

**Acceptability and feasibility of an email-based nutrition intervention using the theory of
planned behaviour in Australia: Fresh Facts**

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Abstract

This study investigated feasibility and acceptability of a new email-delivered intervention promoting fruit and vegetable consumption in a university based population of Australian young adults. The study explored whether there are differences in the reported feasibility and acceptability between demographic groups within the population of interest and at three levels of intervention intensity. The email-delivered intervention program consists of an implementation intention 'planning task' and between 3 and 15 short email messages over a 15 day study period. The intervention program was developed using the Theory of Planned Behaviour and was designed to modify perceived behavioural control. One hundred and ten participants (mean age = 19.21 years, 25.6% male) completed the feasibility and acceptability questionnaire at Day 15. This questionnaire contained items about all intervention components. High acceptability and feasibility scores were found for all intervention parts and at all levels of intervention intensity. There were few significant differences in the reported acceptability of items between key demographic sub-groups, and no differences in reported acceptability at different levels of intervention intensity. These results suggest that this email-delivered intervention is an acceptable and feasible tool for promoting fruit and vegetable consumption for participants in the target population.

The World Health Organisation recommends a daily intake of fruit and vegetables of at least 400g in order to maintain good health (FAO/WHO, 2003). In Australia, the Dietary Guidelines for Australian Adults recommend that adults consume at least two servings of fruit and five servings of vegetables each day (National Health and Medical Research Council, 2003), this is approximately equivalent to a total fruit and vegetable intake of 675g. However, despite the well documented health benefits of fruit and vegetable consumption (FAO/WHO, 2003), and wide-spread public health efforts to increase consumption (Elliot & Walker, 2007), most adults do not consume adequate quantities of fruit and vegetables. In the most recent Australian survey more than 47% of Australian adults reported eating less than 2 servings of fruit each day, and almost 70% reported eating less than 4 servings of vegetables (Australian Bureau of Statistics, 2003). Research both in Australia, and from around the world, indicates that young adults are less likely than older adults to consume adequate quantities of fruit and vegetables (Australian Bureau of Statistics, 1997; Joint Health Surveys Unit, 2008) suggesting a clear need for intervention in this population.

While some interventions have successfully increased fruit and vegetable consumption (Knai, Pomerleau, Lock, & McKee, 2006; Pomerleau, Lock, Knai, & McKee, 2005), few have specifically targeted the fruit and vegetable consumption of young adults. Theoretical accounts of behaviour suggest that predictors of fruit and vegetable consumption are likely to be partly population specific (Ajzen, 1991; Fisher & Fisher, 2002). As such, interventions aimed at the general population may not adequately meet the needs of young adults.

For example, the Australian public health initiative *Go for 2&5* has been widely considered to be a successful campaign, resulting in increased awareness of Australian dietary guidelines and an increase in adherence to those guidelines (Elliot & Walker, 2007). However, recent research into the fruit and vegetable knowledge of Australian young people

shows that many young people cannot correctly report the Australian dietary guidelines for fruit and vegetable consumption and that even relatively educated young adults hold misconceptions which are likely to lessen their ability to successfully consume adequate quantities of fruits and vegetables (Kothe & Mullan, In Press).

Young adults can also be difficult to access through traditional intervention channels. In particular, the majority of fruit and vegetable interventions have been implemented in workplaces or schools (Ammerman, Lindquist, Lohr, & Hersey, 2002; Knai, et al., 2006; Pomerleau, et al., 2005). However, a large number of young adults are not currently enrolled or secondary schooling or working in paid employment (Australian Bureau of Statistics, 2009), meaning that interventions delivered through these channels have a limited capacity to reach young adults. However, over 40% of 18-25 year olds are currently enrolled in tertiary education (Australian Bureau of Statistics, 2009); making higher education settings, such as universities, one possible setting for increasing intervention reach for this age group.

With regard to how to best disseminate interventions aimed at this group, researchers have suggested that internet based programs have the most potential to be successful in younger, more internet savvy participants (Weinstein, 2006), and have recommended more web-based research with this population. Such an approach has resulted in improvements across a range of health domains (Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004).

