Institution: Plymouth University

Unit of Assessment:UoA4

Title of case study: A research-led approach to the design, implementation and evaluation of risk communications to promote safe behaviour.

1. Summary of the impact (indicative maximum 100 words)

The Human Factors Group (HFG) has established an evidence base to inform the design, implementation and evaluation of risk communications in promoting safe behaviour. They have delineated a range of design, linguistic and personal variables that influence the effectiveness of risk communications, as well as identifying important demographic and psychological variables that affect personal safety, particularly in relation to driving. This evidence has been used to inform the development of road safety interventions and tools/guidelines for communication in civil emergencies. There has been impact at national and local government level, driving changes in policy and practice. Evidence has been integrated into the road safety policy and interventions of local government, and into government guidance on communicating during civil emergencies. Emergency preparedness documents for public use have been developed and validated. Our success at embedding research evidence into practice has received national and international recognition (e.g. Prince Michael International Road Safety Award, 2012; HM Government Emergency Preparedness Guidance – case study illustrating good practice; and a request for dissemination to World Health Organisation).

2. Underpinning research (indicative maximum 500 words)

The work described was led by Dr Elizabeth Hellier (Reader) and Professor Judy Edworthy. Edworthy has worked in the school since 1985 and Hellier since 2000. Staff employed and supervised by Hellier and Edworthy to work on the research described were Dr Lex Newbold (2007-9), Dr Kirsteen Aldrich (now Titchener) (2006-9), Dr Donna Reid (2006-7), Dr Elizabeth Gabe-Thomas (2007-11, including PhD), Mr Phil Jefferies (2010-11), Dr Jonathan Rolison (2011-12), and Ms Vicky Dunn (2010-11). Ms Poppy Husband was employed as a KTP associate from 2008-2010 and Ms Laura Hurst as a KTP Associate from 2010-2012. Both KTP associates were supervised by Dr Hellier. Dr Paul Hewson is an Associate Professor in the School of Mathematics and Computing at the University of Plymouth who has collaborated on the work.

Research in this area has covered four main topics: people's interpretation of visual warnings; compliance with visual warnings; the demographics of risky behaviour, particularly in relation to road safety; and the psychological factors predicting road safety. In terms of people's interpretation of visual warnings, the HFG has described how a range of design, linguistic, and personal variables influence the judged effectiveness of risk communications (e.g., how communications are interpreted) and predict risky behaviour. Early work considered the effects of design features on judgements of the hazard implied by warnings, demonstrating for example, that increasing font and border size increases the perceived hazardousness of warnings, as does using the colour red rather than black (Edworthy and Adams, 1995).This was followed by work looking at how linguistic factors impact on the perception of risk communications. For example, signal words (single words like 'Danger', 'Warning', 'Caution', used to draw attention to hazards) were shown to vary consistently and reliably in terms of the degree of severity indicated by those words and to be able to function as a scale of perceived hazard (Hellier, Edworthy, Wright and Newstead, 2000). Further work demonstrated that while perceived hazard/danger is an important attribute of signal words, other meanings they are associated with make them more or less appropriate for use in different risk communication contexts (Hellier, Aldrich, Wright, Edworthy and Daunt, 2007).

In terms of actual compliance with warnings, studies have been carried out using simulation tasks collecting direct behavioural evidence of compliance (Edworthy, Hellier, Lambell, Grey, Aldrich and Lee, 2004). Here, warnings were created that varied systematically along linguistic dimensions such as explicitness/implicitness (the degree to which the risk is described exactly, and in detail), definite/probable (the degree to which the risk is described as likely to occur), active/passive (a linguistic device determining the extent to which the risk is the direct subject of a statement) and the use (or no use) of personal pronoun (which determines the extent to which the observer is directly addressed). When these warnings were rated, there was more anticipated compliance for the first style, rather than the second style, of each pair. The findings were generalised to simulated tasks where the same effects were revealed for actual compliance. This work also showed that warning information is most effective (in terms of actual compliance) when placed within 'Directions for use' so that it is received contemporaneously with the task.

