PROMOTING EVIDENCE-BASED CHILDHOOD FEVER MANAGEMENT THROUGH A PEER EDUCATION PROGRAM BASED ON THE THEORY OF PLANNED BEHAVIOR

ABSTRACT

Aims and Objectives

This study examined effectiveness of a theoretically based education programme in reducing inappropriate antipyretic use in fever management.

Background

Paediatric nurses' inconsistent, ritualistic antipyretic use in fever management is influenced by many factors including inconsistent beliefs and parental requests. Determinants of antipyretic administration, identified by the Theory of Planned Behavior (TPB), were belief-based attitudes and subjective norms.

Design

A quasi-experiment explored group effects of a Peer Education Program, based on the TPB, on factors influencing paediatric nurses' antipyretic administration. Surveys and chart audits collected data from medical wards at experimental and control hospitals one month pre and one and four months post Peer Education Program.

Methods

All nurses employed in targeted wards were eligible to participate in surveys and all eligible charts were audited. The Peer Education Program (PEP) consisted of four one-hour sessions targeting evidence-based knowledge, myths and misconceptions, normative, attitudinal and control influences over and rehearsal of evidence-based fever management. All nurses in experimental

hospital targeted wards were eligible to attend. Peer education and support facilitated session information reaching those unable to attend sessions.

Results

Two-way univariate ANOVAs explored between subject, experimental and control group and within subject factors, pre, post and latency data. Significant interactions in normative influence ($p=0.01$) and intentions ($p=0.01$), a significant main group effect in control influence ($p=0.01$) and a significant main effect between audit data across time points ($p=0.03$) highlight PEP effectiveness in behaviour change. Normative, control and intention changes post PEP were maintained in latency data; mean temperature was not.

Conclusion

The PEP, based on a behaviour change theory, initiated and maintained evidence-based intentions for antipyretics use in fever management.

Relevance to Clinical Practice

The promotion of evidence-based change in organisational unit intentions and behaviour highlights the crucial role peer support and education can play in continuing educational programmes.

Key Words: Child Nursing, Nurse Education, Clinical Decision-Making, Evidence-based Practice, Experimental Design, Theory of Planned Behavior

INTRODUCTION

Although paediatric nurses' inconsistent fever management practices have been reported for more than a decade (Reeves-Swift 1990, Poirier *et al.* 2000), our research was first to theoretically explore fever management (Edwards *et al.* 2001c, 2003b, Walsh *et al.* 2005, 2006). Factors influencing practices included lack of evidence-based knowledge, inconsistent beliefs about benefits of fever (Walsh *et al.* 2005), parent requests for antipyretic administration (Edwards *et al.* 2001c) and parent and health professional concern about harmful effects of fever such as febrile convulsions and brain damage (Crocetti *et al.* 2001, Sarrell *et al.* 2002, Walsh *et al.* 2005). Novice paediatric nurses and parents of young children learn to manage fever by observing experienced paediatric nurses' practice. Experience is not necessarily associated with expertise. Expert nurses had similar inconsistent beliefs about and negative attitudes toward fever as inexperienced nurses (Walsh *et al.* 2006). It is imperative all paediatric nurses practice consistently and in accordance with the latest scientific evidence. Knowledge based continuing educational programmes are not always effective or lasting (McCaffery & Ferrell 1997). More recently, the effectiveness of theoretically based educational programmes has been recognised (Brunt 2000, Howell *et al.* 2000, Edwards *et al.* 2001b). This paper reports findings from an education programme, based on the Theory of Planned Behavior (TPB), targeting factors influencing paediatric nurses' intentions to administer antipyretics to febrile children.

LITERATURE REVIEW

Paediatric nurses' (nurses) management of febrile children includes both non-pharmacological and pharmacological measures. Generally non-pharmacological measures such as removing excess clothing, cool washers and cool drinks are used initially (Edwards *et al.* 2001c). Although, many nurses identify a temperature at which they intervene pharmacologically; pharmacological management of fever with antipyretics is inconsistent (Edwards *et al.* 2001c). Antipyretics are used to reduce temperatures ranging from 37.5°C to 40°C (Poirier *et al.* 2000, Blumenthal 2000, Edwards *et al.* 2001c, Sarrell *et al.* 2002), to improve well-being (Sarrell *et al.* 2002) and relieve pain. They are also administered at parental request, following medical orders, to settle children when the ward is busy, on medication rounds to save time (Edwards *et al.* 2001c), according to the time of day (greater antipyretics administration during the day and increased temperature taking at night) (Edwards *et al.* 2003b) and to prevent febrile convulsions (Poirier *et al.* 2000, Edwards *et al.* 2001c, Sarrell *et al.* 2002, Walsh *et al.* 2005). There is little charted documentation of nurses' antipyretics administration rationales (Edwards *et al.* 2003b).

Our research identified predictors of nurses' intentions to administer antipyretics to febrile children (Walsh *et al.* 2005) through the Theory of Planned Behavior (TPB) (Ajzen 1985). The TPB predicts behaviours not under volitional control (behaviours influenced by others) from a person's intention to perform the behaviour. Behavioural intentions are determined by attitudes toward the behaviour (overall positive or negative evaluations about performing the behaviour) normative influences (perception of social pressure from significant others to engage in the targeted behaviour) and perception of control (the targeted behaviour is within their control) (Ajzen 1985, Madden *et al.* 1992). Twenty-five percent of nurses' intentions to administer antipyretics to febrile children were predicted by their attitudes toward the benefits of antipyretics in fever management and perceptions that parents, peers and medical officers expected them to administer antipyretics (normative influences) (Walsh *et al.* 2005).

A recent meta-analysis, by Armitage and Conner (2001) provides support for the efficacy of the TPB as a predictor of intentions and behaviour. Determinants of intentions to undertake nursing behaviours predicted by the TPB include intentions to conduct pain assessments (Nash *et al.* 1993), administer 'as required' opioids for post-operative pain management (Edwards *et al.* 2001a), adhere to hand hygiene recommendations (O'Boyle *et al.* 2001, Pessoa-Silva *et al.* 2005), use gloves when there is a likely exposure to blood (Levin 1999), report child abuse (Feng & Wu 2005) and choose to care for HIV/AIDS patients (Vermette & Godin 1996, DiIorio 1997).

Educational programmes based on the TPB must target attitudinal, social and control factors; they address all levels of decision making and behaviour (Ajzen & Madden 1986). Recent successful TPB educational interventions include exercise behaviour change in breast cancer survivors (Jones *et al.* 2005), nurses' intentions to administer as required opioid analgesia to post-surgical patients with pain (Edwards *et al.* 2001b), increased cervical cancer screening attendance (Sheeran & Orbell 2000) and increased fruit and vegetable intake (Courneya & Bobick 2000). As numerous factors influence nurses' practices in fever management the TPB provides an excellent theoretical basis upon which to develop an educational intervention.