In light of the research suggesting both a need for nutrition interventions designed for young adults, recognition of universities as a possible setting for fruit and vegetable interventions for young adults, and the growing push for web-based intervention programs for this population, the Fresh Facts intervention program was developed. This approach to intervention design calls for the involvement of all interested parties in intervention design (Bartholomew, Parcel, Kok, & Gottlieb, 2001). Specifically, those for whom the intervention

is designed should be active participants in intervention development (Bartholomew, et al., 2001). Fresh Facts intervention materials for this project have been developed through a series of focus groups. Findings from the development phase of this project have been published elsewhere (Kothe & Mullan, 2010). In addition to the involvement of the target population in intervention design, researchers have also called for extensive feasibility and acceptability testing of any intervention prior to full-scale implementation (Bartholomew, et al., 2001; Tones & Tilford, 2001). Comprehensive pre-testing increases the likelihood that the intervention is seen as comprehensive, relevant, memorable, credible, and acceptable to participants (Bartholomew, et al., 2001; Tones & Tilford, 2001). These factors are thought to be pre-requisites for successful behaviour change (Weinreich, 1999). Pre-testing also allows researchers to determine optimal levels of intervention intensity, this is a crucial feature of the design and implementation of any intervention (Campbell et al., 2000). However, on the basis of current literature, the impact of intervention intensity on the acceptability of an intervention to participants is unknown.

The main aim of this study is to investigate feasibility and acceptability of the program 'Fresh Facts'. A secondary aim of the study is to explore whether there are differences in reported feasibility and acceptability of the intervention between individuals of different ages and genders, and at different levels of intervention intensity. The current study will explore the feasibility and acceptability of the intervention at three levels of intervention intensity.

Methods

Participants and procedure

Data were collected from undergraduate students from a wide range of disciplines who were undertaking a first year psychology course at an Australian University in late 2010. Students

enrolled in first year psychology have access to a website that lists all studies which are seeking first year students as participants. Students are able to sign-up to experiments in order to receive course credit. All participants in this study received course credit for their participation. Participants who enrolled in the study were randomly assigned to one of four groups using a computerised random number generator: (1) no email (2) low intensity (3) medium intensity (4) high intensity (see Figure 1). Randomisation was completed using automated group assignment, meaning that study administrators were not aware of group assignment of individual participants. All aspects of the experiment including recruitment occurred online and could be completed from any computer with internet access. The study was approved by the University Human Research Ethics Committee.

Upon entry to the study each participant received the study URL which provided access to the study website and Part 1 of the user survey. In this part of the survey demographic information (age, gender, ethnicity, occupation of head of household) was collected and participants were prompted to complete a planning task, described below, relating to their consumption of fruit and vegetables over the next 15 days. For participants in groups two, three or four, successful completion of Part 1 triggered delivery of the automated motivational email messages over the next 15 days. All participants received an automated invitation to complete the follow-up survey 15 days after completing Part 1. Participants who had not completed the Part 2 survey within 1 week received a single email reminder. The follow-up survey contained a series of feasibility and acceptability questions as described below.

Intervention

The intervention ('Fresh Facts') is designed to increase fruit and vegetable intake of young adults. Fresh Facts is an email based program which is designed to increase the fruit and

vegetable intake of Australian young adults. The intervention is based on the Theory of Planned Behaviour (Ajzen, 1991), and has been designed using an intervention mapping approach (Bartholomew, et al., 2001). All messages were created as a result of the Fresh Facts development process (Kothe & Mullan, 2010). Messages were designed to address behaviour change techniques previously identified as relevant to the TPB (Abraham, Kok, Schaalma, & Luszczynska, 2010). Messages specifically targeted beliefs about fruit and vegetable consumption identified as important to determining perceived behavioural control during focus groups conducted with young adults in a university setting (Kothe & Mullan, 2010). These included beliefs about the costs associated with fruit and vegetable consumption, the perceived difficulty of consuming adequate quantities of fruit and vegetables, and suggestions about how improve diet using simple plans. Sample messages are available at (<http://www.fresh-facts.com/freshfacts2010/sample.html>).

This study tested a 15 day module designed to target perceived behavioural control. The interventions consisted of two main parts; an implementation intention planning task and a series of automated email messages.