Simultaneously we explored personal variables that influence safety behaviour, which also have implications for safety-related communications and interventions. For example we demonstrated that older drivers are no more at risk than older pedestrians or passengers, suggesting that interventions should consider older road *users*, not older *drivers* explicitly (Rolison, Hewson, Hellier and Husband, 2012). Other work demonstrates how the tendency for older motorcyclists to drive more powerful motorcycles negates the protective effect of age on fatality rate found for road users (Rolison, Hewson, Hellier and Hurst, 2013). This road safety research was conducted in collaboration with Devon and Cornwall County Councils [DCC & CCC] and influenced practice before it was cleared for general publication, hence publication follows impact in this particular case.

3. References to the research (indicative maximum of six references)

Edworthy, J & Adams, A (1995) Quantifying and predicting the effects of basic text display variables on the perceived urgency of warning labels - trade-offs involving font size, border width and colour. *Ergonomics*, *38*, 2221-37. DOI:10.1080/00140139508925264
Citations: 57. Impact factor 2011: 1.409; 5-year IF: 1.620. Ranked 3/16 in 'Ergonomics' for IF and 2/16 for Eigenfactor (JCR)

Hellier, E., Edworthy, J., Wright, D. & Newstead, S. (2000) On the Stability of the Arousal Strength of Warning Signal Words. *Applied Cognitive Psychology*, *14*, 577-592. http://onlinelibrary.wiley.com/doi/10.1002/1099-0720(200011/12)14:6%3C577::AID-ACP682%3E3.0.CO;2-A/pdf
Citations: 29. Impact factor 2011: 1.667; 5-year IF: 1.983. Ranked 45/73 in 'Psychology, Experimental' for IF and 30/73 for Eigenfactor (JCR)

Hellier, E., Aldrich, K., Wright, D., Edworthy, J. & Daunt, D. (2007). A Multidimensional Analysis Of Warning Signal Words. *Journal of Risk Research*, *10*, 323-338. DOI: 10.1080/13669870601066963
Impact factor 2011: 0.880; 5-year IF 1.173. Ranked 33/89 in 'Social Sciences, Interdisciplinary' for IF and 19/89 for Eigenfactor (JCR)

Edworthy, J, Hellier, E J, Lambell, N, Grey, C, Aldrich, K & Lee, A. (2004) Linguistic and location effects in compliance to pesticide warning labels. *Human Factors, 46*, 1-21. DOI: 10.1518/hfes.46.1.11.30383
Citations: 21. Impact factor 2011: 1.187; 5-year IF 1.885. Ranked 7/16 in 'Ergonomics' for IF and 5/16 for Eigenfactor (JCR)

Rolison, J., Hewson, P., Hellier, E., Husband, P (2012) Risk of fatal injury in older adult drivers, passengers, and pedestrians. *Journal of the American Geriatrics Society*, *60*, 1504-8. DOI: 10.1111/j.1532-5415.2012.04059.
Impact factor, 2011: 3.737; 5-year IF 4.315. Ranked 2/30 in 'Gerontology' for IF and 1/30 for Eigenfactor (JCR)

Rolison, J., Hewson, P., Hellier, E & Hurst, L (2013) Risks of High-powered Motorcycles among Younger Adults. *American Journal of Public Health, Online ahead of print, Jan 2013:e1-e4* http://pearl.plymouth.ac.uk:8080/pearl_xmlui/handle/10026.1/1259
Impact factor 2011: 3.926; 5-year IF 4.764. Ranked 3/131 in 'Public, Environmental and Occupational Health' for IF and 2/131 for Eigenfactor (JCR)

Grants

2000-1 Health and Safety Executive The effectiveness of pesticide labelling (Edworthy and Hellier), £74,000

2006-8 Home Office/Cabinet Office: 'Factors influencing information spread and reliability' (Hellier and Edworthy) £292,000

2008-9 Home Office/Cabinet Office: 'Evaluating the Application of Evidence-Based Guidance to the Design of Emergency Communication Literature' (Hellier, Newbold and Edworthy) £63,000