Purpose

The purpose of the study was to evaluate the effectiveness of a Peer Education Program (PEP) on nurses' antipyretic administration to febrile children compared with a control group. Through peer education and support the PEP, based on the TPB, aimed to promote evidence-based antipyretic use in childhood fever by targeting key antecedents of fever management with antipyretics: attitudes,

normative influences, perceptions of control and intentions. This paper reports the PEP's effectiveness in promoting evidence-based intentions in experimental group nurses' antipyretic administration.

Hypotheses

These hypotheses were tested. Following the PEP experimental group nurses would report:

- Evidence-based attitudes toward antipyretic use in fever management (lower scores),
- Less normative influence on practice (lower scores),
- Realistic perceptions of control (lower scores)
- Evidence-based intentions to administer antipyretics to febrile children (lower scores) and
- Evidence-based fever management practices (increase in mean temperature when antipyretics are administered)

compared with pre PEP scores and the post-test and latency scores of control group nurses.

METHOD

Study Design

A quasi-experimental design explored effects of a PEP on factors influencing nurses' management of fever in children admitted to hospital for a febrile illness. Surveys and chart audits collected data at three time points at an experimental and control hospital one month pre PEP and one and four months post PEP.

Ethical Approval

Ethical approval was gained from the university and targeted hospitals. Participants were assured of confidentiality, voluntary participation and anonymity.

Sample

Staff mobility and flexible rostering made it impossible to follow one sample of nurses for the 8-month study period (August 2002 to April 2003); therefore, organisational units, rather than individuals, were targeted as the unit of analysis. Each organisational unit was comprised of two medical wards at metropolitan paediatric hospitals in Queensland, Australia. Two hospitals were recruited; one allocated to experimental condition; the other to control condition. Nurses employed in Level 1 and Level 2 positions in targeted wards of targeted hospitals at each data collection point were eligible to complete surveys. Those employed in Level 1 and Level 2 positions in the

experimental hospital were eligible to attend PEP sessions. In Australia, Level 1 nurses provide direct patient care. Level 2 provide direct patient care and have additional responsibilities in the unit, such as the orientation and preceptorship of new staff, staff development, providing continuing education and research as part of their responsibilities (ANRAC 1990). All nurses employed at each data collection point were invited to complete a survey and those employed in the wards when the PEP was presented were invited to attend PEP sessions.

Survey Sample

Figure 1 displays the number of nurses in the two organisational units at each time point and percentage who participated.

As expected, most participants were female (experimental 93.3% to 97.5%; control 93.8 to 100%). Similar percentages were single (experimental 30.2% to 50.0%; control 31.3% to 50.0%) or married/defacto (experimental 44.5% to 56.3%; control 47.4% to 62.8%). Control participants were significantly younger than experimental participants across the three data points (control mean age 28.6, SD 6.7, range 21 to 30; experimental mean age 32.9, SD 9.22, range 22 to 38; p=0.01). Additionally, more experimental group nurses were employed part-time (experimental 44.4% to 55.1% vs control 30.0% to 56.6%). Table 1 gives a detailed description of other relevant demographic characteristics.

PEP Attendance

Seventy-seven nurses employed in the two targeted wards during the two month period the PEP was presented were eligible to participate in the PEP. Thirty-eight nurses attended Session 1 (34 Level 1, 4 Level 2), 34 attended Session 2 (26 Level 1 and 8 Level 2), 26 attended Session 3 (23 Level 1, 3 Level 2) and 20 attended Session 4(18 Level 1, 2 Level 2). No other demographic data were collected. Attendance at PEP sessions was influenced by shift allocation and ward needs. Non-attendance at an early session in the series did not excluded attendance at later sessions or survey data inclusion in analyses. Seventy-four percent (n=57) attended one or more sessions, 51.9% (n=40) two or more, 19.4% (n=15) three or more, 0.8% (n=6) attended all sessions and 26.0% (n=20) attended no sessions.

Chart Audit Sample

All charts of children aged between 3 and 71 months admitted through the Department of Emergency Medicine with a febrile illness (eg., pneumonia, tonsillitis) to targeted wards during

data collection months (survey) were potentially eligible. Exclusion criteria when charts were examined included:

- diagnosis of meningitis on admission,
- immunosuppression,
- pre-existing neurological or oncological conditions
- afebrile for the first 24 hours in the ward,
- less than 8 hours in the ward,
- inter-hospital transfer,
- signs of cerebral irritation on admission, and/or had
- afebrile or complex seizures, ie., those lasting more than 15 minutes (Baumann 1999), prior to or at admission,
- seizure chart in the ward, and/or
- diagnosis/co-morbidity of epilepsy.

Overall, children were, more likely to be male (experimental 63.6%; control 52.7%), 7.2% of the experimental and 10.8% of the control groups had a history of febrile convulsion and similar percentages had a diagnosis of febrile convulsion (experimental 6.6%; control 11.1%). Experimental group children were more likely to be admitted for pneumonia (25.8%), pyrexia of unknown origin (18.0%) and urinary tract infection (16.1%), whereas, control group children were more likely to be admitted for upper/lower respiratory infections (18.3%), gastro-enteritis (12.9%) and pneumonia (12.2%). Demographic information associated with audited charts is displayed in Table 2. Seasonal variation in admissions is demonstrated in numbers of eligible charts.

Table 2

Instruments

Survey

The instrument developed for our earlier research was modified slightly to add items targeting specific knowledge and attitudes addressed by the PEP and participant comments on the original instrument; pre-post test Kappa 0.664 and face and content reliability determined by an expert panel (Walsh *et al.* 2005). The Fever Management Survey (FMS) used in this study comprised three instruments: the Fever Management Knowledge (FMK) (24 items), Fever Management Attitudes (FMA) (32 items), Fever Management Practices (FMP) (28 items) and a demographic section. The FMP instrument reported in this paper explored factors influencing nurses' decision-making in

administering antipyretics to febrile children explored through the tenets of the TPB (Ajzen 1985) and consists of:

- attitudes about the effectiveness of antipyretics (18 items, eg., 'Antipyretic medications: increase comfort, reduce the risk of febrile convulsions'),
- normative influences (6 items, eg., 'Nursing colleagues expect me to administer antipyretics to febrile children'),
- perception of control (2 items, eg., 'When antipyretic medication is ordered, its administration is within my control') and
- intention (2 items, eg., 'If an antipyretic is ordered, I intend to administer it when next caring for a febrile child').

