

# Medical Decision Making

## Framing options as choice or opportunity: does the frame influence decisions?

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7 **Title: Framing options as choice or opportunity: does the frame influence decisions?**<sup>1</sup>  
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**Abstract**

**Objective:** Health professionals must enable patients to make informed decisions about healthcare choices through unbiased presentation of all options. This study examined whether presenting the decision as 'opportunity' rather than 'choice' biased individuals' preferences in the context of trial participation for cancer treatment.

**Method:** Self-selecting healthy women (N=124) were randomly assigned to the following decision frames: opportunity to take part in the trial (opt-in), opportunity to be removed from the trial (opt-out), and choice to have standard treatment or take part in the trial (choice). The computer-based task required women to make a hypothetical choice about a real-world cancer treatment trial. The software presented the framed scenario, recorded initial preference, presented comprehensive and balanced information, traced participants' utilisation of information during decision making and recorded final decision. A post-task paper questionnaire assessed perceived risk, attitudes, subjective norm, perceived behavioural control and satisfaction with decision.

**Results:** Framing influenced women's immediate preferences. Opportunity frames, whether opt-in or opt-out, introduced a bias as they discouraged women from choosing standard treatment. Using the choice frame avoided this bias. The opt-out opportunity frame also affected women's perceived social norm; women felt others endorsed the trial option. The framing bias was not present once patients had had the opportunity to view detailed information on the options within a patient decision aid format. There were no group differences in information acquisition and final decisions. Sixteen per cent changed their initial preference after receiving full information.

**Conclusions:** A 'choice' frame, where all treatment options are explicit is less likely to bias preferences. Presentation of full information in parallel, option-by-attribute format is likely to 'de-bias' the decision frame. Tailoring of information to initial preferences would be ill-advised as preferences may change following detailed information.

**Keywords:** framing; informed decision making; patient choice; trial participation; opt-in/opt-out; decision aids

## Introduction

Healthcare policies worldwide recommend patients be enabled to make informed decisions about their healthcare choices, especially when the decision is 'preference sensitive' i.e. there is no single best option available.<sup>1</sup> To enable informed decision making, it is essential that health professionals a) present all available options and information about options in a balanced manner and b) encourage patients to engage with the information to evaluate it in accordance with their own values.<sup>2,3,4</sup> Balance refers to complete and unbiased presentation of all the relevant options and the information about those options—in content and in format—in a way that enables individuals to process this information without their choices being influenced by the presentational aspects.<sup>5</sup>

From years of research in decision psychology, we know that the way information is presented can have unintended effects on the way it is attended to, perceived and processed. These unintended effects include biases in people's judgements and choices. This 'framing effect' is described as biasing people's judgements and choices because people make different decisions when the same information is packaged differently.<sup>6</sup> A classic example of the framing effect is presenting risk information either positively or negatively. For example, people's preferences are seen to reverse when the same decision problem is presented either in terms of 'losses' (400 of 600 patients will die) or 'gains' (200 of 600 patients will be saved).<sup>7-9</sup> Framing effects are believed to occur due to a focussing phenomenon.<sup>10,11</sup> When faced with a decision, people construct a mental representation of the decision which contains the information needed to make the choice.<sup>12</sup> As the capacity of the working memory is limited, not all aspects of the decision situation can be included in this representation. A major determinant of what information enters the mental representations is the description of the decision situation, as people attend selectively to the information provided. Information explicitly presented about the decision is more likely to be included within the representation for evaluation than information implicit in the decision problem. The resulting mental representation is then used to make decisions quickly without too much cognitive effort, but this means that relevant information about the decision may be omitted. Different presentations of the same situation can therefore induce people to form markedly different mental representations, which in turn, lead to different choices.

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3 Most framing research in the healthcare context has focussed on the way information about  
4 probabilities of outcomes associated with different options is presented; for example, presenting the  
5 probabilities positively vs. negatively<sup>13,14</sup> or in absolute vs. relative terms.<sup>15,16</sup> Relatively little research  
6 has investigated how framing the presentation of decision options affects people's choices. Research  
7 from outside the health context, however, suggests that people's choices and perceptions of options  
8 vary when the decision options are presented in slightly different ways. A commonly used frame in  
9 everyday conversation is the offering of options as an opportunity (i.e. a single option is explicit and  
10 the decision is presented as an opportunity to pursue that option) rather than a choice (i.e. all options  
11 are explicit and the decision is presented as a choice between two or more options).<sup>10</sup> Unlike the  
12 choice frames which make all available options explicit, the available alternatives are often implicit  
13 within the opportunity frames. The effect of this type of framing on people's decisions and information  
14 seeking was first demonstrated in a non-medical context by Jones et al.<sup>10</sup> Presenting an option as an  
15 opportunity was found to be associated with an increased willingness to choose that option and a  
16 reduction in questions about other alternatives, compared with when the option was presented as a  
17 choice.<sup>11,17</sup> Many health-related options are presented as opportunities - for instance "Would you like  
18 to have this test/treatment/take part in the trial?"- where the alternative of continuing without a  
19 test/treatment or having standard treatment is implicit. There is evidence to suggest that this type of  
20 framing may be, advertently or inadvertently, taking place in routine clinical practice. For example,  
21 health professionals are reported to use communication methods that emphasise benefits over risks,  
22 make explicit or implicit recommendations, and position an option as the only sensible choice.<sup>18-24</sup>  
23 However, presenting options as an opportunity or choice is rarely recognised as a 'frame' that may  
24 influence and/or bias people's choices, causing changes from a situation in which both options are  
25 salient. In consequence, little research has explored systematically the effect of the opportunity  
26 versus choice frame within different decision contexts.