2009-10 NHS Connecting for Health: 'Efficacy of prompts and alerts in eprescribing' (Edworthy and Hellier) £80,000

4. Details of the impact (indicative maximum 750 words)

The impact of this work has been in four areas

1. *Staff Movement from Academia to Local Government*

Knowledge Transfer Partnerships (KTPs) were established between the University and both Cornwall County Council and Devon County Council [1,2]. The explicit aim of these KTPs was to

transform the councils into evidence-led organisations, and to embed the research evidence into practice locally and nationally. Following the awards, a permanent position, 'Evidence-Based Researcher' was created in DCC (post filled by Poppy Husband formerly employed by the KTP) [2] The awards were as follows:

- 2010-2012 Knowledge Transfer Partnership with ESRC/Cornwall County Council (Hewson and Hellier). To improve road safety programme delivery through evidence and research led practice, specifically focussing on fatalities within the elderly, the young and motorcyclists (£116,000).
- 2008-2010 Knowledge Transfer Partnership in collaboration with ESRC/Devon County Council (Hellier and Hewson). Evidence based practice for road safety practitioners. (£109, 635).

2. Changes to National and Local Government guidelines

In 2009 the group was commissioned to produce a Public Information Booklet for the MoD on Nuclear Emergency at Devonport Dockyard. This booklet incorporates specific research findings (in particular, from Edworthy et al. 2004 and Edworthy and Adams, 1995), for example, the use of the personal pronoun, definitive language, increased readability and print size/colour). The booklet has been distributed to 30,000 homes within a 3km radius of Devonport Dockyard and has been shown to be more understandable, more memorable and preferred to the previous booklet [3]. This work was cited by HM Government Emergency Preparedness Guidance (Chapter 7: Communicating with the Public) [4] as a case study of good practice for using research evidence to inform the design and evaluation of guidance for the public. The key findings have also more generally informed HM Government Emergency Preparedness Guidance on Part 1 of the Civil Contingencies Act (2004, guidance revised in March 2012) [5]. Front line responders nationwide are required to use this guidance to develop and implement their emergency communications.

The key research findings on warning perception and compliance (Edworthy and Adams, 1995; Edworthy et al. 2004; Hellier et al. 2000; Hellier et al. 2007) have been incorporated into DCC's Guidelines on Persuasive Communication (2011) which guide the design of communication with the public across all Council Departments [2]. The guidelines are also incorporated into DCC's 'Evidence-Based Practice for Road Injury Prevention' course which has been delivered to 50 road safety professionals in Devon and 40 nationally, with 100 participants anticipated in 2013 [6]. The course has been designed to ensure that road safety practitioners use research evidence to inform their professional practice. In DCC amendments have been made to on-road text warnings, to bring them into line with the guidance [2] and research findings.

3. Changes to national/local Government Practice

The research findings in their entirety (warning perception and compliance; psychological factors of and demographic factors in road safety) have been applied to road and driver safety. The research into road safety (Rolison et al., 2012; Rolison et al., 2013) identifies problem areas in driver safety which can be addressed through behavioural change programmes. Through Knowledge Transfer Partnerships awarded to Hellier and Hewson, and Devon and Cornwall County Councils from 2008 onwards (see above), the application of the HFG's work has been translated into a number of practical outputs. Reports applying the evidence to promoting safe behaviour in older drivers (2009), younger drivers (2010), motorcyclists (2010), and work-related drivers(2010), as well as the influence of deprivation on safe behaviour and the effectiveness of cognitive training and behaviour change techniques, were published on the Road Safety Knowledge Centre (2266 subscribers, approximately 1400 views a month) [7] . These reports are disseminated to road safety professionals nationally and now influence practice. For example, the deprivation report resulted in the introduction of 20mph zones in deprived areas in Cornwall, and was included in the Cornwall and Isles of Scilly Alcohol Awareness Strategy [8], leading to interventions for drunken and teenage pedestrians in deprived areas [9]. The behaviour change report led to a revision of all CCC's road safety initiatives in line with the recommendations that they include a variety of behaviour change techniques. This initiative won the Prince Michael International Road Safety Award (2012), and has been adopted by other local authorities. The Director of Road Safe has asked to share this work with the World Health Organisation [1]. The report on young drivers led to the re-design of Devon and Cornwall's 'Learn2Live' programme (a road safety intervention delivered to 14,000 17-18 year olds pa [2]. The motorcycle report (and subsequent paper, Rolison et al. 2013) resulted in a campaign to prompt anticipated regret amongst riders and awareness campaigns for specific risk factors of motorcycling such as engine