Chart Audit

An audit tool used successfully in previous research exploring nurses' administration of paracetamol to febrile children during the first 24 hours following admission (Edwards *et al.* 2003b) was used. This tool targets demographic information, temperatures, antipyretic orders and administration.

Peer Education Program

The educational programme was developed to address factors influencing nurses' fever management identified in earlier research (Edwards *et al.* 2001c, Edwards *et al.* 2003b, Walsh *et al.* 2005, Walsh *et al.* 2006). The programme, comprised of four one hour sessions, was modelled on an Australian TPB peer education programme developed to enhance nurses', as required, opioid administration (Edwards *et al.* 2001b). Sessions included information giving, small group peer discussion and session evaluation. See Table 3 for specific PEP aims. Past experience with research education programmes, staff mobility and flexible rostering lead us to expect that, despite sessions being offered 10 times during each two-week period, not all nurses would attend the PEP. Therefore, peer support and education were included to facilitate PEP information reaching those either unable to attend sessions or new to organisational units during the eight-month study period.

When the PEP was developed and implemented paediatric hospitals in Queensland required all medications including antipyretics be checked by two registered nurses. This interaction can influence nurses' intentions and practices related to 'as required' medication administration and was targeted through the programme as a mechanism for peer education and support for evidence-based

fever management practices. To stimulate peer discussion and expose nurses not attending sessions to programme information, posters reflecting session content were displayed in experimental wards and a folder containing information discussed during sessions and reference articles was placed in the nurses' area of each experimental ward. Nurses commented that posters stimulated between nurse-nurse, nurse-medical officer and nurse-parent discussions.

The programme was reviewed by a team of experts including paediatric nurse researchers, Level 2 paediatric nurses and academic researchers familiar with TPB programmes. Following minor revisions it was considered ready for implementation.

Procedure

Survey

Two weeks prior to each survey a team member addressed nurses during a ward meeting discussing their potential involvement. A survey was sent to each nurse's ward address. Completed surveys were returned to a sealed box in the ward. Nurses were regularly encouraged to complete the survey during data collection. The same procedure was followed for each data collection period.

PEP

Two-weeks following pre-test data collection and immediately prior to the PEP an invitation to participate was sent to all experimental group nurses informing them about the programme and inviting them to participate. Session times and an evidence-based fever management article (JBIEBNM 2001) were included to introduce the topic and stimulate interest. The team member presenting the PEP informed nurses about the programme at ward meetings during this period. Earlier research identified the need for educational interventions to be presented at the ward level (Edwards *et al.* 2001c). This was accommodated and each session presented at a time suitable to ward requirements.

Chart Audit

Permission to access charts was obtained from the appropriate department heads along with a list of children admitted to hospital in the participating wards during months when survey data were collected. Potential participants were identified; charts accessed and relevant data collected.

Data analysis

Data were entered into SPSS, searched for outliers and irregularities, all data were checked for data entry reliability. Between group data were examined descriptively for between group differences. P-values less than 0.05 were considered statistically significant. Demographic frequencies were examined by crosstabs and differences by ANOVA.

TPB

Data examining influences on nurses' antipyretic administration were prepared for analysis in accordance with the TPB and the theoretical model developed by Ajzen and Fishbein (Ajzen & Fishbein 1980). All items were recoded so that -3 indicated a negative influence and +3 indicated a positive influence. This is described in detail in by Edwards et al. (2001b). Tenet scale reliabilities were determined with Cronbach's Alpha. Following this Levene's tests were undertaken to determine equality of error variance on the dependent variables (tenets of the TPB; attitudes, normative influence, perception of control and intentions), across groups. Two-factor Univariate ANOVAs were then conducted on each tenet. Between subjects (organisational unit) factor was group (experimental or control) and within subject (organisational unit) factor was time of data collection (pre-test, post-test and latency test). Significant interactions were further explored through pairwise comparisons.

Chart Audit

All data were checked for entry reliability. Demographic data were examined for frequency to determine similarity between groups. Data were examined similarly to the TPB data. Two-factor Univariate ANOVA, with 'temperature when an antipyretic was administered' as variable, investigated interaction effects of the PEP on nurses' antipyretic administration. Between and within factors were the same as the PEP analysis.

RESULTS

Theory of Planned Behavior

Factors influencing nurses' administration of antipyretics to children hospitalised for a febrile illness will be discussed through the tenets of the TPB, specifically, attitudes, normative influences, perception of control and intention. Descriptive statistics for these tenets are portrayed in Table 4.

Table 4

Attitudes

No significant differences were discovered in nurses' attitudes between groups, experimental and control, or within groups, across the three data collection time points (see Table 4). The hypothesis was not confirmed. Attitudes toward the efficacy of antipyretics to increase comfort, activity, appetite and alertness and to reduce irritability, the risk of febrile convulsions, parental anxiety, temperature and temperature set-point were not significantly influenced by the PEP.

Normative Influences

There was a significant interaction between experimental and control groups and across data collection time points ($F[1,181]=8.353$, $p=0.01$, $\eta_p^2=0.04$). Examination of simple main effects identified a reduction in normative influence in the experimental group when compared to the control group post PEP ($p<0.01$). Fever management practices in the experimental group were under significantly less normative influence when post-test ($p=0.01$) and latency data ($p=0.01$) were collected than pre-PEP. Refer to Figure 2 and Table 4. This confirms the hypothesis. The PEP reduced normative influences from colleagues, parents and medical officers on nurses' antipyretic administration to febrile children.

Perception of Control

A significant main effect identified a reduction in perception of control over antipyretic administration between experimental and control groups ($F[1,179]=6.850$, $p=0.01$, $\eta_p^2=0.04$) (see Table 4). Experimental group nurses had more realistic perceptions of control over antipyretic administration than control group nurses post PEP ($p=0.05$). The hypothesis is partially confirmed. Following the PEP experimental group nurses were more aware of factors exerting a controlling influence over their antipyretic administration to febrile children than control group nurses.

Intention

There was a significant interaction between experimental and control groups and across data collection time points ($F[2,181]=6.884$, $p=0.01$, $\eta_p^2=0.07$). Examination of simple main effects identified a reduction in experimental group nurses' intention compared to control group nurses ($p<0.01$). Experimental group nurses' intentions to administer an antipyretic to the next febrile child cared for were significantly less than control group nurses when post-test ($p=0.01$) and latency data ($p<0.01$) were collected, they were more evidence-based. This confirms the hypothesis. The PEP reduced experimental group nurses' intentions to administer antipyretics to febrile children. See Table 4 and Figure 3.