All participants completed the planning task during the Part 1 user survey. This task was based on an implementation intention (Gollwitzer, 1999; Sheeran & Orbell, 1999) intervention which has previously been shown to increase fruit and vegetable consumption in a university based sample (Kellar & Abraham, 2005). Participants were asked to plan when and where they would purchase fruit and vegetables over the next week, and to generate breakfast, lunch, and dinner meal ideas which incorporate fruit and vegetables. Participants were given the opportunity to print their plan after completion.

Participants randomised to the low, medium, or high intensity intervention groups received short automated email messages in the 15 days between Time 1 and Time 2 (low intensity = 5 messages, medium intensity = 10 messages, high intensity =15 messages). A

pool of messages was created for use in this study, the messages excluded from the low and medium intensity intervention groups were selected using a random number generator.

Feasibility and acceptability questionnaire

Many researchers have called for increased pre-testing of intervention materials before intervention implementation (Bartholomew, et al., 2001; Tones & Tilford, 2001; Vandelanotte & De Bourdeaudhuij, 2003), several key concepts are known to be important in the pre-testing process. Vandelanotte & De Bourdeaudhuij (2003) identified these as: usability, user-friendliness, credibility, clarity and readability. In the present study, a self-administered questionnaire was used to assess these concepts for both intervention components: the planning task and the automated emails. The questionnaire used in this study was based on an existing questionnaire used to measure feasibility and acceptability of a web-based physical activity intervention (Vandelanotte & De Bourdeaudhuij, 2003).

The feasibility and acceptability questionnaire was comprised of two parts. Part A consisted of questions about both intervention components. The questions examined the extent to which participants found each intervention component to be: annoying, interesting, credible, logical, easy to understand, personally relevant, confusing, complete, too long and useful. To avoid excessively neutral response patterns, each item was scored on a 6-point Likert scale (1=strongly disagree, 6=strongly agree) with no neutral mid-point (Kulas & Stachowski, 2009). In Part B participants' were asked to report their actual level of usage of the intervention components (e.g. *Do you remember receiving emails about fruit and vegetables during the week? Yes/No*) and were given the opportunity to make specific comments and suggestions through a series of two open-ended questions.

In addition to self-reported measures, feasibility was also evaluated by investigating the level of attrition over the course of the study.

Statistical analyses

All quantitative analyses were performed using SPSS 17.0. All items were scored from 1 to 6, with a higher score indicating greater agreement with the target statement. In order to increase clarity in reporting of statistics, item means are accompanied by the percentage of participants who agreed the with target statement. The “percent agreed” represents the proportion of participants who answered “strongly agree” or “agree” on the individual item.

Independent sample t-tests were conducted to explore differences in feasibility ratings between participants who did and did not report using the plan; between participants who reported reading the emails and those who reported receiving the emails but not reading them; and between male and female participants. Bivariate correlation analyses were conducted to investigate the relationship between age (a continuous variable) and reported feasibility and acceptability. One-way ANOVAs were used to explore the influence of intervention intensity on feasibility and acceptability items.

Thematic analysis was used to interpret comments and suggestions made about intervention components by intervention participants (Silverman, 2004). Thematic analysis was conducted using NVivo 8.0. Qualitative coding was conducted by the two authors, with the final themes decided through consensus. Common themes are reported using illustrative quotes.

Results

Data were collected from 117 students at baseline, 25.6% of the baseline sample were male, age at baseline ranged between 18 and 25 years (M=19.21). The demographic characteristics of the sample are presented in Table 1. Participants were randomised to the four levels of the interventions as follows: no email (n=27), low intensity (n=39), medium intensity (n=21), and

high intensity (n=30). There were no significant between group differences in demographic characteristics at baseline.

A total of 110 participants completed the feasibility and acceptability measures at follow-up. This represents a total attrition rate of 6% over the course of the study. There were no significant differences in the rate of drop-out between groups.

Table 1. Demographic characteristics of the baseline sample.

	Mean	SD
Age (years)	19.21	1.35
	N	%
Gender		
Male	30	25.6
Female	87	74.4
Ethnicity		
Australian	59	50.4
North West and South East European	9	7.7
North African	7	6.0
South East Asian	18	15.4
North East Asian	13	11.1
South Asian	4	3.4
Other	7	6.0
Occupation of head of household*		
Higher managerial, administrative or professional	44	37.6
Intermediate managerial, administrative or professional	26	22.2
Supervisor, clerical or junior	6	5.1
Skilled manual workers (e.g. tradesperson)	10	8.5
Semi and unskilled manual workers	5	4.3
Student	22	18.8

* Percentages do not add to 100 due to missing values

Quantitative responses to the planning task

Table 2 presents the total sample means and proportion who agreed with items related to the feasibility and acceptability of the planning task. Scores for this intervention component were generally very positive.