size [1].

The research evidence was also integrated into the Department of Transport's National Evaluation Toolkit 2010 for road safety practitioners [10] (Husband was National Champion for this toolkit, hosting workshops to embed it in practice) and into the monitoring and evaluation framework for the Local Transport Plan. The toolkit is for use by all UK road safety practitioners to evaluate road safety interventions. The HFG's evaluation of DCC's 'Honest Truth' intervention won the Chartered Institute of Public Relations West of England PRide award for best Use of Measurement and Evaluation 2012 http://www.cipr.co.uk/content/events-awards/pride-awards/results-2012/west-england

In addition, change management teams have been created within DCC and CCC to embed the research evidence into practice. The change management teams go beyond road safety professionals and also include fire service, police, driving instructors, and neighbourhood groups [1,2,8].

4. Participation in national public policy/advisory committees

The HFG have been invited as research experts to several policy/advisory committee meetings. These committees shape national and local government policy and practice. These are: Cabinet Office Civil Contingencies Secretariat Warning and Informing Workshop 2009 (Hellier); Parliamentary Advisory Committee for Transport Working Party on Young Drivers 2010 (Husband); and Cabinet Office Civil Contingencies Secretariat Cell Broadcast Feasibility Working Group 2009 (Edworthy)

5. Sources to corroborate the impact (indicative maximum of 10 references)

[1] Casualty Reduction Manager, Transportation Service. Environment, Planning & Economy, Cornwall Council, Redruth Tel. 01872 327237 (corroborating email available on request)

[2] Road Safety Operations and Partnership Programme Manager, Devon County Council. Environment Economy and Culture Directorate (corroborating email available on request)

[3] Civil Protection Manager, Plymouth City Council, Plymouth, Devon (corroborating email available on request)

[4] Civil Contingencies Act Enhancement Programme 2012, Chapter 7: Communicating with the Public http://www.cabinetoffice.gov.uk/sites/default/files/resources/Chapter-7-Communicating-with-the-Public_18042012.pdf. pages 17, 32, 40

[5] High Impacts Team Policy Manager, Civil Contingencies Secretariat, Cabinet Office (corroborating email available on request)

[6] Devon County Council's Evidence-Based Practice for Road Injury Prevention course http://system.newzapp.co.uk/GPage.asp?LID=OSwxODE3MDU1NDc=

[7] Road Safety Knowledge Centre Links (some only visible for review via CCC website due to password restrictions).
Work related drivers: http://www.roadsafetygb.org.uk/news/1618.html
Deprivation report : http://www.cornwall.gov.uk/default.aspx?page=30370.
Motorcyclists: http://www.cornwall.gov.uk/default.aspx?page=30370.
Behaviour Change: http://www.roadsafetyknowledgecentre.org.uk/sections/research-reports/knowledge/571.html

[8] Cornwall and the Isles of Scilly Alcohol Awareness Strategy https://www.amethyst.gov.uk/Download_Documents/Strategies Audits/CIOS%20Alcohol%20Needs%20Assessment%202010-11%20FINAL.pdf (pg 100)

[9] County Council Meeting Minutes available on request to corroborate the use of 300,000 flash animations on www.motorcyclenews.com which ran from 1-5-12 to 31-7-12, and petrol pump stickers on 14 forecourts in Cornwall for 8 weeks

[10] The toolkit evaluation website http://www.roadsafetyevaluation.com/index.html