' safety knowledge in first aid, emergency call procedures, and basic life support resuscitation and awareness of danger in playing near a canal (Frederick, Bixby, Orzel, Brown, & Willett, 2000).

In recent work, evaluative research designs have also become more complex and experimental, in conjunction with more complex programs. When communities lack proscriptive legislation, then direct instruction of the children at risk becomes a priority. An extended K-5 curriculum for car safety belts, bicycle helmets, and smoke alarms in 12 Oklahoma schools undertook a range of formative, process, and outcome evaluations of the curriculum (Azeredo & Stephens-Stidham, 2003). Given that the low-based behaviours in this study showed some small but significant changes, long-term teaching was recommended as the best strategy to ensure maintenance of learning. Wesner (2003) used an experimental design and reported improved knowledge by midwestern Canadian preadolescents on 13 general knowledge questions. Health professional guest speakers taught the Think First Saskatchewan program to "use your head to protect your body."

Students with bicycles and rollerblades did not use protective gear before the program but showed a small significant increase after the program. Wesner found no sex differences in boys' and girls' risk taking in wearing seatbelts and rollerblading.

A widespread belief in safety programs is that the social validation of intervention might be greater when the agent who delivers a didactic program in a typical setting (e.g., school) is a direct participant in the clinical care setting. The agents involved in implementation of psychological interventions (Carr et al., 1999) can be either typical (e.g., teacher, parent) or atypical (e.g., psychologists, researchers). Health care professionals who are actively engaged in the aftermath of brain trauma often evince strong motivation to change the admission rate of avoidable injury. Although participation in prevention and community education might be beneficial to the well-being of these agents (e.g., acting to make a difference), there is little evidence that it benefits the recipients. For example, a hospital-school-community partnership mobilised nursing students to participate, as part of their community service, in a 6-week Think First injury prevention program with Year 2 children (Hall-Long, Schell, & Corrigan, 2001). Children showed a 35% increase in basic safety knowledge, and the nursing team agreed with the general value of the program and its community outreach). Despite the extensive effort involved in establishing this partnership, evaluation was focused on acquisition of specific facts and on instructors' sense of community engagement.

### **Prevention for adolescents**

Preventable brain injury arising from everyday activities of adolescents is one focus of community education, because adolescents and, indeed, all up to 19-years-old, are clearly the largest community age group with acquired brain injuries (Sterling, 1995). In the National Hospital Morbidity Database 1996-97, adolescents aged 15–19 had the highest incidence of hospitalisation for brain injury. Early injury is a disproportionate contributor to "years of potential life lost" (Durlak, 1997, p. 116). Serious consequences can accrue to financial future, family relationships, and to physical, academic, social, and emotional functioning.

Adolescents acquire elevated levels of developmental risk as they assume independent control of their lives free of adult supervision and as they begin to practice adult activities (e.g., driving) that afford extra risk. Adolescents take risks because they expect more positive than negative consequences for their behaviour (Moore & Gullone, 1996). Adolescents are sometimes viewed as stereotypically reckless about negative and dangerous consequences from fast driving, juvenile crimes, and unsafe sex (Gullone, Moore, Moss, & Boyd, 2000). Some developmental risk may accrue to socially approved thrill-seeking and general pursuit of independence. Other risks don't seem to have severe negative consequences, and risk-taking behaviour is likely when the perceived risk is slight (Gullone et al., 2000). Given that the link between perception and behaviour implies some cognitive and rational awareness of risk, Gullone et al. (2000) suggested that "negative" risk-takers might be able to shift to more positive risks.

Public health and safety programs for prevention of adolescent head injury have focused on head protection wear through a combination of public policy to alter the environment (legislation, car safety devices, bicycle helmets, sporting equipment, and

rules of games) and didactic health education of the child (Durlak, 1997). Various educational programs in western countries utilise a didactic instructional approach that aims to improve knowledge and awareness (Greene et al., 2000, 2002). These intervention programs involve combinations of videos, demonstrations of brain structure and function, plus testimonials from brain-injured adolescents. For example, there are Think First for Teens state and federal organisations and related websites in the USA and Canada such as the Think First Foundation (1996) and the American Neurosurgical Association (1995). It is assumed that these programs have educative value, such that instruction will increase understanding of the issues of brain and spinal injury and such that information will improve safety consciousness.

Support for didactic programs reflects an implicit view that, if young people only knew the consequences and understood what brain trauma could mean for their future, then they would change their risky behaviour and make more effort to protect themselves. For example, in 1998, the South West Health Region of NSW sponsored a major program to inform 12,000 adolescents in that country region that drinking-and-driving misbehaviour can lead to brain damage. Brain-injured tutors helped to deliver a 2-hour program on driving risks for brain injury (Passmore, undated). The rationale was that prevention of one injury would justify the cost. The minor evaluative component, an afterthought of this intervention, could only claim increased student awareness and future intention to drive safely (Dennis Gillivan, personal communication, 20th November, 2001).