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29 Although opportunity framing makes only one option explicit, there are two types of opportunity frame  
30 which differ in terms of the option that occurs if no action is taken (the default option). The decision  
31 may be presented as an opportunity *to pursue* an option (opt-in) or as an opportunity *not to pursue* an  
32 option (opt-out). The opt-in frame presents the option as novel and implies a loss of that option if no  
33 action is taken. The opt-out frame presents the option as routine and implies the loss of that option if  
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3 action is taken. Within the healthcare context, a number of examples can be found where the options  
4 are presented in either an opt-in or an opt-out frame.<sup>25</sup> For example, most screening and  
5 immunisation options are presented in an opt-in frame where people are invited to have a test or a  
6 vaccine, whereas others such as organ donation and HIV testing are, in some countries, presented in  
7 an opt-out frame where these services are offered as routine/default with an opportunity to refuse  
8 them.<sup>25,26</sup> Evidence in both medical and non-medical contexts suggests that people make different  
9 choices depending on whether the options are presented as opt-in or opt-out; presenting an option in  
10 an opt-out frame is often found to increase the uptake of that option compared to when it is presented  
11 in an opt-in frame.<sup>27-33</sup> The increased attractiveness of the option in the opt-out frame is believed to be  
12 due to the frame's impact on people's representation of the option as socially valued or endorsed by  
13 others, so less cognitive effort is involved in accepting the default, and to the lower levels of regret  
14 experienced by people when harm results from a decision not to take action.<sup>30,34-36</sup>

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27 Most research has focussed on comparing the effects of opt-in and opt-out frames; however, these  
28 frames have rarely been viewed as variants of opportunity frames and contrasted with a choice frame  
29 as a baseline. It is therefore unclear how using opt-out versus opt-in to express an opportunity will  
30 change decisions relative to a choice frame. It may be that, despite the differences in choices  
31 resulting from the opt-in and opt-out frames, the important feature of such frames is that both make  
32 salient the uptake of the option they explicitly present. Both the frames may therefore nudge people to  
33 focus on the option that is explicit in the frame, though one increases the uptake of the option more  
34 than the other by presenting it as a default/routine. Alternatively it may be that the opt-in and opt-out  
35 frames produce take-up rates on either side of choice, as opt-out nudges decision makers towards  
36 uptake of the option while opt-in reduces the chances of them taking the option. A third alternative  
37 would be that opt-in and choice produce similar effects, because in both cases the decision maker  
38 starts from a position of not taking the option and has to take action to do so, whereas opt-out  
39 produces higher uptake because the default is to take the option. While the expected result is unclear,  
40 the choice frame, nonetheless, removes the implicit nudging by presenting all options explicitly and  
41 would therefore seem most appropriate for supporting informed decision making.

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3 Most framing research has evaluated the effect of framing on people's judgements and choices.  
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5 However, it remains unclear if framing leads to judgements and choices that are more or less  
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7 informed. To enable informed decision making, it is crucial that the presentation of options and  
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9 information be complete, unbiased and encourages people to evaluate all available options and their  
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11 attributes in accordance with their own values.<sup>2,3</sup> It is largely unknown whether and which frames bias  
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13 or enhance decision making and in what contexts. This makes it difficult to determine the optimal way  
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15 in which options and information should be presented to ensure choices are not biased. Jones et al<sup>10</sup>  
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17 argue that presenting an option within a choice frame leads to a more complete and balanced  
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19 representation of the decision problem in terms of both explicit presentation of all available options  
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21 and absence of any subtle nudging of people's attention towards or away from a single option.  
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23 Certainly if this framing effect is evident in health-related decisions, presenting options as a choice  
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25 rather than an opportunity is likely to have prescriptive implications for facilitating informed decision  
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27 making.

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29 This article describes the first study to investigate systematically the choice versus opportunity frame  
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31 within a health context. The study evaluates the choice versus opportunity frame – both opt-in and  
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33 opt-out versions - on decisions in the context of trial participation for cancer treatment. Cancer clinical  
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35 trial choices are complex decision contexts as the decisions about trial participation are often nested  
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37 or subsumed within decisions about treatment.<sup>37</sup> The offer of trial participation complicates the  
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39 treatment decision by introducing the prospect of a better outcome but with uncertainties associated  
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41 with treatment allocation, effects and outcomes. Although patients are provided with written trial  
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43 information, often the option is initially offered verbally during consultation with health  
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45 professionals.<sup>37,38</sup> Evidence suggests that patients make these decisions instantaneously, using a  
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47 range of heuristic strategies such as selectively attending to information, forming early impressions  
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49 based on quick evaluations of initial information, or settling on a satisfactory option without  
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51 considering alternatives.<sup>37-43</sup> This suggests that patients are likely to be influenced by the way trial  
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53 options are verbally presented, even before they consider the written information, so the framing of  
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55 the initial description of the decision they receive is important. We initially hypothesised that people  
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57 receiving either of the opportunity frames would be more likely to choose the trial than those receiving  
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59 the choice frame, on the basis that participants in Jones et al. (1998) when faced with opt-in frames  
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3 tended to choose the option more often, and we would expect opt-out frames to increase this  
4 tendency by making the opportunity the default option. Given the tendency for people to seek  
5 information that confirms their decision<sup>34</sup> we hypothesised that any bias in the initial decision resulting  
6 from the use of opportunity frames could affect the later processing of decision information leading to  
7 less informed decisions.  
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## 13 **Method**

