

# The Effectiveness of Persuasive Health Communication Techniques

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## Abstract:

*Objective:* This study tests the effectiveness of Framing and Fear conditions to change attitudes towards elective single embryo transfer (eSET) in a large, non-clinical population. *Method:* A repeated measures randomised control trial design was used with 632 male and female participants allocated to one of two intervention groups (Framing or Fear condition) or a control group. There were two conditions in the Framing group (gain or loss frame), three conditions in the Fear group (high, medium or low fear) and two control conditions (education and non-education). Questionnaires were completed before exposure to the message (time 1) and immediately afterwards (time 2).

*Results:* High fear ( $\beta = .637$ ,  $P < 0.008$ ) and gain frame ( $\beta = .718$ ,  $P < 0.005$ ) were the only significant conditions predicting hypothetical intentions towards eSET at Time 2 for the total sample. No other conditions were predictive of hypothetical intentions. Education only improved knowledge and non-education showed no changes in scores.

*Conclusion:* These results highlight the benefits of multidisciplinary expertise in designing health promotion to reduce multiple pregnancies.

*Practice Implications:* Findings suggest that educational material needs to be presented alongside persuasive communication techniques incorporating high fear and gain frames to help promote eSET in clinical practice.

## Keywords:

Embryo Transfer; Communication; Health Promotion; Education; Infertility

## 1. INTRODUCTION

The Human Fertilisation Embryology Association's (HFEA, UK) guidelines aim to reduce the average national multiple birth rate to 10% [1] through the single embryo transfer policy (eSET), because multiple pregnancies are the single greatest health risk to infants and mothers following IVF treatment [2]. Currently, one in four births conceived through in vitro fertilisation (IVF) result in twins or triplets, compared to one in 80 in natural conceptions [3, 4]. Some patients and clinicians reject eSET [5] because of the (perceived) reduced chance of pregnancy [6], despite the fact that eSET is known to decrease multiple rates without decreasing pregnancy rates [7].

Encouraging patients to use eSET can therefore be difficult because some patients undergoing IVF treatment consider the risks of multiple pregnancies acceptable [8, 9], multiple births an ideal treatment outcome [10], or choose DET to maximise their chances of achieving a pregnancy [11]. Newton et al. [12] reported that patients preference for DET was ‘firmly established’ and ‘remained largely unchanged’, and shifts towards twin preferences were more salient if patients had negative pregnancy tests [13]. Multifaceted implementation strategy [14] increased eSET rates moderately, although no differences in eSET preferences were reported in a follow up, suggesting limited effectiveness [15]. Similarly, providing patients with extra information leaflets or additional discussion sessions did not change couples’ attitudes towards eSET [16]; Educational DVD’s have improved attitudes towards eSET but not eSET uptake [17, 18] and educational leaflets paired with hypothetical increases in insurance coverage for fertility treatment improved preferences towards SET, suggesting appropriately framed or targeted losses or benefits may be more persuasive than education or information [19].

The Framing [20, 21] and Fear conditions [22] were used in a previous persuasive health study [23]. Framing is based on the Prospect theory [20], which predicts that people have different preferences for equivalent outcomes that are framed either positively (as gains) or negatively (as losses) [21]. The framing effect generally predicts that people avoid risks when considering gains, but prefer risks when considering losses. Fear conditions assume that fear creates tension which motivates individuals to adopt advised recommendations to alleviate the threat [24]. Janis’s [25] family-of-curves theory postulates that there is an optimal fear arousal level for facilitating behavioural change, although this has been disputed [26, 27]. Specifically, high fear and high efficacy messages have been found to be effective in changing behaviours and attitudes [27, 28], and gain framed, and high and medium fear conditions improved knowledge and hypothetical intentions towards eSET [27, 28]. The aims of this paper were to test the robustness of two health communication strategies, Framing Effect and Fear Appeal, in a large student population using a randomised control trial.

## 2. METHODS

A repeated measures design where participants were randomised to the intervention and control groups, as shown in **Figure 1** was used.

### 2.1 Participants

In order to recruit a large sample, 632/1005 (63%) University students were recruited. Ages ranged from 17 to 55 years (mean 22 years). Females represented more than 60% (n=388) of the sample, although gender data was missing for 13 participants. Most were single (71%, n=448), with no children (90%, n=528) and non-white (66%, n=340).