The present study presents an evaluation of the effectiveness of a didactic intervention program. A health professional, who worked in a critical care hospital facility with many young head-injured patients, had previously developed the program, offered it to schools, and delivered it to several groups of school students (Avery, Bryer, & Grimbeek, 2001). This program evaluation sought to clarify issues of the nature of the knowledge that is transmitted to students, in addition to more typical measures of descriptive facts. In multicomponent didactic intervention, the component dimensions actually responsible for outcomes are often obscured (Durlak, 1997). The present study sought to examine the extent to which a range of dimensions of intervention was salient to adolescents before, during, and after intervention. The selection of dimensions affected by intervention was shaped in part by Bronfenbrenner's (1979) characterisation of the social field in terms of concentric circles of more immediate and more personal versus less immediate and less personal social influences. Based on this conceptualisation, it seemed likely that students would respond more readily to local and specific items than to more general and broadly based items. For this reason, questions about program format focussed on the immediate impact of video, personal contact, or both on participants, and questions about program content concerned the immediate dimensions of human change that influenced participants. This study predicted that a brief didactic intervention on adolescent awareness of situations likely to trigger negative consequence would result in attitudinal changes consistent with a diminution of risky behaviours.

## Methodology

### Participants

Students doing an elective health subject within one high school in a southern suburb of Brisbane, Queensland were asked to participate in this study. The school administration, health teacher, parents, and students agreed to participate after receiving ethical clearance documentation. From an initial group of 52 students, 44 students completed the study. Two students with previous traumatic experience were excluded, three became unavailable, and three produced incomplete responses on one or all of the pretest and posttest questionnaires.

### Materials

Questionnaire materials consisted of a set of self-report items with one exception (see below) produced specifically for this study. Equivalent sets of questionnaire items were developed for the pretest, posttest, and deferred posttest phases.

The pretest survey had several sections. The first section addressed personal exposure to injury, including general knowledge related to the incidence of brain injury; the second examined student judgments about risky behaviours; the third addressed helmet use on bikes; the fourth solicited open-ended responses to a car accident scenario; the fifth utilised items from the Risk and Adventure checklist (Lightfoot, 1997) related to risky behaviour; and the sixth asked participants to estimate the extent of risk for various bike riding scenarios.

The immediate post-test involved the four judgment questions plus a two-item estimate of the riskiness of a friend's seatbelt behaviour either alone or in company. The deferred follow-up posttest contained the four judgment questions, the Risk and Adventure Checklist, a magnitude item, and a rating of personal risk of brain injury, on a 10-point thermometer (0 = no risk; 10 = extreme risk). Students were asked to rate their risk of brain injury on a scale of "0" to "10", where the "0" point on the range of responses roughly corresponded with the bulb on a visual depiction of a thermometer, and the "10" corresponded to the tip of the thermometer. Participants were encouraged implicitly to rate themselves as scoring higher than "0" in that the zero point was accompanied by the bracketed message, "You're kidding!"

A 20-minute video, *Handle with Care* (Armstrong & Slattery, 1994), showed the diverse effects on social, emotional, and intellectual life, including the loss of independence, produced by brain injury sustained subsequent to risky behaviour involving drinking alcohol and driving a vehicle in an inebriated state.

Program materials included a model of the skull and the brain, and notes on the presenter's critical care work, types of brain injuries of patients and their causes, the process and outcomes of recovery from brain injury, and the case for prevention.

### Design

Half of the students, including half of the video students, participated in the one-hour program with the nurse. Half of the students who had not watched the video also received the program. One group continued with normal classroom activities.

**Table 1**

Design of intervention program

GROUP	PRETEST	WEEK 1	WEEK 2	POSTTEST	FOLLOW-UP TEST
1	Yes	Video	Nothing	Yes	Yes
2	Yes	Video	Program	Yes	Yes
3	Yes	Nothing	Program	Yes	Yes
4	Yes	Nothing	Nothing	Yes	Yes

### Procedure

The agent pilot-tested the program in several primary and secondary schools prior to the study and ran this program and the posttest 2 weeks later before holidays, and the longer-term posttest 3 months later.

The liaison teacher introduced the agent as a registered nurse (RN) from Royal Brisbane Hospital. As shown in Table 1, prior to commencing the study, all students were asked to complete a self-report instrument. This pretest was administered in the library video room or the school hall. A fortnight later, these students were asked again to provide ratings. After a three-month interval, these students were again asked to respond to selected items. These questionnaires each took about 20 minutes to complete.