### 14 **Sample**

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16 All women aged 18 years or older working and/or studying at the University of Leeds, UK were invited  
17 to participate via the University's email distribution list. No women volunteering to participate were  
18 excluded. There are ethical concerns about carrying out this type of research in a sample of patients  
19 making actual trial participation choices as there is a risk of influencing the choices that may affect  
20 their health, illness and possibly mortality. In this applied context, we need to have confidence that  
21 any manipulation, at the least, causes no additional harm and may even benefit the patient making  
22 the choice. This study is therefore carried out in a sample of healthy women making a hypothetical  
23 choice about trial participation but using information from a real-world cancer treatment trial. This  
24 study is expected to provide some proof of concept data, as in a 'phase II' trial addressing whether  
25 these framing effects affect healthcare choices.<sup>44</sup> The Leeds Institute of Psychological Sciences  
26 Ethics Committee approved the study in June 2006. All participants were provided with details of the  
27 University's counselling service and the hospital's clinical psychological services in case personal  
28 issues were raised as a result of taking part in this research.  
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### 44 **Design and procedure**

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46 The study employed an experimental between-subjects design with random allocation to one of the  
47 three decision-framing conditions: (1) Decision problem framed as an *opportunity* to take part in a  
48 clinical trial (opt-in); (2) Decision problem framed as an *opportunity* to be removed from a clinical trial  
49 (opt-out); (3) Decision problem framed as a *choice* between taking part in a clinical trial or having  
50 standard treatment. As the order in which options are presented may influence people's choices<sup>45-46</sup>,  
51 the sequence in which the trial and standard treatment alternatives were described in the *choice*  
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3 frame was counterbalanced so that half received the trial option first (T-S) and half the standard  
4 treatment option first (S-T).  
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8 The study was carried out in a decision lab using computers situated on partially-enclosed desks. The  
9 Mouselabweb software programme<sup>47</sup> was used to manage the randomisation to condition, present the  
10 decision information and task, and trace participants' information usage concurrently with the task. At  
11 the beginning of the session, participants received written instructions outlining how the session would  
12 proceed. The software programme asked participants to input the identification number and reference  
13 number appearing on the instructions sheet. The reference number specified to the MouselabWeb  
14 programme which framing condition the participant was allocated to: 1. opt-in, 2. opt-out, 3. choice S-  
15 T, and 4. choice T-S. Participants were allocated to the framing conditions in randomly permuted  
16 blocks with the pattern 1, 2, 3, 1, 2, 4, 1, 2, 3... and so on to ensure that there were equal numbers of  
17 participants in each framing condition, with the choice condition being counterbalanced. Participants  
18 were unaware that they were allocated to different framing conditions using the reference number.  
19 Following evidence from previous literature<sup>18,37,38</sup> and input from a practicing oncology consultant on  
20 the study team, the study was designed to mimic how cancer treatment and trial options are offered in  
21 a real-world setting. Treatment and trial decisions are sometimes first presented and discussed  
22 verbally during clinical consultations, before the written information is provided. To replicate this  
23 process in a controlled laboratory setting, we first presented participants with a brief decision scenario  
24 (Figure 1) and asked them to indicate their initial preference in response to the scenario. Following  
25 the scenario, they received detailed information about the trial and standard treatment options (Figure  
26 2) and were asked for their final decision preference. Participants filled out the paper questionnaire  
27 after completion of the computer task. Figure 3 summarises the study procedure. The study was  
28 piloted on the first nine participants and modifications were made to the study materials following  
29 participant feedback and data inspection. Participants from the pilot were included in the main data as  
30 the modifications were not expected to change the key aspects of their behaviour.  
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51 <Insert Figures 1, 2 and 3 about here>

## 52 **Materials**

### 53 *The decision scenario and framing intervention*

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3 Participants were asked to imagine they had been diagnosed with early stage breast cancer, had had  
4 the lump removed by surgery and were discussing treatment options with their doctor, who suggested  
5 chemotherapy. Participants were told that the clinic was offering participation in a clinical trial, known  
6 by the acronym TACT (Taxotere as Adjuvant chemotherapy); TACT was an international phase-three  
7 chemotherapy trial for early stage breast cancer, carried out by the local cancer unit.<sup>48</sup> A breast  
8 cancer scenario was used as it is one of the most common and high profile cancers, likely to be  
9 known to most people through media or experience of family/friends. To enhance the validity of the  
10 scenario, participants were asked to consider the impact this diagnosis would have on specific  
11 aspects of their life such as work, social life and daily chores and to recollect the experiences of any  
12 family and friends who had experienced cancer.<sup>49</sup>  
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23 The decision scenario and the accompanying questions eliciting initial and final decision preference  
24 were framed either as a 'choice' or an 'opportunity'. The choice frame explicitly stated that there were  
25 two options and asked participants to choose between those options. The opportunity frames made  
26 only the trial option explicit and asked participants to decide whether to follow or not to follow that  
27 option. There were two versions of the opportunity-frame: opt-in and opt-out, both with the same  
28 option explicit but differing in the defaults. The opt-in condition presented the decision as an  
29 opportunity to take part in the trial with standard treatment as the implicit default. The opt-out  
30 condition presented the decision as an opportunity to opt-out of the trial with trial participation as the  
31 default (Figure 1).  
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#### 42 *Detailed decision information*