Chart Audit

Temperature when an antipyretic was administered

A significant main effect was discovered across data collection time points ($F[2,276]=3.638$, $p=0.03$, $\eta_p^2=0.03$). Temperature at which experimental group nurses administered antipyretics in post-test data was significantly higher than in pre-test data ($p=0.01$). Table 5 reports mean temperature and standard errors of the means. The hypothesis was partially confirmed. The PEP positively influenced antipyretic administration practices of the experimental group, evidenced by an increase in mean temperature when antipyretics were administered post PEP, compared to control group nurses. Mean temperature difference of 0.68ºC was considered clinically significant.

DISCUSSION

This study examined the effectiveness of a Peer Educational Programme, based on the TPB, in promoting evidence-based antipyretic administration by paediatric nurses' to febrile children. The PEP reduced intentions to administer antipyretics, changing practice intentions from a ritualistic base to an evidence-base. Behaviour changes were confirmed by higher mean temperatures when antipyretics were administered post PEP. TPB tenets influenced by the PEP were normative and control factors. Nurses became aware of the influence of others on their practices and impacted clinically evidenced by the mean higher temperature when antipyretics were administered. Findings highlight the effectiveness of a theoretically based education programme to promote and maintain positive change in clinical practice. Findings will be discussed under the hypotheses, that the PEP will change belief-based attitudes, subjective norms, perceived control, intentions and mean temperature when antipyretics were administration.

Attitudes

Belief-based attitudes were not significantly influenced by the PEP. Items targeted attitudes toward the actions of antipyretics, specifically increasing comfort, activity, appetite and alertness and reducing temperature, risk of febrile convulsions, parental anxiety and temperature set-point. Attitude scores were positive with little variance. Overall, positive attitudes were not significantly improved though there was a significant reduction in attitudes toward antipyretics reducing the risk of febrile convulsions in experimental group nurses compared with control group nurses ($p=0.01$).

The FMP targeted knowledge attitudes about antipyretics. These were important to include in the FMP as nearly 25% of those who completed surveys had less than one year paediatric experience.

A number of nurses had not heard of a temperature set-point. Items addressing fever management practices with antipyretics and potential harmful effects of antipyretics (addressed in the PEP) were not included. Further development of the FMP should include items targeting this area.

Normative Influence

The significant interaction effect on normative infleunce highlights the impact of the PEP on experimental group nurses over time and that the overall normative influence was lower on the experimental group than the control group. Through attending the PEP nurses became aware of their perception that parents, colleagues and medical officers expected fever to be reduced with antipyretics. Following the PEP nurses were knowledgeable about and understood scientific rationales behind evidence-based fever management; current myths and misconceptions were corrected (Edwards *et al.* 2004, Walsh *et al.* 2004). Additionally, they were less likely to comply with referents' antipyretic requests or perceive colleagues and medical officers as expecting them to reduce fever with antipyretics.

The PEP provided nurses with current literature to justify practice changes when questioned by colleagues and medical officers. Peer and parent education were promoted as mechanisms to promote and sustain practice changes. Colleagues who had not attended the PEP were educated and supported to address current myths and misconceptions and to change practice. Additionally, posters of session content displayed in experimental wards stimulated nurse-nurse and parent-nurse discussions about evidence-based fever management. These mechanisms, peer education, posters and parent education, enabled nurses to observe febrile children more closely rather than actively reducing fever with antipyretics.

Changes in normative influence were maintained over time, four months post PEP, indicating the role of peer support, peer education and informal education in maintaining change. Informal peer support, the sharing of information and experiences, was considered an important aspect in learning new skills by nurse prescribers (Otway 2001). Informal education has been successfully used by experienced paediatric nurses to educate novices about paediatric pain assessment (Fuller & Conner 1997). The promotion of peer education and support during the PEP as a mechanism for sustaining positive practice changes and educating new staff ensures sustainability of best practice. Earlier research found similar negative attitudes toward fever and fever management in experienced and novice paediatric nurses and suggested novices learn to manage childhood fever management through informal education from experienced nurses with negative attitudes (Walsh *et al.* 2006).

Informal peer education and support could be the medium through which the experimental group maintained the reduced normative influence four months post PEP.

Perception of control

The PEP influenced nurses' perception of control over antipyretic administration. Experimental group nurses' reported, more realistically, less control than control group nurses post PEP. Findings reflect PEP effectiveness in raising nurses' awareness to the strong normative influences over practice clarifying to them that their actual control in antipyretic administration is much less than they originally perceived. Continued reduction in perception of control over time possibly reflects again the powerful influence of informal peer education and support.

To administer or not to administer an antipyretic is not always within nurses' control, when medications are ordered fourth hourly then nurses must administer them. Parents insistence upon antipyretic administration, even following education about the latest scientific evidence purporting benefits of mild to moderate fever (Lorin 1999), or directing their request to a medical officer (Edwards *et al.* 2001c) reduce nurses' control. Nurses, aware their practice is influenced by others, can accommodate normative influences in decision-making. One could argue that nurses' increased awareness of the potential for normative influences over their practice and awareness of the direction of this influence would increase their perception of control rather than reduce it. However, through increased awareness of influences over their practices nurses' reports of control are more accurate than before the PEP. Perception of control is, with intention, regarded as the co-determinant of behaviour – although the control-behavioural intention relationship is dependent on the accuracy of people's perceptions of control (Ajzen 1985, Sheeran *et al.* 2003). By improving the accuracy of nurses' perception of control their intentions to administration antipyretics were reduced.

Intention

Intentions were significantly reduced post PEP and continued to reduce over time reflecting intentions to practice in accordance with the latest scientific evidence. These findings highlight the clinical implications of theoretically based education. Findings indicate the effectiveness of the PEP in precipitating changes in practice and support the use of peer support and education as mechanisms to maintain practice changes over time. Nurses who do not intend to routinely administer antipyretics to febrile children and are aware of their control over and normative influences on this practice are more likely to practice in accordance with the latest scientific

evidence. Nurses' implementation intentions, goal directed intentions linked toward a specific situation (Gollwitzer 1999), when next caring for a febrile child, accurately represented their practice.

Mean temperature when antipyretics were administered

Despite the small number of charts audited one and four months following the PEP, the significant increase in temperature when antipyretics were administered confirms experimental nurses' intentions to practice. Experimental group nurses' mean temperature post PEP was higher (38.7°C) than the control group mean temperature (38.3°C). Although this disparity was not maintained (latency mean temperatures: experimental group 38.4°C, control group 38.4°C) it indicates the effectiveness of the PEP in changing behaviour. That behaviour changes were not maintained over time highlights the need and timing for a refresher intervention to raise again evidence-based fever management practices to conscious awareness.

Less than half the numbers of pre PEP charts were audited in experimental latency data reflecting seasonal and organisational differences. Summer is traditionally a time when there are fewer febrile illnesses. Extending data collection periods could influence findings. All data were colleted at the same time to ensure charts reflected practices when survey data were collected.