### 2.2 Materials

*Framing messages:* The gain framed condition highlighted the benefits of eSET by emphasising the potential health benefits of a singleton pregnancy, whereas the loss framed condition highlighted the costs associated with not selecting eSET by emphasising the potential health risks associated with multiple

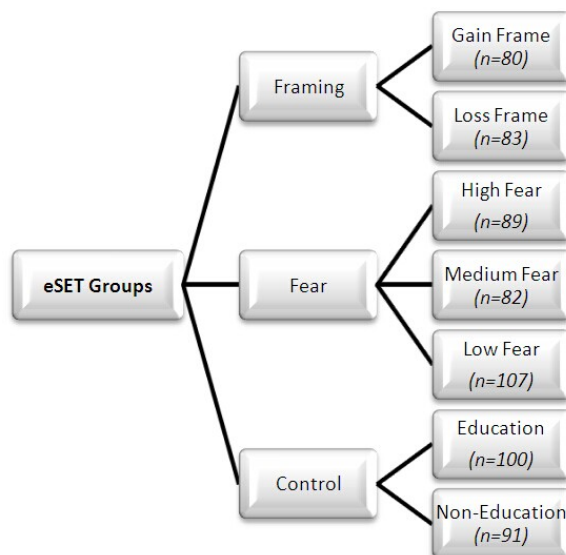


Figure 1. Participant entry to conditions

pregnancies.

*Fear Appeal messages:* High, Medium or Low fear conditions followed a problem-solution pattern (problem -multiple pregnancies, solution - single embryo transfer). The problem includes the important *threat* component; the solution recommends an *action*, to choose a single embryo solution to avoid the threat of multiple pregnancies depicted in the condition, demonstrating response and personal efficacy.

The high fear condition consisted of bolded words, emotive language, a vivid photograph of a live pre-mature child; medium fear had fewer bolded, less emotive, a vivid drawing of a baby in an incubator; low fear used very little bolded, emotive language or imagery. With the exception of the threat component, all three conditions included the same vulnerability, action, personal and response efficacy components and were all based on the loss frame, as summarized below:

The intervention conditions included a statement: “At some point you may be thinking of having children yourself, and most of you will succeed. However, 1 in 7 couples will experience fertility problems and some of these couples will then seek fertility treatment such as in vitro fertilisation (IVF).”

*Control:* The control group received an ‘Educational’ or ‘non-Educational’ condition. All conditions are available upon request from the authors.

### 2.3 Instrument

The adapted Attitudes towards Single Embryo Transfer questionnaire [23] was completed before exposure (baseline) and immediately after exposure to the conditions to test their effectiveness. Questions concerned *knowledge* of multiple pregnancies in IVF; *preference towards having twins*; *intentions* about the number of embryos which should be transferred during IVF in principle and in [hypothetical] practice for themselves, and *attitudes* towards the acceptability of eSET. Most response options were ‘yes’, ‘don’t know’ ‘no’, with high scores indicating a positive response towards eSET and negative responses towards multiple pregnancies. Items on sub-scales for knowledge (items 1-4,  $\alpha$  .16), twin preference (items 5-6,

$\alpha$  .06), hypothetical intentions (items 7-8,  $\alpha$  .74) and attitudes (items 9-14,  $\alpha$  .48) were summed together. The dependent variable (hypothetical intentions), combines the two items on intentions to use eSET in principle and in practice for themselves, with high scores indicating intention to use eSET, as Cronbach's alpha revealed high internal consistency for time 1 on these items.

## 2.4 Procedure

A simple randomisation procedure was used. Questionnaires and messages were unmarked (to researchers and participants) to ensure blinded distribution. Participants were given written information, consent and the questionnaire (Time 1). Following the first questionnaire, they were asked to read the randomly allocated message and to complete the Time 2 questionnaire and the debrief sheet. Care was taken to ensure participants did not read messages before completing time 1 questionnaire. Only non-English speaking participants were excluded from the study. Ethical approval was granted by the university ethics committee.