43 The information about the TACT trial and the standard treatment was adapted for use on the  
44 computer (Figure 2). The information about the two decision options was arranged in adjacent  
45 columns. The information was presented in concealed boxes labelled by questions relating to the box  
46 content which were accessed by clicking on the box (Figure 4). The box remained open as long as  
47 the cursor was inside the box and closed when the cursor was moved out of the box. Each box  
48 opening counted as an acquisition of information. The information readability score was 8.0  
49 (equivalent of an eighth grader / age 14 level)<sup>50</sup>.  
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## Measures

Data were elicited by two methods – responses recorded by the computer during the decision task and the paper questionnaire completed after the task – and assessed the following:

### *Responses recorded by the computer:*

- Decision preference - initial decision preference was assessed before the receipt of detailed information using a categorical response: take part in the trial, have the standard treatment or undecided. The final decision preference was assessed after the receipt of full information using a categorical response: take part in the trial or have the standard treatment. (Figure 1). The option of refusing both options was not presented because, in real-world practice, this is not often considered a reasonable option.
- Information acquisition measures - MouselabWeb software recorded the total number of information boxes acquired, the number of times they were reacquired, and the amount of time spent on each box (Figure 4). From these data, process tracing indices were computed<sup>51</sup>: depth of search was calculated separately for trial and standard treatment information as the proportion of available information examined; reacquisition rate was calculated as the total number of information pieces examined minus the total number of first acquisitions, divided by the total number of information pieces examined. A higher depth of search and reacquisition rate indicates a more systematic decision process.

### *Paper questionnaire:*

- Socio-demographic information: age, ethnic origin, occupation, educational level, marital status, personal history of cancer diagnosis and treatment, and people known with cancer in the social network.
- Decision cognitions about risks included: perceived likelihood and severity of side effects for the trial and the standard treatment using 7-point Likert scales, scored 1=not at all likely/not at all severe to 7=very likely/very severe.
- Decision cognitions informed by the *Theory of Planned Behaviour* (TPB)<sup>52</sup> included: *attitude* towards taking part in the TACT trial assessed using four semantic differential scales ('Bad-Good', 'Beneficial-Harmful', 'Risky-Safe' and 'Reassuring-Worrying'), scored 1 to 7; two *subjective norm* items ('people who are important to me' and 'my doctor'), scored 1=strongly disagree to 7=strongly agree; three *perceived behavioural control* items assessing whether

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3 or not taking part in the trial is up to the participant, scored 1=strongly disagree to 7=strongly  
4 agree. The Cronbach's alpha for the three scales were 0.77, 0.49 and 0.44 respectively<sup>2</sup>.

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- 8 • Satisfaction with the decision was assessed using the six-item validated Satisfaction with  
9 Decision Scale<sup>53</sup> assessing the degree to which participants felt their decision was of good  
10 quality, informed, consistent with personal values, satisfactory and implementable (scored  
11 1=strongly disagree to 5= strongly agree). Higher scores indicate higher satisfaction with the  
12 decision (Cronbach's alpha = 0.85).  
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### 16 **Data analysis**

17 First, homogeneity of framing groups with respect to demographic characteristics was assessed using  
18 analysis of variance (ANOVA) and chi-squared tests. Second, analyses were performed to identify the  
19 effects framing had on women's decision making. If differences are found between the frames in  
20 terms of information acquisition, decision related cognitions and final decision outcome measures,  
21 there are two ways these might arise (and, indeed, both might be present):  
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27 1) The frame, because of the internal representation of the problem it invokes, leads to changes in the  
28 ways people acquire information and think about the decision, and this leads to changes in the option  
29 they choose. Here the frame is affecting the decision in the usual way we expect in framing effects.  
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32 2) It may be that the initial decision people make leads to changes in the ways they acquire  
33 information and think about the decision, and affects the option they choose. This could occur, for  
34 example, if people spent more time looking at information related to the option they initially chose. If  
35 the frame affects the initial decision, it would then affect the final decision through the impact the initial  
36 decision has on processing  
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43 In identifying whether the first or the second case applies, the role of the initial decision provides  
44 evidence. In the second case, frame will affect the initial decision, but the effect on other outcomes  
45 will be via the initial decision. In this case the initial preference should explain differences in the other  
46 outcomes and the effect of frame should no longer be significant when initial decision is included in  
47 the model.  
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55 <sup>2</sup> The two items assessing subjective norms used two different referent groups. As people may have different  
56 beliefs about different referent groups, the two items are not expected to show high internal consistency. The  
57 internal consistency of the three items assessing perceived behavioural control was lower than the usual cut-offs  
58 (0.44). However, a factor analysis on these items indicated that all three items had loadings of >0.6 on a single  
59 factor, suggesting that the items were measuring the same underlying construct.  
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3 Framing effects on initial preference and final decision were examined using chi-squared tests and  
4 multinomial logit analyses. Multinomial logit analyses examined the group differences in initial  
5 preference using two sets of models; the first set compared the 'trial' category with the 'standard  
6 treatment' and 'undecided' categories; the second set provided comparisons of the 'standard  
7 treatment' and 'undecided' categories. In each set of models, the choice group served as the  
8 reference category against which each of the opportunity frame groups was compared. The output  
9 from these models indicates the change in the predicted odds of an outcome for a unit change in the  
10 predictor (denoted by the beta co-efficient). Framing effects on information acquisition, decision  
11 cognitions and decision quality were assessed using multivariate analyses of variance (MANOVA).  
12 Significant univariate effects were followed up using pairwise comparisons with Bonferroni  
13 adjustment.