Clinical significance

The study alerted nurses to influences on their practice, nurses aware of these influences changed intentions to practice and practice to reflect the latest scientific evidence. Peer support and education facilitated organisation change and maintained positive changes in normative influence, perception of control and intentions. Organisational practice changes, modelling evidence-based fever management, in association with parent education further reduced perceived normative influences from parents and peers increasing nurses' ability to practice other methods of evidence-based fever management, such as monitoring febrile children and increasing fluid intake. The finding that behavioural changes were not maintained highlights the need for follow-up education or refresher between one and four months. During the programme nurses frequently commented on the need to educate all parents in fever management to not only assist their practice but also to reduce unnecessary demands on the health system from some unnecessarily concerned parents.

Continuing education

Earlier research identified continuing education needs in both novice and experienced nurses (Walsh *et al.* 2006). Although latest scientific evidence in fever management and evidence of nurses' inconsistent ritualistic practices are available in health literature nurses' practices remained inconsistent. Clinicians barriers to research utilisation include lack of time, limited access, resistance to change and pressure to conform to ritualistic practices (Veeramah 2004) highlighting the need for programmes targeting practice change to be based on behaviour change theories.

Mandatory continuing education is essential particularly in the current knowledge and technology explosion in health (Eustace 2001). However, escalating financial constraints have caused continuing education programmes to be scrutinised and rationalised (Levett-Jones 2005). To address this the preparation of user-friendly manuals of successful theoretical programmes based on the latest scientific evidence must be readily available to facilitate cost-effective, uncomplicated, program implementation (eg., Edwards *et al.* 1997, Edwards *et al.* 2003a). This will assist educators and clinicians improve clinical practice without the need for programme development, enhancing clinical skills and evidence-based care of many rather than the few involved in research.

Limitations

Findings from this study should be considered within the following limitations that could limit their generalisability to other settings. The study was conducted in medical wards at the two metropolitan hospitals in Brisbane limiting the potential sample. Findings might reflect specific practices although knowledge and attitudes (Walsh *et al.* 2005) were similar to those found by other authors. Chart numbers were limited by organisational and seasonal factors and could influence findings.

Recommendations

We recommended the study be replicated in other paediatric settings, with larger cohorts of nurses at a time of year when more eligible charts are available for inclusion. PEP implementation in autumn and post and latency data collection one and three months later in winter would increase the number of charts eligible. This study focused on group changes. Further research with larger numbers of participants could explore relationship between individual and group changes following the PEP.

Conclusions

Paediatric nurses' fever management practices prior to the PEP were inconsistent and ritualistic. Following the PEP, based on the TPB, practices of nurses working in targeted wards at the

experimental hospital were in line with the latest scientific evidence. This study demonstrates how in today's climate, with reduced continuing education funding, educating individuals can instigate ward/organisational practice changes. The PEP precipitated change in factors influencing paediatric nurses' fever management, specifically normative influences, perceptions of control and intentions to administer antipyretics to febrile children. Nurses became aware of their perceived normative beliefs about antipyretic administration and the influence these have on their practice. This was reflected in more realistic normative beliefs and perceptions of control over antipyretic administration and intentions to practice in accordance with the latest scientific evidence. Changes in practices of nurses who did not attend the PEP were facilitated through peer support and education. To positively change and maintain changes to nurses' practice continuing education programmes need to be based on behaviour change theories. The PEP, based on the TPB, reported in this article demonstrates this need.

Contribution of Authors

Study design: HE, AW, MC, SM, JW, JY

Data collection and analysis: HE, AW, SM, JW

Manuscript preparation: HE, AW, MC, SM, JW, JY

REFERENCES

Ajzen I (1985) From intentions to actions: a theory of planned behavior. In *Action control: from cognition to behavior* (J. Kuhl & J. Beckmann, eds). Springer Verlag, Berlin, pp. 11-39.

Ajzen I & Fishbein M (1980) Understanding attitudes and predicting social behavior. Prentice Hall Inc, Englewood Cliffs, New Jersey, pp. 1-11;244-275.

Ajzen I. & Madden T (1986) Prediction of goal-directed behavior: attitudes, intentions and perceived behavioral control. *Journal of Experimental Social Psychology* **22**, 453-474.

ANRAC (1990) A.N.R.A.C. Nursing Competencies Assessment Project. Australasian Nurse Registering Authorities Conference ANRAC, University of Queensland, Brisbane.

Armitage C & Conner M (2001) Efficacy of the Theory of Planned Behaviour: a meta-analytic review. *The British Journal of Social Psychology* **40**, 471-499.

Baumann R (1999) Technical report: treatment of the child with simple febrile seizures. *Pediatrics* **103**, e86.

Blumenthal I (2000) Fever and the practice nurse: management and treatment. *Community Practitioner* **73**, 519-521.

Brunt B (2000) Continuing education evaluation of behavior change. *Journal for Nurses in Staff Development JNSD* **16**, 49-54.

Courneya K & Bobick T (2000) Integrating the theory of planned behavior with the processes and stages of change in the exercise domain. *Psychology of Sport and Exercise* **1**, 41-56.

Crocetti M, Moghbeli N & Serwint J (2001) Fever phobia revisited: have parental misconceptions about fever changed in 20 years? *Pediatrics* **107**, 1241-1246.

DiIorio C (1997) Neuroscience nurses' intentions to care for persons with HIV/AIDS. *Journal of Neuroscience Nursing* **29**, 50-55.

Edwards H, Courtney M, Walsh A, Wilson J, Monaghan S & Young J (2004) The Theory of Planned Behavior in promoting evidence-based nursing care. Eighth International Conference in Behavioral Medicine, Mainz, Germany.

Edwards H, Nash R, Najman J, Yates P, Fentiman B, Dewar A, Walsh A, McDowell J & Skerman H (1997) Peer Intervention Program: a collaborative educational strategy for improving pain management by registered nurses. Queensland University of Technology, Brisbane, Australia.

Edwards H, Nash R, Najman J, Yates P, Fentiman B, Dewar A, Walsh A, McDowell J & Skerman H (2001a) Determinations of nurses' intention to administer opioids for pain relief. *Nursing and Health Sciences* **3**, 149-159.

Edwards H, Nash R, Yates P, Walsh A, Fentiman B, McDowell J, Skerman H & Najman J (2001b) Improving pain management by nurses: a pilot peer intervention program. *Nursing and Health Sciences* **3**, 35-45.

Edwards H, Walsh A, Courtney M, Wilson J, Monaghan S & Young J (2003a) Peer Education Program: a fever management education program for paediatric nurses. School of Nursing, Queensland University of Technology, Brisbane, Australia.