Table 2. Sample means and proportion agreed for planning task feasibility and acceptability items.

	Sample mean	% agree
Annoying	2.98	25.9
Interesting	4.46	88.2
Credible	4.64	97.1
Logical	4.77	97.4
Easy to understand	5.44	100
Personally relevant	4.60	88.9
Confusing	2.08	6.9
Comprehensive	4.23	88.0
Too long	3.07	27.3
Useful	4.44	87.9

Participants who reported that the plan was “too long” were less likely to report having used the plan [$t(71)=2.001$, $p=.049$]. No other differences in feasibility and acceptability item response patterns were detected.

Quantitative responses to the automated emails

Table 3 presents the total sample means and proportion who specified agreement with items related to the feasibility and acceptability of the automated emails. A total of 12 participants randomised to an automated email intervention group reported not receiving intervention emails. Thus, this section only reports responses from individuals who were randomised to an email intervention condition and who reported receiving emails. As shown, scores for this intervention component were very positive.

Table 3. Sample means and proportion agreed for automated email feasibility and acceptability items.

Email	Sample mean	% agree
Annoying	2.77	21.2
Interesting	4.93	97.6
Credible	4.78	92.5
Logical	4.89	97.6
Easy to understand	5.38	100
Personally relevant	4.40	86.1
Confusing	1.90	4.4
Comprehensive	4.31	87.1
Too long	2.53	11.8
Useful	4.50	90.9

A total of 18 participants who reported receiving emails did not read the intervention emails. Participants who reported that the emails were annoying [$t(54)=3.787$ $p<.001$] or too long [$t(54)= 3.109$ $p=.003$] were significantly less likely to report having read all of the emails. Conversely, individuals who reported that the emails were useful [$t(54)= -2.880$ $p=.006$], logical [$t(54)= -4.878$ $p<.001$], and interesting [$t(55)= -4.342$ $p<.001$] were more significantly more likely to report having read all of the emails.

Predictors of feasibility and acceptability ratings

With regard to gender, males were more likely than females to rate the planning task as annoying [$t(104)=2.88$, $p=.005$] and too long [$t(105)=2.311$, $p=.023$]. Whereas, females were more likely than males to rate both the planning task [$t(105)=-2.135$, $p=.035$] and automated emails as comprehensive [$t(56)=-2.283$, $p=.026$]. There were no other significant gender-related differences. There were no significant relationships between age and any of the feasibility and acceptability items.

No effects of intervention intensity on reported feasibility and acceptability scores of either intervention component were detected.

Qualitative responses to the planning task

A number of important issues were identified in qualitative responses to the planning task.

These common themes are reported using illustrative quotes.

A number of participants reported that they were highly motivated to increase their fruit and vegetable consumption when completing the planning task:

“I found that in the moment of committing to my plan I was highly motivated...it would have been great to make use of that moment of high motivation” – Female, 18

However, some reported that this level of motivation was not sustained during the 15 day intervention period:

“...it requires a lot of motivation to stick to a plan, unfortunately I don't have that motivation”. – Female, 19

This loss of motivation appeared to be strongest for the no email intervention group, as a number of participants in the automated email intervention groups reported that the emails were useful in maintaining motivation to adhere to the plan:

“The planning task was very beneficial in changing some of my diet habits [sic] ...overall one must admit that the emails were quite encouraging! Thanks!”. – Female, 18

Participants reported differing levels of success in adhering to the plan they made as part of Fresh Facts. While some participants found their plans easy to follow:

“It was easy to follow and I stuck fairly close to it” – Male, 18

Others reported more difficulty:

“I didn't stick to the plan due to inconveniences of going to the supermarket, and cooking the actual food” – Female, 18

At all levels of intervention intensity, most participants who reported non-adherence to their plan also reported encountering challenges to their ability to adhere to the plan (e.g. limited time, illness, lack of control over food purchases).