## 24 25 **Results**

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27 One hundred and twenty-four women, aged between 18 and 54 years (Mean=26 years, SD=8.5), took  
28 part in the study. No participants dropped-out once an initial contact had been made. The sample was  
29 predominantly Caucasian (75%); over half (66%) were students and 75% were single. Three percent  
30 had been previously diagnosed with cancer<sup>3</sup> and the rest (97%) knew someone with cancer in their  
31 social network, of whom 30% were close relatives, 43% were distant relatives and 24% were friends,  
32 colleagues or other acquaintances. There were no differences among the framing conditions with  
33 respect to age ( $F[2,119]=1.7$ , n.s.), number of people known with cancer ( $F[2,121]=.15$ , n.s.), ethnicity  
34 ( $\chi^2 =4.2$ ,  $df=2$ , n.s.), marital status ( $\chi^2 =2.2$ ,  $df=2$ , n.s.) and experience of cancer ( $\chi^2 =2.1$ ,  $df=2$ , n.s.)  
35 (Table 1). Significant differences among framing conditions were observed by occupation ( $\chi^2 =6.3$ ,  
36  $df=2$ ,  $p<.05$ ) but further analyses revealed no significant differences between students and staff with  
37 respect to initial preference and final decision, information acquisition, decision cognition and quality  
38 measures. Framing effects were examined by comparing the opt-in (N=42), opt-out (N=41) and  
39 choice (N=41) framing conditions. The two counterbalancing versions of the choice frame were  
40 collapsed into a single category as no significant differences were found between the two versions  
41 with respect to any of the dependent measures.

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57 <sup>3</sup> To test the possibility that women with a diagnosis of cancer may have thought and acted differently, analyses  
58 were conducted with and without these participants. As there was no difference between the findings, the results  
59 for the whole sample are reported.

<Insert Table 1 about here>

### ***Framing effects***

#### *Framing effect on initial preference*

When asked about their initial preference following the decision scenario and before receipt of full information, 64% indicated a definite preference (48% to take part in the trial; 16% to have the standard treatment), and 36% were undecided.

Framing affected initial preferences ( $\chi^2 = 13.18$ ,  $df=4$ ,  $p=.010$ , effect size  $w=0.33$ ) (Figure 5). A post-hoc power calculation, using G\*Power<sup>54,55</sup> and the effect size  $w$  from the statistical test output, indicated that the power of the  $\chi^2$  test of whether framing affects initial preferences is 0.85, suggesting that the study was adequately powered to test this hypothesis. Those in the opportunity frames were less likely to choose the standard treatment rather than the trial when compared to those in the choice frame (for opt-in,  $\beta=-0.14$ ,  $p=0.042$ , Odds Ratio = 0.259,<sup>4</sup> with 95%CI 0.070 to 0.954; and for opt out;  $\beta= -1.9$ ,  $p=.008$ , Odds Ratio =0.148, with 95%CI 0.036 to 0.601). Women in the opportunity frames were also more likely to be undecided than to choose the standard treatment (for opt-in;  $\beta= 1.6$ ,  $p=.016$ , Odds Ratio = 5.146 with 95%CI 1.356 to 19.524; and for opt-out  $\beta=1.5$ ,  $p=.041$  Odds Ratio = 4.694 with 95%CI 1.068 to 20.631). There were no significant differences between the opt-in and opt-out conditions. Although these models are underpowered due to the sample size, they provide further insight into the differences between groups illustrated in Figure 5.

<Insert Figure 5 about here>

#### *Framing effect on final decision*

After receipt of full information, 76% decided to take part in the trial and 24% decided to have the standard treatment. No significant results were found by the chi-squared test of the distribution of the final decision across the three framing conditions ( $\chi^2=1.9$ ,  $df=2$ ,  $p=.38$ ,  $Eta=0.125$ ) (Figure 6). Logistic regression analyses confirmed these findings.

<Insert Figure 6 about here>

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<sup>4</sup> The odds ratio relates to the change in odds of taking up an option between the base group and the focal group to which it applies. It is calculated as the odds after a unit change in the independent variable (dummy variables for group membership in this case) divided by the odds for the base category. An odds ratio greater than 1 represents an increasing chance of taking the option, and an odds ratio below 1 indicates a decreasing chance. Here the odds ratio of 0.259 indicates a decreasing chance of choosing standard treatment with odds of 1:3.86 ( $3.86=1/0.259$ ).

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3 Of those who had indicated a definite preference before receiving full information, 16% changed their  
4 decision after receipt of full information; 10% switched to taking part in the trial and 6% to having the  
5 standard treatment. Logistic regression analyses showed no differences by frame in the propensity to  
6 change decision (Table 2).  
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10 <Insert Table 2 about here>

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12 *Framing effect on information acquisition measures*

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14 MANOVA analysis on the information acquisition measures showed no significant main effects of opt-  
15 in, opt-out and choice framing on total amount of information acquired and reacquisition rate  
16 (F[8,238]=1.05, p=.39) or depth of search (F[8,238]=.84, p=.57) (details of the measures in each  
17 group of dependent variables can be found in Table 3).  
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21 <Insert Table 3 about here>

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23 *Framing effect on decision cognitions*

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25 Details of the dependent variables in each analysis can be found in Table 4. There were no significant  
26 multivariate effects of frame for perceived risk and severity of side effects (F[8, 236]=1.2, p=.31). A  
27 significant multivariate effect of frame was found for the Theory of Planned Behaviour measures (F[6,  
28 236]=2.9, p=.009); with a significant univariate effect for subjective norm (F[2, 119]=4.3, p=.015).  
29 Pairwise comparisons with Bonferroni correction indicated that participants in the opt-out condition  
30 were more likely to infer that the trial would be an option recommended by significant others than  
31 those in the choice condition (p=.021).  
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38 <Insert Table 4 about here>