Edwards H, Courtney M, Wilson J, Monaghan S & Walsh A (2001c) Fever management practices: what pediatric nurses say. *Nursing and Health Sciences* **3**, 119-130.

Edwards H, Courtney M, Wilson J, Monaghan S & Walsh A (2003b) Fever management audit: Australian nurses antipyretic usage. *Pediatric Nursing* **29**, 31-37.

Eustace LW (2001) Mandatory continuing education: past, present, and future trends and issues. *Journal of Continuing Education in Nursing* **32**, 133-7.

Feng J & Wu Y (2005) Nurses' intention to report child abuse in Taiwan: a test of the theory of planned behavior. *Research in Nursing & Health* **28**, 337-347.

Fishbein M (1998) Changing behavior to prevent STDs/AIDS. *International Journal of Gynecology & Obstetrics* **63**, S175-S181.

Fuller B & Conner D (1997) The influence of length of pediatric nursing experience on key cues used to assess infant pain. *Journal of Pediatric Nursing: Nursing Care of Children & Families* **12**, 155-68.

Gollwitzer P (1999) Implementation intentions: strong effects of simple plans. *American Psychologist* **54**, 493-503.

Howell D, Butler L, Vincent L, Watt-Watson J & Stearns N (2000) Influencing nurses' knowledge, attitudes, and practice in cancer pain management. *Cancer Nursing* **23**, 55-63.

JBIEBNM (2001) Fever Management. The Joanna Briggs Institute for Evidence Based Nursing and Midwifery, Perth, Australia.

Jones L, Courneya K, Fairey A & Mackey J (2005) Does the theory of planned behavior mediate the effects of an oncologist's recommendation to exercise in newly diagnosed breast cancer survivors? Results from a randomized controlled trial. *Health Psychology* **24**, 189-197.

Levett-Jones T (2005) Continuing education for nurses: a necessity or nicety. *The Journal of Continuing Education in Nursing* **36**, 229-233.

Levin P (1999) Test of Fishbein and Ajzen models as predictors of health care workers' glove use. *Research in Nursing & Health* **22**, 295-307.

Lorin M (1999) Pathogenesis of fever and its treatment. In *Oski's Pediatrics: principles and practices* (J. B. McMillan, C. DeAngelis, R. D. Feigin & J. B. Warshaw, eds), 3rd edn. Lippincott, Williams & Wilkins, Philadelphia, pp. 848-850.

Madden T, Ellen P & Ajzen I (1992) A comparison of the Theory of Planned Behavior and the Theory of Reasoned Action. *Personality and Social Psychology Bulletin* **18**, 3-9.

McCaffery M & Ferrell B (1997) Nurses' knowledge of pain assessment and management: how much progress have we made? *Journal of Pain & Symptom Management* **14**, 175-88.

Nash R, Edwards H & Nebauer M (1993) Effect of attitudes, subjective norms and perceived control on nurses' intention to assess patients' pain. *Journal of Advanced Nursing* **18**, 941-947.

O'Boyle C, Henly S & Larson E (2001) Understanding adherence to hand hygiene recommendations: The theory of planned behavior. *American Journal of Infection Control* **29**, 352-360.

Otway C (2001) Informal peer support: a key to success for nurse prescribers. *British Journal of Community Nursing* **6**, 586.

Pessoa-Silva C, Posfay-Barbe K, Pfister R, Touveneau S, Perneger T & Pittet D (2005) Attitudes and perceptions toward hand hygiene among healthcare workers caring for critically ill neonates. *Infection Control & Hospital Epidemiology* **26**, 305-311.

Poirier M, Davis P, Gonzalez-del Rey J & Monroe K (2000) Pediatric emergency department nurses' perspectives on fever in children. *Pediatric Emergency Care* **16**, 9-12.

Reeves-Swift R (1990) Rational management of a child's acute fever. *MCN, American Journal of Maternal Child Nursing* **15**, 82-5.

Sarrell M, Cohen H & Kahan E (2002) Physicians', nurses', and parents' attitudes to and knowledge about fever in early childhood. *Patient Education and Counselling* **46**, 61-65.

Sheeran P & Orbell S (2000) Using Implementation Intentions to Increase Attendance for Cervical Cancer Screening,. *Health Psychology* **19**, 283-289.

Sheeran P, Trafimow D & Armitage C (2003) Predicting behaviour from perceived behavioural control: Tests of the accuracy assumption of the theory of planned behaviour. *The British Journal of Social Psychology* **42**, 393.

Veeramah V (2004) Utilization of research findings by graduate nurses and midwives. *Journal of Advanced Nursing* **47**, 183-191.

Vermette L & Godin G (1996) Nurses' intentions to provide home care: the impact of AIDS and homosexuality. *AIDS Care* **8**, 479-488.

Walsh A, Edwards H, Courtney M, Wilson J, Monaghan S & Young J (2004) The Theory of Planned Behavior in promoting evidence-based nursing care. 4th Annual Queensland Health and Medical Scientific Meeting, pp. 116.

Walsh A, Edwards H, Courtney M, Wilson J & Monaghan S (2005) Fever Management: paediatric nurses' knowledge, attitudes and influencing factors. *Journal of Advanced Nursing* **49**, 453-464.

Walsh A, Edwards H, Courtney M, Wilson J & Monaghan S (2006) Paediatric fever management: Continuing education for clinical nurses. *Nurse Education Today* **26**, 71-77.

Table 1: Demographic details of survey participants

Demographic		*Pre-test*		*Post-test*[a]		*Latency-test*[b]	
		n	***%***	***n***	***%***	***n***	***%***
HIGHEST ACADEMIC QUALIFICATION							
Experimental	Non-tertiary	*40*	15.0	*49*	24.5	*45*	11.1
	Diploma/Degree		67.5		59.2		64.4
	Post-Graduate		17.5		16.3		24.4
Control	Non-Tertiary	*20*	15.0	*16*	18.8	*18*	16.7
	Diploma/Degree		80.0		75.0		66.6
	Post-Graduate		5.0		6.2		16.7
			p=0.33		*p=0.93*		*p=0.20*
PAEDIATRIC CERTIFICATE							
Experimental	Yes	*40*	32.5	*49*	36.7	*44*	38.6
	No		67.5		63.3		61.4
Control	Yes	*20*	55.0	*16*	31.3	*18*	27.8
	No		45.0		68.7		72.2
			p=.10		*p=0.70*		*p=0.43*
LEVEL OF EMPLOYMENT							
Experimental	Level 1	*40*	67.5	*49*	75.5	*45*	77.8
	Level 2		32.5		24.5		22.2
Control	Level 1	*20*	80.0	*16*	93.8	*18*	83.3
	Level 2		20.0		6.2		16.7
			p=.32		*p=0.04**		*p=0.63*
PAEDIATRIC EXPERIENCE							
Experimental	<1 year	*39*	20.5	*49*	12.2	*45*	13.3
	1-4 years		23.1		26.5		33.3
	5-9 years		23.1		22.4		17.8
	10+ years		33.3		38.8		35.6
Control							
	<1 year	*20*	15.0	*16*	25.0	*18*	16.7
	1-4 years		50.0		50.0		61.1
	5-9 years		20.0		6.3		11.1
	10+ years		15.0		18.7		11.1
			p=.26		*p=0.03**		*p=0.03**
TIME IN CURRENT POSITION							
Experimental	1-6 months	*40*	30.0	*49*	12.2	*45*	17.8
	7-11 months		17.5		24.5		11.1
	1-4 years		30.0		36.8		48.9
	5+ years		22.5		26.5		22.2
Control	1-6 months	*18*	10.0	*16*	0.0	*18*	22.2
	7-11 months		20.0		31.3		11.1
	1-4 years		50.0		56.2		55.6
	5+ years		20.0		12.5		11.1
			p=0.24		*p=0.89*		*p=0.48*