Students were asked not to discuss their participation during the course of the study. The conditions of pretest questionnaire completion, however, did not preclude some sharing. Similarly, posttest conditions were somewhat disorganised.

The *Handle with Care* video ran for approximately 20 minutes, with a discussion afterward. The program ran for one hour.

The program featured the agent's work in intensive care and neuroreferral and included description of the various kinds of patients with acquired brain injury (e.g., drugs, alcohol, accidents such as drowning) and consequential problems in acute care (e.g., brain infections from shunts, etc.). The presenter showed a "Real Skull" model (sectional brain within a skull structure) to make the point that the skull acts as a helmet for the brain (brain model sitting inside); except in circumstances of extra speed and external forces, the skull provides sufficient protection. The presenter pointed out lobes of the brain and opened the model to discuss the basic anatomy of lobes, in which each area have special jobs but work together as one. The presenter outlined the nature of injuries, including skull fractures, broken blood vessels (haemorrhage), and swelling from oxygen deprivation and concussive forces. She also outlined causes, including car accidents, alcohol and other drug use, and sport. The agent stressed that, compared to broken bones and other injuries, brain recovery requires considerable time to heal and recover.

### Results

#### Collation of data

Data was transcribed from the three sets of questionnaires and collated in terms of experimental group. Since student responses to open-ended questions were not available for coding, they were omitted from subsequent analyses. Also, given the vast array of

items and tests, only a subset of these was reported below.

### **Descriptive analysis**

Participants ranged in age from 14 to 16, with a majority of 15-year-old (68% of the total) and males (60% of the total). Participants were evenly allocated across the four experimental groups (23%, 27%, 30%, & 21%). In order to facilitate further analysis of age related effects, the three 16-year-olds were recoded to form part of a 15- to 16-year-old group.

Prior exposure to injury was rated by asking participants to nominate whether they'd been a visitor or patient in a general ward, accident and emergency ward, intensive care unit, or operating room, with the extent of exposure designated numerically by scores ranging from 0-8. Again, to facilitate further analysis, the response range was recoded into two categories, labelled "low" or "high" exposure groups. Approximately 41% of participants had a high degree of previous exposure to hospital settings.

Approximately 21% knew someone close to them that had recently acquired an accident-related disability, and 25% knew someone close that had died from accidental injuries.

An examination of nonparametric bivariate correlations indicated a pre-existing association between experimental group membership and exposure to accident-related disability (Spearman's  $\rho = -0.363$ ,  $p < .05$ ). Further examination via SPSS Crosstabs contingency tables suggests that the 20% who had experienced such an event were equally present in both control and program groups and almost entirely absent from the video + program group. For this reason, a decision was taken to recode the four groups into three: video, video + program, and control. The recoded set of three groups was not significantly correlated with accident related disability or with any other pre-existing condition.

When asked about the likelihood of females receiving brain injuries, only 16% of participants judged the matter correctly. In contrast, when asked to judge which age group would be most likely to receive brain injuries, 61% did so correctly.

Approximately, 71% said they wore a helmet. Additionally, 66% said their friend would be likely to wear a helmet with straps loosely or firmly in place when riding alone, and 89% said their friend would do so when riding in a group.

Students were asked to assess the likelihood of taking risks in a variety of contexts, and responses were summed on a scale from 1–12. Over 50% of the students obtained scores of 8 or more out of 12, with a median score of 8, and an interquartile range extending from 5 to 9.

There were significant correlations between gender and the likelihood of wearing a helmet ( $r = .336$ ,  $p < .05$ ) or previous exposure to hospital settings ( $r = -.420$ ,  $p < .05$ ) such that females were less likely not to wear a helmet and females were less likely to have been exposed to high levels of hospital setting.

There was a significant correlation between those exposed to accidental death and those likely to wear a helmet ( $r = -.316$ ,  $p < .05$ ) such that those who had been exposed to accidental death were less likely to wear a helmet.

Finally, there was a positive correlation between a friend wearing a helmet when cycling alone and previous exposure to hospital settings ( $r = .381$ ,  $p < .01$ ), or age ( $r = .421$ ,  $p < .01$ ),

such that 15- to 16-year-olds or those previously exposed to high levels of hospital settings were far less likely to respond that a friend when riding alone would ride a bike without the helmet relatively safely done up.

In summary, although there were significant relationships between some of these pre-existing conditions, none of them were significantly correlated with the three experimental groups under consideration.

### **Inferential analysis**

#### *Pretest*

Participants were required to rank responses to sets of questions aligned to seven distinct dimensions of identity, comprising physical, cognitive, social, family, work, appearance, and emotion (see method section). The effect of group membership on the ranking of these seven dimensions was examined in four distinct contexts, comprising importance to daily life, risky situations, risky behaviours, and effect of brain injury on daily life.