## 3. RESULTS

Time 1 questionnaires were completed by 632 participants. In all communication conditions, sample sizes varied resulting from drops outs and missing items. **Table 1** shows the exact number of participants included in all data analyses for time 1 and time 2. There were no significant socio-demographic differences between participants (in all conditions at Time 1) on age ( $F(6, 610) = 1.292; P > 0.05$ ), gender ( $\chi^2 = 2.258, d.f. = 6, P > 0.05$ ), ethnicity ( $\chi^2 = 8.962, d.f. = 6, P > 0.05$ ), parity ( $\chi^2 = 5.776, d.f. = 6, P > 0.05$ ), and marital status ( $\chi^2 = 2.038, d.f. = 6, P > 0.05$ ).

### 3.1 Group comparisons

To ensure there was no possibility of pre-existing knowledge, twin preference, attitudes or hypothetical intention bias towards eSET as rated at Time 1, the Attitudes towards Single Embryo Transfer questionnaire responses were also compared between the seven condition groups. No significant differences between scores on knowledge ( $F(6, 551) = 1.468; P > 0.05$ ), twin preference ( $F(6, 624) = 1.168; p > 0.05$ ), attitudes ( $F(6, 606) = 0.440; P > 0.05$ ) or hypothetical intentions ( $F(6, 592) = 1.056; P > 0.05$ ) towards eSET at Time 1 was observed between the seven conditions.

### 3.2 Effectiveness of the messages

*Framing effect:* As can be seen from **Table 1**, the gain frame condition demonstrated a significant improvement in participants' attitudes and hypothetical intentions towards eSET whereas the Loss frame only improved knowledge. Analysis by gender showed the gain frame improved women's attitudes and hypothetical intentions towards eSET (see **Table 2**), and the loss frame had no impact. For men, only the gain frame improved hypothetical intentions at T2 (see **Table 3**).

**Table 1.** Differences in participant's scores before and after exposure to the messages for the entire sample

Conditions	Sub-scales	Means (sd) for T1 & T2 & sample size	Paired sample T-test Results
Gain frame	Knowledge	T1 6.15( 1.78) T2 6.48 (1.91)n=54	Ns
	TwinPreference	T1 1.60 (1.29) T2 1.67 (1.24) n=63	Ns
	<b>Attitudes</b>	<b>T1 6.57 (2.19) T2 7.31 (2.49) n=61</b>	<b>.011</b>
	<b>Hypothetical intentions</b>	<b>T1 3.98 (1.55) T2 4.83 (1.48) n=59</b>	<b>.001</b>
Loss frame	<b>Knowledge</b>	<b>T1 6.69 (2.14) T2 7.23(1.86) n=65</b>	<b>.046</b>
	Twin Preference	T1 1.45 (1.18) T2 1.32(1.09) n=71	Ns
	Attitudes	T1 6.90(2.42) T2 7.15(2.33) n=71	Ns
	Hypothetical intentions	T1 4.25(1.33) T2 4.50(1.54) n=69	Ns
High Fear	<b>Knowledge</b>	<b>T1 6.84(1.83) T2 7.45(1.72) n=73</b>	<b>.002</b>
	Twin preference	T1 1.45(1.35) T2 1.51(1.26) n=78	Ns
	Attitudes	T1 7.00(2.48) T2 7.48(2.77) n=73	Ns
	<b>Hypothetical intentions</b>	<b>T1 4.05(1.52) T2 4.74(1.38) n=74</b>	<b>.001</b>
Medium Fear	Knowledge	T1 6.63(1.46) T2 6.51(1.52) n=59	Ns
	<b>Twin Preference</b>	<b>T1 1.31(1.13) T2 1.62(1.15) n=71</b>	<b>.012</b>
	Attitudes	T1 6.97(1.91)T2 7.37(2.62) n=70	Ns
	<b>Hypothetical intentions</b>	<b>T1 3.90(1.48) T2 4.50(1.51) n=68</b>	<b>.0001</b>
Low Fear	<b>Knowledge</b>	<b>T1 6.64(1.84) T2 7.14(1.98) n=70</b>	<b>.012</b>
	Twin Preference	T1 1.34(1.05) T2 1.34(1.06) n=85	Ns
	<b>Attitudes</b>	<b>T1 6.70(2.18) T2 7.26(2.35) n=84</b>	<b>.015</b>
	Hypothetical intentions	T1 4.32(1.40) T2 4.52(1.45) n=84	Ns
Education	<b>Knowledge</b>	<b>T1 6.45(1.91) T2 7.38(1.92) n=71</b>	<b>.0001</b>
	Twin Preference	T1 1.45(1.18) T2 1.51(1.26) n=84	Ns
	Attitudes	T1 6.99(2.34) T2 6.72(2.53) n=76	Ns
	Hypothetical intentions	T1 3.97(1.43) T2 4.31(1.64) n=78	Ns
Non-education	Knowledge	T1 6.85(1.79) T2 6.87(2.23) n=71	Ns
	Twin Preference	T1 1.14(1.03) T2 1.29(1.15) n=79	Ns
	Attitudes	T1 6.67 (2.15) T2 6.78(2.72) n=79	Ns
	Hypothetical intentions	T1 4.37(1.41) T2 4.13(1.51) n=78	Ns