[a] one month post PEP

[b] four months post PEP

* significant difference between demographic data $p < 0.05$

Table 2: Demographic data from audited charts of children admitted with a febrile illness

	Experimental Group						**Control Group**					
	Pre-test (n=25) *Winter*		**Post-test[a] (n=19)** *Summer*		**Latency-test[b] (n=11)** *Autumn*		**Pre-test (n=45)** *Winter*		**Post-test[a] (n=11)** *Summer*		**Latency-test[b] (n=18)** *Autumn*	
	Freq	***%***	***Freq***	***%***	***Freq***	***%***	***Freq***	***%***	***Freq***	***%***	***Freq***	***%***
Gender												
Male	18	72.0*	12	63.2	5	45.5	22	48.9*	4	36.4	13	72.2
Female	7	28.0	7	36.8	6	54.5	23	51.1	7	63.6	5	27.8
Febrile Seizure												
Yes	4	16.0	0	0.0	0	0.0	8	17.8	0	0.0	0	0.0
No	21	84.0	19	100.0	11	100.0	37	82.2	11	100.0	18	100.0
Diagnosis on admission[c]												
Pyrexia of unknown origin	5	16.7	4	20.0	2	18.2	7	13.2	0	0.0	2	11.1
Febrile seizure	4	13.3	0	0.0	0	0.0	9	17.0	0	0.0	0	0.0
Pneumonia	6	20.0	7	35.0	3	27.3	5	9.4	2	18.2	3	16.7
Urinary tract infection	2	6.7	6	30.0	2	18.2	0	0.0	2	18.2	4	22.2
Gastro-enteritis	2	6.7	0	0.0	0	0.0	9	17.0	0	0.0	4	22.2
Bronchiolitis	2	6.7	1	5.0	1	9.1	5	9.4	2	18.2	1	5.6
Upper/Lower respiratory tract infection	4	13.3	0	0.0	1	9.1	11	20.8	1	9.1	3	16.7
Other	5	16.7	2	10.0	2	18.2	7	13.2	4	36.4	1	5.6
	Mean (SD) Range		***Mean (SD) Range***		***Mean (SD) Range***		***Mean (SD) Range***		***Mean (SD) Range***		***Mean (SD) Range***	
Age in months	24.16 (17.96) 3-71		25.84 (15.70)* 3-48		21.27 (14.39) 5-55		20.72 (16.35) 4-69		13.18 (6.94)* 4-29		17.39 (15.22) 4-56	
Length of hospitalisation in hours	57.84 (35.53)* 12-183		60.68 (33.30) 26-169		76.00 (64.57)* 36-254		71.11 (59.05)* 11-234		67.82 (32.98) 44-154		58.25 (22.71)* 26-119	

[a] one month post PEP
[b] four months post PEP
[c] multiple diagnoses were recorded for some admissions
* significant difference between experimental and control groups $p < 0.05$

Table 3: Specific aims of the Peer Education Program

Session 1

- Discuss the importance of rational evidence-based fever management for children hospitalised for a febrile illness;
- Increase physiological knowledge of fever and evidence-based fever management;
- Identify attitudinal influences on and perceived control regarding fever management and antipyretic administration and
- Identify myths and misconceptions about fever and fever management.

Session 2

- Review Session 1 concerns;
- Discuss effects of attitudes, norms and perceived control on behaviour and practice;
- Identify current practices and perceptions promoting or hampering rational fever management;
- Identify current strategies to promote positive attitudes to fever management and
- Identify specific fever management strategies to be targeted through case studies during Session 3.

Session 3

- Review Session 2 concerns;
- Confirm strategies to promote rational fever management to be discussed and
- Apply the strategies to the case studies and develop additional strategies to promote evidence-based fever management.

Session 4

- Discuss peer support, its role in sustaining positive attitude changes and overcoming perceived barriers to rational, evidence-based fever management;
- Review costs and benefits of rational, evidence-based fever management;
- Review roles of specific factors influencing fever management;
- Discuss the need for parent education to reduce normative influences
- Clarify questions or concerns from participants and
- Reflectively evaluate the PEP.

Educational Resource Materials

Brief Update Sheets summarising main knowledge areas:

  - physiology of fever,
  - benefits and costs of fever,
  - nursing management of fever, fever phobia,
  - febrile convulsions,
  - antipyretics and
  - parent education;

- Recent reference articles;
- Clinical exercises to reinforce session content;
- Participant evaluation of all sessions and
- Posters reinforcing session content.

Note: PEP sessions, procedures and additional educational materials are described in detail in a user-friendly manual developed to enable this program to be implemented by nurses interested in fever management peer education. The manual is available from http://www.hlth.qut.edu.au/nrs/research/instedu/

Table 4: Factors influencing nurses' antipyretic administration to febrile children (distribution and reliability of measures of nurses' behavioural factors)

	Pre-Test			Post-Test[a]			Latency[b]			
	n	**Mean**	**SEM[c]**	**n**	**Mean**	**SEM[c]**	**n**	**Mean**	**SEM[c]**	**α[d]**
ATTITUDES (18 items; possible range -81 to +81)										
Experiment	*36*	29.11	2.78	*42*	30.94	2.45	*41*	27.53	2.55	0.87
Control	*15*	27.15	3.83	*14*	29.38	4.28	*14*	33.24	4.15	
NORMATIVE INFLUENCES (6 items; possible range -27 to +27)										
Experiment	*39*	8.49	1.13	*49*	3.49	1.01	*45*	3.69	1.05	0.77
Control	*20*	7.60	1.58	*16*	10.69	1.76	*18*	7.28	1.66	
PERCEPTION OF CONTROL (2 items; possible range -6 to +6)										
Experiment	*37*	3.86	1.48	*49*	3.43	2.01	*45*	3.02	1.94	0.63
Control	*20*	4.30	1.49	*16*	4.50	1.51	*18*	3.94	2.82	
INTENTION (2 items; possible range -6 to +6)										
Experiment	*39*	2.51	0.36	*48*	0.69	0.32	*44*	0.09	0.34	0.69
Control	*20*	2.05	0.50	*16*	2.81	0.56	*18*	2.67	0.53	