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40 To explore the route by which the frame affected subjective norm, differences in subjective norm were  
41 first examined by initial preference. Second, the effect of frame on subjective norm was investigated  
42 with initial preference as a covariate. A significant multivariate effect of initial preference was found for  
43 the TPB measures (F[6,236]=5.9, p<.001) with a significant univariate effect for attitude and  
44 subjective norm. Pairwise comparisons with Bonferroni correction indicated that those who preferred  
45 the trial had a more favourable attitude to the trial and greater subjective norm perceptions compared  
46 to the standard treatment choosers and the undecided (all p<0.001). To examine if the effects of  
47 frame on the TPB variables remained significant after controlling for the differences by initial decision,  
48 initial decision was included as a covariate in a MANCOVA. The multivariate effect of frame remained  
49 significant (F[6,234]=2.7, p=.014) with a significant univariate effect for subjective norm (F[2,118]=3.4,  
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3  $p=.037$ ) and similar findings in pairwise comparisons for subjective norm ( $p=.038$ ) to those found  
4 without the covariate. These findings suggest that framing affected women's subjective norm in the  
5 way usually associated with framing effects and not just via an impact on initial choice.  
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#### 8 9 10 *Framing effect on satisfaction with decision*

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12 The effect of framing on women's satisfaction with the decision was assessed using one way analysis  
13 of variance. The findings suggest that the three framing conditions did not differ with respect to  
14 satisfaction with the decision ( $F[2,120]=.24, p=.78$ ) (Table 4).  
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### 17 18 19 **Discussion**

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21 This study is the first, to the authors' knowledge, to test the effect of the opportunity versus choice  
22 frame for a healthcare decision. We demonstrated a framing bias arising from presenting trial  
23 participation as an opportunity, whether opt-in or opt-out, versus as a choice, as women's immediate  
24 preferences varied depending on the frame. When the decision was presented as an opt-in or opt-out  
25 opportunity, women were more likely to prefer the trial option or to be undecided than to have the  
26 standard treatment, compared to when it was presented as a choice. This bias was possibly due to  
27 the opportunity frames focussing women's attention on the trial option which was explicit in these  
28 frames; the choice frame avoided this bias possibly by drawing attention to other alternatives. The  
29 opt-out opportunity frame also affected women's evaluations of the degree to which the trial option  
30 would be endorsed by significant others (health professionals). Sixteen per cent of participants  
31 changed their initial preference about trial participation after receiving detailed information but  
32 information acquisition and final decision preference were not affected by the frames. Findings from  
33 this study suggest presenting the decision as a 'choice' is less likely to bias people's preferences.  
34 Further, encouraging people to view balanced and comprehensive information presented in a parallel,  
35 option-by-attribute format *before* eliciting preferences can 'de-bias' the decision frame, removing its  
36 effect on choice.  
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53 Unlike past studies,<sup>22,26,28,31,35</sup> this study found no difference in preferences between the opt-in and  
54 opt-out framing groups. There are several explanations for this variation in findings. First, the framing  
55 bias may be greater or smaller depending on the type and/or context of the decision, for example  
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3 different levels of effects may be found for donating organs after death, choosing treatment to live  
4 longer, choosing treatments for another person, and so on. Second, the framing bias may depend on  
5 how much detail is provided about the healthcare option. In this study, we made the trial option in both  
6 the opportunity frames explicit, which may have led participants to focus more on this option than on  
7 the implicit option of the standard treatment. Third, the framing bias may be greater or smaller  
8 depending on the values and experiences of the individuals so studies of people making real-world  
9 versus hypothetical decisions may find different effect levels. For example, the lack of difference  
10 between the two opportunity frames may have been due to a lower rate of choosing to participate in  
11 the trial in the opt-out group than might be expected relative to the opt-in group. This lower  
12 participation rate may reflect the negative attitudes of some participants to trial participation, which in  
13 the opt-out condition could reduce their tendency to accept the default option of the trial. In this study,  
14 it was not possible to assess participants' attitudes to trial participation before the decision as such  
15 measurement may impact the decision by making some values more salient than others. However,  
16 attitudes to trial participation, assessed after the decision, were found to be related to participants'  
17 initial decision of trial participation, particularly so in the opt-out frame. A logistic regression analysis  
18 revealed that attitudes significantly predicted the initial trial participation decision in both opportunity  
19 frames. Although the measure of attitudes was collected after the decision, these findings suggest  
20 that the effect of framing may depend on the nature and strength of pre-existing attitudes towards the  
21 options. Given the possibility of an unmeasured interaction effect of the opt-out frame and pre-existing  
22 attitudes, further research should examine the moderating role of attitudes in framing effects.