Importantly, some participants reported that they had difficulty generating fruit and vegetable meal ideas during the planning task:

“I found it hard to find places in my diet where I could incorporate more fruit and vegetables” – Male, 19

In some cases this appeared to have resulted in participants generating unrealistic plans that they then had difficulty adhering to:

“I don’t have...the cooking skills required to follow my plan!” – Female, 18

Qualitative responses to the automated emails

Comments about the feasibility and acceptability of the automated emails are reported separately for each level of intervention intensity. Common themes are reported using illustrative quotes.

Low intensity intervention participants reported that the emails were a “*good reminder,*” and several participants commented that they found the recipes and tips to be especially useful:

“good recipes – I never imagined fruits and vegies could make so many dishes”. –
Female, 20

However some participants reported that the emails were “*just common sense*”.

Most medium intensity intervention participants who commented on the automated emails reported that they found the emails to be encouraging, and that the emails helped them to

“remember to eat fruit and veg more often”. However, some participants reported that they found the emails repetitive, and that they felt they received too many emails:

“They were fairly encouraging but a bit repetitive. After a while i [sic] didn't pay too much attention to them” – Female, 18

Like participants in the low and medium intensity intervention, the majority of respondents in the high intensity intervention reported that the intervention provided good motivation to increase fruit and vegetable consumption:

“the emails were interesting to read and they encouraged and motivated me to eat healthy” – Female, 19

Responses from participants suggest that the emails were effective in increasing perceived behavioural control:

“they made keeping healthy seem very easy” – Female, 18

However, as with the lower intensity interventions some participants reported that at least some of the emails were *“a little obvious”*. Interestingly, no participants in the high intensity intervention reported feeling that they received too many emails.

Discussion

The aims of the present study were to test the feasibility and acceptability of the Fresh Facts intervention, and to explore whether these were different at different levels of intervention intensity and between demographic sub-groups. Generally speaking, the quantitative and qualitative data both showed the Fresh Facts intervention to be a feasible and acceptable intervention for improving fruit and vegetable consumption in a university based sample of young adults. There was a low rate of attrition over the course of the study, and nearly all participants responded favourably to both the email and planning components of the intervention, reporting that both components were credible, interesting, useful, easy to

understand, personally relevant and comprehensive. Since these factors are thought to be related to intervention efficacy (Weinreich, 1999), these findings provide support for the use of an email-delivered TPB based intervention to increase fruit and vegetable consumption in Australian university undergraduates.

Potential threats to intervention acceptability

While the majority of participants rated the intervention positively, more than a fifth of participants indicated that the planning task was too long, and that both the planning task and automated emails were annoying. This is consistent with qualitative responses indicated that a number of participants felt that the intervention materials were “just common sense” or “too repetitive”. Although the vast majority of participants rated these intervention components as acceptable, this relatively small number of negative responses is still important to consider as these factors may cause higher than expected rates of drop-out during intervention implementation. Unfortunately, the design of the study did not allow individuals who dropped out of the study to complete the feasibility and acceptability measures, so this hypothesis cannot be directly tested. Future studies are needed to investigate the extent to which attrition is related to intervention acceptability. However, the results provide partial support for a link between acceptability ratings and intervention adherence, since participants who rated the emails as annoying were less likely to have read the emails. Given this apparent link, more work is needed to identify factors that can reduce the extent to which the email intervention is considered annoying in order to increase adherence.

With regard to the acceptability of the intervention across a range of subgroups - only a few significant differences were found for age and gender. This provides strong support for the belief that this intervention would be suitable for increasing the fruit and vegetable consumption of young adults across a range age and gender groups. This is a major goal in

intervention development, and is widely consistent with reports of intervention feasibility and acceptability for other web-based interventions (Vandelanotte & De Bourdeaudhuij, 2003; Vandelanotte, De Bourdeaudhuij, & Brug, 2004). While the total sample size was relatively low, the demographic characteristics of this sample are similar to the characteristics of other university based samples (Kothe, Mullan, & Amaratunga, 2011; Wong & Mullan, 2009). Given that the Fresh Facts intervention is designed to be used in a university context it would appear that this sample is generally appropriate. However, like many university based samples used in health promotion research, females were over-represented in this sample. This should be kept in mind when considering the gender effects reported in this study. Future research may be needed to determine the extent to which the intervention is acceptable to male participants, particularly if the intervention were to be trialled in a sample of students where the proportion of males was significantly higher.