Note: Data in bold represent significant results; Ns=non-significant t-test

*Fear appeal:* As can be seen from **Table 1**, high fear messages significantly improved knowledge and hypothetical intentions towards eSET; Medium fear also improved hypothetical intentions towards eSET and twin preferences (high score indicates lower twin preference); whereas Low fear improved knowledge and attitudes towards eSET at Time 2. However, high fear improved women's knowledge, attitudes and hypothetical intentions towards eSET (**Table 2**), but only improved knowledge in men (**Table 3**). Medium fear improved hypothetical intentions in both women and men and the low fear condition changed attitudes for men only (see **Table 2** and **Table 3**).

*Control:* As expected Education improved knowledge but did not influence twin preference, attitudes or hypothetical intentions and non-education showed no changes in scores. Education improved knowledge and hypothetical intentions for women (**Table 2**), and for men, only knowledge was improved (see **Table 3**). No effects for non-education were obtained.

### 3.3 Conditions predicting hypothetical intentions towards eSET

Since regression modelling found no effect for gender on intentions to towards eSET at time 2 ( $\beta = .172$ ,  $P=0.216$ ), gender was removed from the regression analyses. A second linear regression model (without gender) and using all seven conditions revealed that high fear ( $\beta = .637$ ,  $P<0.008$ ) and gain frame ( $\beta = .718$ ,  $P<0.005$ ) were the only significant conditions predicting hypothetical intentions towards

**Table 2.** Differences in participant’s scores before and after exposure to the messages for women only sample

Conditions	Sub-scales	Means(sd) for T1 & T2 & sample size	Paired samples T-test results
Gain frame	Knowledge	T1 6.19 (1.75) T2 6.43 (1.97) n=37	Ns
	Twin Preference	T1 1.61 (1.36) T2 1.59 (1.42) n=46	Ns
	<b>Attitudes</b>	<b>T1 6.51 (2.20) T2 7.42 (2.32) n=43</b>	<b>.009</b>
	<b>Hypothetical intentions</b>	<b>T1 4.14 (1.61) T2 4.91 (1.46) n=43</b>	<b>.010</b>
Loss frame	Knowledge	T1 6.73 (2.29) T2 7.34 (1.68) n=41	Ns
	Twin Preference	T1 1.52 (1.23) T2 1.26 (1.08) n=46	Ns
	Attitudes	T1 6.73 (2.49) T2 6.91 (2.36) n=45	Ns
	Hypothetical intentions	T1 4.16 (1.35) T2 4.57 (1.63) n=44	Ns
High Fear	<b>Knowledge</b>	<b>T1 7.19 (1.86) T2 7.86 (1.73) n=43</b>	<b>.017</b>
	Twin Preference	T1 1.28 (1.29) T2 1.17 (1.16) n=46	Ns
	<b>Attitudes</b>	<b>T1 6.70 (2.29) T2 7.50 (2.72) n=44</b>	<b>.035</b>
	<b>Hypothetical intentions</b>	<b>T1 3.63 (1.57) T2 4.58 (1.56) n=43</b>	<b>.001</b>
Medium Fear	Knowledge	T1 6.68 (1.66) T2 6.45 (1.58) n=40	Ns
	Twin Preference	T1 1.37 (1.14) T2 1.52 (1.21) n=46	Ns
	Attitudes	T1 7.00 (2.06) T2 7.37 (2.67) n=46	Ns
	<b>Hypothetical intentions</b>	<b>T1 3.84 (1.46) T2 4.38 (1.54) n=45</b>	<b>.012</b>
Low Fear	Knowledge	T1 7.22 (1.78) T2 7.66 (2.02) n=41	Ns
	Twin Preference	T1 1.29 (1.11) T2 1.19 (1.07) n=52	Ns
	Attitudes	T1 7.13 (2.03) T2 7.38 (2.48) n=53	Ns
	Hypothetical intentions	T1 4.25 (1.47) T2 4.35 (1.49) n=52	Ns
Education	<b>Knowledge</b>	<b>T1 6.76 (1.98) T2 7.24 (2.00) n=46</b>	<b>.043</b>
	Twin Preference	T1 1.32 (1.21) T2 1.48 (1.29) n=56	Ns
	Attitudes	T1 7.04 (2.39) T2 6.70 (2.73) n=50	Ns
	<b>Hypothetical intentions</b>	<b>T1 3.81 (1.48) T2 4.26 (1.67) n=54</b>	<b>.044</b>
Non-education	Knowledge	T1 6.96 (1.85) T2 7.09 (2.33) n=47	Ns
	Twin Preference	T1 1.17 (1.10) T2 1.25 (1.06) n=52	Ns
	Attitudes	T1 6.77 (2.05) T2 6.75 (2.67) n=52	Ns
	Hypothetical intentions	T1 4.30 (1.30) T2 4.15 (1.43) n=53	Ns