The effect of group membership on these variables was examined by means of the SPSS Kruskal-Wallis test, given its suitability for combinations of categorical and ordinal scales of measurement. Additionally, because of the large number of comparisons planned in the course of this study, only significance levels less than one in a hundred were considered. From the point of view of correcting for family-wise error, a probability of one in a thousand would enjoy a higher degree of acceptance. However, given the small sample sizes (cell sizes of 9, 10, and 25 in the three experimental conditions), a slightly less stringent correction was deemed appropriate. When considered at this relatively stringent level, there were no significant effects for group membership prior to the onset of the study program.

#### *Posttest 1*

Students were again asked to rank the items immediately following the completion of experimental and control conditions on the first day of the program. A further set of Kruskal-Wallis tests were carried out to examine the effect of the administration of the program on responses to items representing the seven dimensions and the four contexts for consideration of brain injury.

Following posttest 1, there was a significant effect for family in the context of importance to daily life ( $X^2 = 9.328$ ,  $df = 2$ ,  $p < .009$ ) such that the video + program group considered this to be least important and the control group most important. There was also a significant effect for appearance in the context of risky situations ( $X^2 = 11.905$ ,  $df = 2$ ,  $p < .003$ ) such that the video + program group considered it most important and the control group least important. Finally, there was a significant effect for work in the context of risky behaviours ( $X^2 = 10.590$ ,  $df = 2$ ,  $p < .005$ ) such that the video + program group considered it most important and the control group least important.

Participants were again asked to describe the riskiness of a friend's behaviour in terms of the extent to which the seatbelt is done up either when driving alone or with friends. In neither case was there a significant effect for group membership.

### *Posttest 2*

Students were asked again to rank the items 3 months after completion of the prevention program. A set of Kruskal-Wallis tests were carried out to examine the longer-term effect of the administration of the program on responses to items representing the seven dimensions and the four contexts for consideration of brain injury. Surprisingly, there were no significant effects for group membership three months subsequent to the completion of the program.

Additionally, willingness to take risks was re-examined 2 months subsequent to the completion of the program by asking participants to complete a second risk inventory (the risk thermometer). Again, there was no significant effect for group membership, and there was a significant longer-term effect for gender ( $X^2 = 7.721$ ,  $df = 1$ ,  $p < .005$ ) such that males were more likely than females to rate their risk of brain injury as high rather than low.

### **Discussion**

It was predicted that exposure to the program or video or both would lower willingness to take risks. It was also predicted that exposure to the program or video or both would have a positive effect on participant ability to discriminate the relative importance of varying social settings in relation to the importance, situations, risks, and consequences of brain injury. In the event, there was a significant effect for group in the posttest immediately following completion of the one-hour program. In the longer-term, there was no significant effect that could be related directly to exposure to the program.

Methodological issues that bear on these outcomes include the nature of the sample and the seminatural conditions for conducting the study. The intervention program was run in the natural setting of a high school, and availability and cooperation of specific teachers constrained its selection of participants. In addition, despite attempts to avoid leakage, it is likely that students discussed the video and one-hour program in other settings, a situation that probably diluted the effect of group condition. From this perspective, the study setting most probably acted to dilute the effect of group condition, but the short-term statistical significance for some measures suggests that these adverse conditions did not substantially influence short-term outcomes.

Didactic education is the most common preventive approach to acquired brain injury. This approach is relatively easy to implement but unlikely to be evaluated even in the short-term. Although immediate outcomes from this evaluation of a relatively brief didactic intervention by a health professional indicate that it might be beneficial for future programs to focus on protecting self, friends, and parents from harm, the longer-term evaluation found no statistical evidence that the program had any impact.

One insight into the countervailing forces to such intervention programs came from pretest and posttest responses, which indicated that females rated themselves as less at risk than males. This gender difference is consistent with pretest associations between events such as exposure to hospital settings and familiarity with previous instances of disability or death. Male adolescents were more likely to be aware of risks (hospital outpatients) but were not deterred (Lightfoot, 1997). That is, independent of the intervention program, adolescent males were more likely to be perceived as at risk of

brain injury, an outcome that might well reflect the importance of male risk taking as a rite of passage in adolescent culture.

## Conclusions

Two general conclusions can be drawn from this study's findings. One is that, if we are to continue to invest in such short-term intervention programs, then we need to incorporate evaluation over the longer term. The other is that we need to reconsider the way in which such programs target adolescents. In terms of Bronfenbrenner's (1979) circles of influence, this study's findings suggest the influence of the broader domain of adolescent culture to be more influential than the more immediate domain of personal safety. Some early development studies support participation and play, but the hubris of adolescence might well require intervention programs to take into account adolescent culture by targeting, for instance, the personal impact of brain injury on independence from family.

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