One of the key reasons to explore the influence of intervention intensity on ratings of the intervention was the concern that the high intensity email intervention may be less acceptable to participants. However, the low rates of attrition across all study groups and the lack of intervention intensity effects would suggest that intervention intensity does not affect the acceptability of the intervention to participants. This is consistent with qualitative findings. However, it is important to note that although intervention intensity may not influence acceptability of the intervention – there is some evidence to show that intervention intensity may influence efficacy (Kroeze, Werkman, & Brug, 2006). Research on the links between intensity, acceptability, and efficacy, is currently very limited. Future researchers should conduct thorough pilot testing of interventions to determine optimal levels of intervention intensity for each intervention.

Potential threats to feasibility

In addition to the small number of participants who reported not reading all intervention emails – there are some indications of other variations in protocol over the course of the study that should be taken into account when considering the feasibility of this intervention. In particular, qualitative feedback regarding the planning task indicates that some participants may have encountered difficulty in adhering to the implementation intentions they formed in this task. Complete adherence to implementation intentions by all participants is an unreasonable goal. However, qualitative responses to the planning task suggest that some participants developed tasks that were impossible for them to adhere to. This may have undermined the effectiveness of this part of the intervention. This finding highlights the importance of conducting pre-testing of all intervention materials. Although this planning task has successfully been used in a previous study in a similar UK population (Kellar & Abraham, 2005), results from this study suggest it may need to be altered for use in an Australian population in order to encourage people to form more realistic implementation intentions.

As in all intervention studies, another potential challenge to intervention feasibility is the issue of intervention fidelity. While fidelity data was not directly collected in this study, there are some indications that such measures should be included in future evaluations of Fresh Facts and similar interventions. Eighteen participants reported receiving but not reading intervention emails. However, the self-report nature of this item may have led to under-reporting for this item. Twelve participants in the current study reported not receiving automated emails. While it appears that only a relatively small proportion of participants did not read or did not receive intervention emails, future email based interventions should include fidelity checks to ensure that participants are truly receiving the intervention as designed. In particular the use of email management systems which allow tracking of email

delivery status and email open rates may be useful in tracking intervention fidelity in future studies.

Comparison of intervention feasibility and acceptability across studies

Because so few researchers routinely publish feasibility and acceptability information for newly developed interventions it is not possible to compare the feasibility and acceptability results with previous interventions of a similar format. However, given the limited comparisons which are available this intervention does compare favourably to the interventions for which comparable data is available. For example, Vandelanotte & De Bourdeaudhuij (2003), reported that only 54% of participants rated computer tailored physical activity feedback in their study as personally relevant or useful. In contrast, despite the fact that Fresh Facts intervention materials are not individually tailored, approximately 87% of participants reported that the intervention components were personally relevant.

Limitations of the present study

In addition to the issues discussed in the above sections, this study has a number of methodological limitations which should be taken into consideration when interpreting these results. The intervention received high ratings of acceptability across all groups. This may have created ceiling effects and limited variability of acceptability items. As such, it is possible that some analyses may not have reached significance due to low variability in acceptability.

Secondly, one of the stated aims of the FreshFacts study is to increase fruit and vegetable consumption in Australian young adults. To date the FreshFacts intervention has only been implemented in an undergraduate population. While over 40% of young adults are currently enrolled in tertiary education (Australian Bureau of Statistics, 2009) this

intervention does not currently address fruit and vegetable consumption in young adults outside of the university setting. Intervention materials do not refer to university and could easily be made available to young adults in other contexts. Future research should look at the feasibility and acceptability of this intervention outside of the university context in order to improve the reach of this intervention.

Conclusion

Despite limitations in the current body of work in this field, these results broadly support the conclusion that this email-delivered intervention is an acceptable and feasible tool for promoting increased fruit and vegetable consumption. Although further studies are needed to examine the intervention efficacy, this study provides support for the continued development of the Fresh Facts program. Findings from this study may also inform the development of similar interventions in different contexts. Importantly, this study contributes to a small, but growing, literature on the feasibility and acceptability of behaviour change interventions. Although interpretation of the current findings is limited by the lack of existing research in the area; dissemination of feasibility and acceptability data of interventions in a range of contexts is a vital step in improving the literature in this field.

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