Note: Data in bold represent significant results; Ns=non-significant t-test

eSET at Time 2 for the total sample. No other conditions were predictive.

#### 4. DISCUSSION AND CONCLUSION

This study investigated the robustness of persuasive health communication conditions to inform participants about the dangers associated with multiple births. The results showed that the high fear and gain frame were the most effective at predicting hypothetical intentions towards eSET. Gender had no impact on predicting hypothetical intentions at time 2. Some gender differences were observed in the individual analyses; the gain frame and high fear conditions successfully improved women’s attitudes and hypothetical intentions towards eSET (and knowledge in the high fear condition) and the gain frame condition improved men’s hypothetical intentions and high fear improved their knowledge. These results are consistent with the data reported previously [23]. Medium fear was also successful at improving hypothetical intentions but was not predictive of knowledge which was improved alongside intentions in the earlier paper [23]. Both studies found that education only improved knowledge, not change attitudes or intentions. These results are therefore robust and were replicated. It is not enough to provide educational training or information regarding the dangers of multiple pregnancies and benefits of eSET. This may be why previous intervention studies have reported limited changes in patient’s preference towards eSET [16, 17]. Educational material presented alongside persuasive communication messages may be useful in

**Table 3.** Differences in participant's scores before and after exposure to the messages for men only sample

Conditions	Sub-scales	Means (sd) for T1 & T2 & sample size	Paired samples T-test results
Gain frame	Knowledge	T1 6.33 (1.84) T2 6.80 (1.82) n=15	Ns
	Twin Preference	T1 1.67 (1.18) T2 1.93 (1.16) n=15	Ns
	Attitudes	T1 6.63 (2.28) T2 7.00 (3.03) n=16	Ns
	<b>Hypothetical intentions</b>	<b>T1 3.57 (1.40) T2 4.64 (1.55) n=14</b>	<b>.046</b>
Loss frame	Knowledge	T1 6.61 (1.92) T2 7.04 (2.21) n=23	Ns
	Twin Preference	T1 1.29 (1.12) T2 1.42 (1.14) n=24	Ns
	Attitudes	T1 7.24 (2.35) T2 7.64 (2.27) n=25	Ns
	Hypothetical intentions	T1 4.50 (1.25) T2 4.50 (1.32) n=24	Ns
High Fear	<b>Knowledge</b>	<b>T1 6.24 (1.67) T2 6.79 (1.52) n=29</b>	<b>.036</b>
	Twin Preference	T1 1.61 (1.33) T2 1.94 (1.21) n=31	Ns
	Attitudes	T1 7.36 (2.72) T2 7.36 (2.91) n=28	Ns
	Hypothetical intentions	T1 4.60 (1.22) T2 4.93 (1.05) n=30	Ns
Medium Fear	Knowledge	T1 6.61 (0.92) T2 6.78 (1.31) n=18	Ns
	Twin Preference	T1 1.13 (1.14) T2 1.78 (1.09) n=23	Ns
	Attitudes	T1 6.91 (1.72) T2 7.41 (2.70) n=22	Ns
	<b>Hypothetical intentions</b>	<b>T1 4.10 (1.55) T2 4.86 (1.46) n=21</b>	<b>.012</b>
Low Fear	Knowledge	T1 5.88 (1.61) T2 6.46 (1.79) n=26	Ns
	Twin Preference	T1 1.43 (0.91) T2 1.60 (1.07) n=30	Ns
	<b>Attitudes</b>	<b>T1 5.89 (2.36) T2 7.04 (2.20) n=28</b>	<b>.016</b>
	Hypothetical intentions	T1 4.59 (1.24) T2 4.79 (1.35) n=29	Ns
Education	<b>Knowledge</b>	<b>T1 5.88 (1.67) T2 7.64 (1.78) n=25</b>	<b>.0001</b>
	Twin Preference	T1 1.71 (1.08) T2 1.57 (1.20) n=28	Ns
	Attitudes	T1 6.89 (2.27) T2 6.77 (2.14) n=26	Ns
	Hypothetical intentions	T1 4.24 (1.33) T2 4.40 (1.55) n=25	Ns
Non-education	Knowledge	T1 6.65 (1.70) T2 6.48 (2.04) n=23	Ns
	Twin Preference	T1 1.08 (0.91) T2 1.24 (1.23) n=25	Ns
	Attitudes	T1 6.44 (2.43) T2 6.72 (2.92) n=25	Ns
	Hypothetical intentions	T1 4.48 (1.68) T2 4.09 (1.65) n=23	Ns