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42 The frame did influence women's perceptions of social norm; women were more likely to infer that  
43 people who were important to them and the health professionals would support the trial option when it  
44 was presented as an opt-out. The opt-out frame presents the trial option as the default, i.e. what  
45 would happen if no action were taken; the implication is that the opt-out frame casts the trial option as  
46 a social norm and by doing so, leaks information about the writer/speaker's preference.<sup>56,57</sup> Consistent  
47 with the explanations offered for the increased attractiveness of default options, the heightened  
48 perceptions of social norm may have contributed to an increased preference for the trial option in two  
49 possible ways. First, the trial option could be seen as an implicit recommendation from the health  
50 professional, thereby providing a rationale for its preference.<sup>30,58</sup> Second, the trial could be seen as the  
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3 morally appropriate option, i.e. something people 'should do', making it harder to opt-out.<sup>31,59</sup> Both  
4 possibilities are consistent with McKenzie et al's<sup>58</sup> explanation that the writer/speaker's choice of  
5 description implicitly leaks information about their own preferences about the option as well as their  
6 beliefs about what others should do. They showed that, compared to opt-in frames, people are more  
7 likely to infer from the opt-out frames that the option described is the writer/speaker's preferred option  
8 and that therefore other people ought to choose the default. It is interesting that, despite the above  
9 possibilities, women's final decisions were unaffected by the frame. It is possible that the effect of the  
10 implicit recommendation in the opt-out frame was tempered by their subsequent evaluation of the full  
11 information. Future research should further explore the relationship between default framing,  
12 subjective norm and deliberation.  
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23 This study not only demonstrates the biasing effect of opportunity frames, but also suggests a  
24 potential way of ameliorating it through provision of balanced and comprehensive information about  
25 the options prior to eliciting preferences. Prior findings indicate that strength of framing biases  
26 decreases when individuals are encouraged to deliberate on the decision problem by providing  
27 detailed information about the options<sup>60-62</sup> or the context<sup>63</sup>, by asking individuals to provide rationales  
28 for their decisions<sup>64</sup> and by inducing individuals to engage in analytical thinking<sup>65</sup>. In this study, it is  
29 possible the detailed information minimised the effects of frame by encouraging more systematic  
30 processing of information. It is worth noting that the content and structure of the information we  
31 provided was designed to encourage active deliberation. The standard treatment and trial information  
32 presented within the computer task was structured with reference to decision aid guidelines.  
33 Equivalent information was presented in parallel, option-by-attribute table format, as illustrated in  
34 Figure 4, which allowed the attributes of each option to be compared and contrasted at a glance.<sup>5</sup>  
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36 Most patient information presents treatment options in a fixed linear sequence, which forces patients  
37 to consider the options and their attributes in the given order. The linear presentation of options is  
38 more likely to encourage biasing in what is attended to and/or evaluated, for instance, through  
39 primacy or recency effects.<sup>66</sup> It is possible a more traditional presentation of trial information would  
40 have resulted in a more pronounced framing effect on participants' acquisition, and evaluation, of  
41 decision information. Future research should compare the linear and parallel, option-by-attribute  
42 formats of presentation and explore their impact on framing effects.  
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3 This study is unique in that it investigates a novel aspect of framing, addresses an important clinical  
4 context, employs a robust experimental design and involves measures of what information is attended  
5 to. The study does have potential limitations to its generalization. Nonetheless it provides proof of  
6 concept data, which can underlie further research. First, a self-selecting sample of healthy women  
7 making a hypothetical choice about trial participation may not generalize to patients making these  
8 decisions or to those with other types of cancer. There is evidence that people's values change  
9 depending on their health state<sup>67</sup>, which may influence their treatment choices. We suspect this  
10 sample had relatively stable values as all indicated they had experience of cancer, either as a  
11 previous patient or as an acquaintance of someone with cancer. More importantly, we expect that  
12 these results would be replicated in the real-world and in other contexts, because the study explores  
13 how an individual's construction of a decision problem is influenced by the presentation of options,  
14 rather than the evaluation of the information contained within the decision problem. It is likely that the  
15 same metacognitive processes would be employed by individuals whether or not they were  
16 patients.<sup>68,69</sup> This issue can be explored further in phase III type trials with populations that have more  
17 direct involvement with cancer (e.g. survivors/family/patients). Second, the sample in this study had a  
18 much higher rate of trial participation than is observed in the real world. This could be due to the  
19 hypothetical nature of the decision<sup>70</sup> or higher levels of education in the sample. We acknowledge that  
20 patients making these decisions in the real-world may be quite different in age, gender or educational  
21 status from participants of this study. Nevertheless, the aim of this study was to demonstrate that  
22 different decision frames can lead to different choices; this can be further tested in more  
23 representative populations and contexts.

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44 Third, provision of the 'undecided' option at the initial but not the final decision complicates the  
45 comparison of findings, as 'undecided' may reflect that participants have no clear preference or that  
46 they are not sure enough to express or act on their preference. However, a forced-choice question to  
47 elicit an initial decision preference was not appropriate in this study. It may have biased participants'  
48 subsequent information processing, cognitions and the final decision due to the potential tendency to  
49 feel more committed to the chosen option and process any subsequent information in a way that  
50 confirms this choice<sup>34</sup>. Inclusion of the undecided option helped confirm the focusing effect of the  
51 frames; women receiving the opportunity frames were not only more likely to choose the trial but also  
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3 more likely to be undecided than to choose the standard treatment option. Inclusion of an undecided  
4 option to elicit final decision was also not appropriate because, often in reality, patients must choose  
5 one or the other. Thus, final decision by the initially undecided participants may reflect either a change  
6 from 'no preference' to a clear preference for the trial or the standard treatment option, or the  
7 expression of an initial preference which had not been strong enough to be expressed at the initial  
8 decision stage. Fourth, presentation of options and information via computer may compromise the  
9 study's external validity. As described earlier, this study replicated the clinician-delivered information  
10 in a controlled laboratory experiment to investigate whether framing affects people's information  
11 acquisition (i.e. what information is accessed, for how long and how often) along with their choices  
12 and cognitions. To allow collection of these data, information needed to be presented in such a way  
13 that only one piece of information is visible at a time.<sup>51</sup> The computer based approach was needed to  
14 facilitate presentation of information and acquisition of data, which would have been difficult with  
15 paper-based information.  
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29 These findings have implications for those delivering services to enhance patients' informed decision  
30 making about treatment, testing and trial options. First, the routine practice of presenting healthcare  
31 and clinical trial options using an opportunity frame (opt-in or opt-out) can lead to significant biases in  
32 people's preferences. Bias is less likely to occur when all options are presented explicitly using a  
33 choice frame. Saying "Do you want to have the standard treatment or take part in the trial" instead of  
34 "Do you want to take part in a trial" changes the decision representation to include two options rather  
35 than one, allowing individuals to consider all available options. Framing an option as an opt-out  
36 versus an opt-in seems to leak information interpreted as an endorsement of the option. It is unclear  
37 whether this frame affects informed decision making; it may change the value of a component part of  
38 the evaluation but not the ability to reason systematically about it. For some decisions where there is  
39 a 'correct' behaviour (e.g. illness prevention programmes), it may be argued that framing an option as  
40 an opt-out enables people to make an informed choice, rather than an informed decision, and this  
41 level of engagement with the information is sufficient.<sup>29,30</sup> In these contexts, the opt-out framing may  
42 nudge people towards the desired behaviour without removing their freedom to choose differently.  
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3 information can de-bias the decision context and enable patients to re-evaluate labile preferences.<sup>62,64</sup>