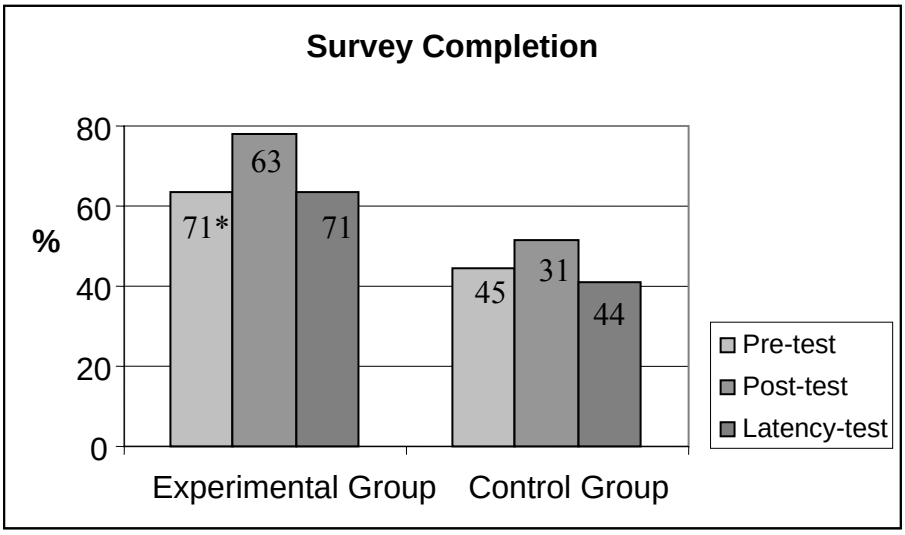
[a] one month post PEP
[b] four months post PEP
[c] Standard Error of the Mean
[d] Cronbach's Alpha

Table 5: Mean temperature in degrees Celsius and standard errors of the mean when antipyretics were administered

	Pre-test		Post-test (1 month)		Latency test (4 months)	
	Mean	**SEM***	**Mean**	**SEM**	**Mean**	**SEM**
	n = 49		**n = 42**		**n = 29**	
Experimental	38.05	0.15	38.73	0.16	38.38	0.19
	n = 100		**n = 27**		**n = 35**	
Control	38.17	0.10	38.26	0.20	38.42	0.17

* Standard Error of the Mean

Figure 1: Percentage of nurses who completed and returned surveys



* Number of nurses employed in organisational units at each time point

Figure 2: Interaction effect for subjective norms

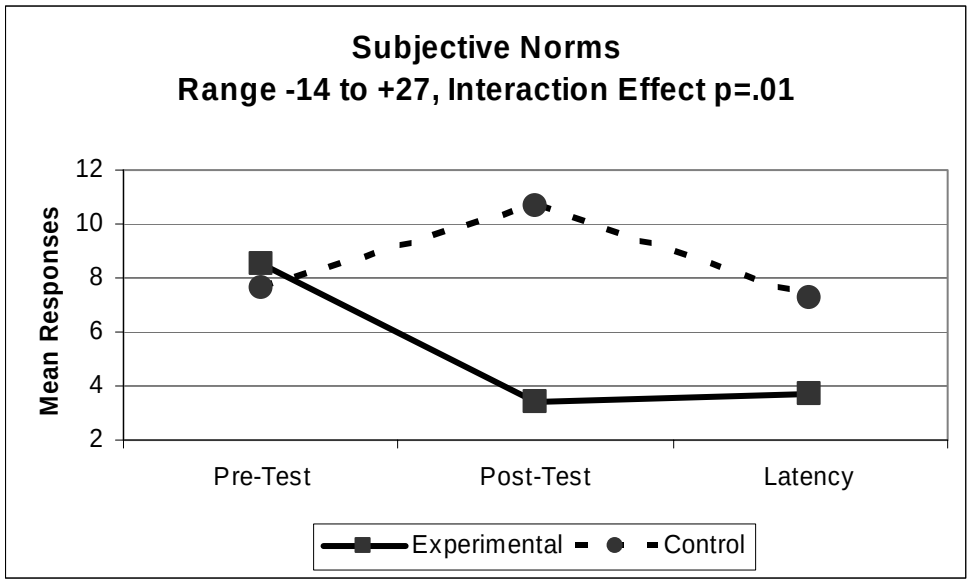


Figure 2: Interaction effect for normative influences

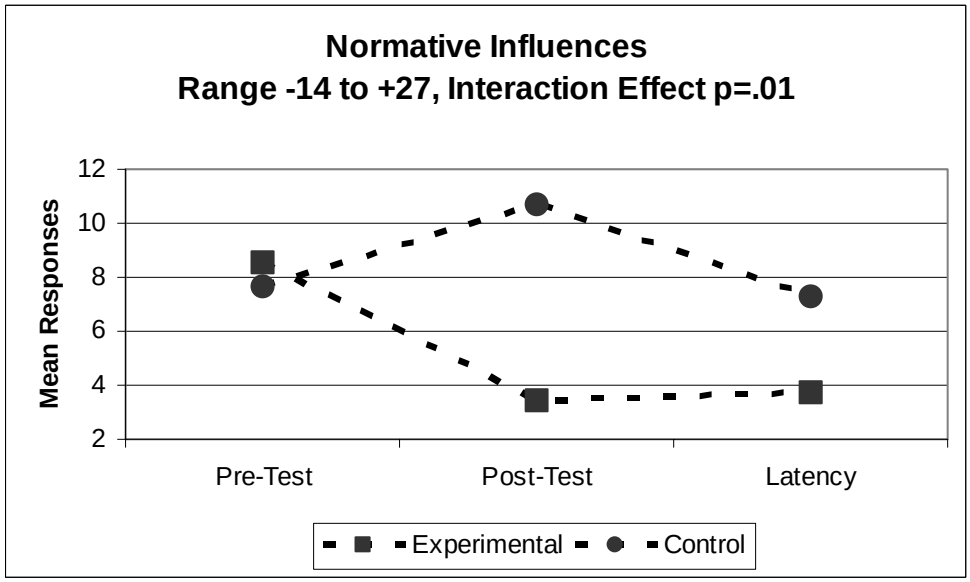


Figure 3: Group effects for intentions across time points