Note: Data in bold represent significant results; Ns=non-significant t-test

developing handouts for patients.

The effectiveness of the gain frame and high fear to promote eSET is consistent with theory and research. Gain frames are more effective in prevention behaviour (i.e., preventing multiple pregnancies) and loss frames are more effective at promoting health detection behaviour (such as self examinations) [29–34]. A previous meta-analysis [26] reported that stronger fear messages were more persuasive than weaker fear messages. In our study, high fear and gain frame were the two most effective conditions and the high fear (as all the other fear conditions) was loss framed and the loss framed conditions were not successful at promoting eSET. Fear appeals generally tend to be loss framed [35] and our fear conditions were based upon recommendations that all the fear messages should be ‘loss framed’ to emphasise negative consequences ‘for not following message recommendations’ [22] (pp. 75). The high fear content may have overridden the loss frame basis of the messages. It may be worthwhile to develop high fear messages using gain frames and investigate whether this leads to even more effective conditions that target both men and women. There is clearly scope for future research to investigate the effect of positive framing on high fear conditions.

Preferences towards twins were significantly reduced in the medium fear condition for the whole group analysis, but did not reach significance in the women or men's separate analysis. The desire for multiple pregnancies also tends to be strong amongst infertile patients [8–10], and may only be reduced further if the fear conditions are positively framed. Persuasive techniques may also be useful in patients reducing multiple birthrates. This study has shown the messages are effective and replicable, and can now be applied

to patients in an effort to reduce the incidence of multiple births further alongside appropriate funding for treatment [30].

#### 4.1 Limitations

Our study used a healthy population to determine the effectiveness of specifically designed theoretically different communication techniques to change attitudes, knowledge and hypothetical behaviours. Any attitude and knowledge changes were therefore actual, whereas the intended changes in behaviour were hypothetical. A chief limitation is therefore that transferability of the intended behaviours to clinical populations' actual behaviours, is as yet unknown. However, although the behaviours were hypothetical, it was necessary to confirm robustness of the findings across time in normal populations, before testing the techniques on patients. Studies with patients using actual [18] and hypothetical [19] educational scenarios have been equally successful.

#### 4.2 Conclusion

Previous research with infertility patients has found that providing information alone to patients rarely leads to attitude or intention change towards eSET [16, 17]. Our results have demonstrated that applying psychological theory in designing health promotion communication strategies to reduce multiple pregnancies is effective. It is not yet known if the results readily transfer to clinical a population, but the replicability across studies are positive.

#### 4.3 Current knowledge on the subject

Previous reports have demonstrated patients are reluctant to elect single embryos for transfer, and educational strategies to increase single embryo transfer rates are of limited success.

#### 4.4 What this study adds

This study has demonstrated the robustness of a gain framed and high fear strategy at improving intentions to elect single embryo transfers demonstrating the usefulness of psychological theory in health behaviour communications.

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