4 This is particularly important because in the real-world setting, patients may not often be provided with  
5 full information, in an accessible and comparable format, immediately after the initial trial offer. Third,  
6 women's trial preferences change when they receive more information and/or have time to consider  
7 the decision information.<sup>71,72</sup> Tailoring information according to a first preference will limit the  
8 likelihood patients are able to make informed decisions.  
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10 **Conflicts of interest disclosure:**

11 The authors have no conflicts of interest to declare.  
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## Tables

**Table 1: Characteristics of participants by framing groups**

	Opt-in (N=42)	Opt-out (N=41)	Choice (N=41)
Average (SD) age in years	28.2 (9.5)	25.3 (8.7)	25.0 (6.9)
Ethnicity: White, N(%)	32 (76%)	34 (83%)	26 (63%)
Occupation: student N (%)	23 (55%)	33 (80%)	26 (63%)
Marital status: single N(%)	29 (69%)	30 (73%)	34 (83%)
Women with close relatives with cancer N(%)	13 (31%)	15 (37%)	9 (22%)
Average (SD) number of people known with cancer	2.4 (1.5)	2.4 (1.3)	2.3 (1.2)

**Table 2: Change in decision by framing conditions**

	<b>Opt-in (N=42)</b>	<b>Opt-out (N=41)</b>	<b>Choice (N=41)</b>
<b>Change in decision among those with definite initial preference N(%)</b>	<b>4 (10%)</b>	<b>2 (5%)</b>	<b>7 (17%)</b>
<i>From Trial to Standard treatment</i>	2 (5%)	1 (2.5%)	2 (5%)
<i>From Standard treatment to Trial</i>	2 (5%)	1 (2.5%)	5 (12%)
<b>Final decision among those initially undecided N(%)</b>	<b>19 (45%)</b>	<b>13 (31%)</b>	<b>12 (29%)</b>
<i>Choosing Trial</i>	14 (33%)	8 (19%)	9 (21%)
<i>Choosing Standard treatment</i>	5 (11%)	5 (12%)	3 (7%)

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Table 3: Mean (SD) for information acquisition measures by frame

	Opt-in (N=42)	Opt-out (N=41)	Choice (N=41)	Partial Eta Squared
<b>Total amount of information examined</b>	Multivariate $F[8,238]=1.05, p=.39$			0.034
Proportion of information searched	.74 (.20)	.76 (.18)	.69 (.26)	.017
Total time spent on information screen	6.6 min. (2.7)	6.5 min (2.1)	6.2 min (2.7)	.001
Average time spent per information piece	5.4 sec.(2.1)	5.6 sec.(2.1)	5.4 sec.(1.9)	.004
Reacquisition rate	.19 (.09)	.19 (.08)	.19 (.11)	.002
<b>Depth of search</b>	Multivariate $F[8,238]=.84, p=.57$			.027
Proportion of information examined on trial	.79 (.23)	.85 (.19)	.74 (.28)	.029
Proportion of information examined on standard treatment	.63 (.24)	.59 (.21)	.58 (.29)	.005
Proportion of time spent on trial information	.55 (.12)	.59 (.07)	.53 (.14)	.039
Proportion of time spent on standard treatment information	.16 (.07)	.15 (.06)	.15 (.08)	.004

**Table 4: Mean (SD) for decision related cognitions by frame**

	<b>Opt-in (N=42)</b>	<b>Opt-out (N=41)</b>	<b>Choice (N=41)</b>	<b>Partial Eta Squared</b>
<b>Perceived risk and severity of side effects</b> (low-high; 1-7)				.039
Multivariate $F[8, 236]=1.2, p=.31$				
Severity of trial side effects	5.3 (1)	5.3 (1)	4.9 (1)	.006
Risk of trial side effects	6 (1.2)	6 (1.3)	5.8 (1.1)	.013
Severity of ST side effects	5.4 (1)	5.3 (1)	5.1 (.9)	.011
Risk of ST side effects	5.8 (1.4)	6 (1)	5.8 (1.2)	.024
<b>Theory of Planned Behaviour measures</b> Multivariate $F[6, 236]=2.9, p=.009$				.069
Attitude towards trial (Unfavourable-Favourable; 4-28)	16.7 (.7)	17.1 (.7)	16.9 (4.7)	.001
Subjective norm (low-high; 2-14)	8.9 (4)	10.1 (4)	8.7 (2.1)	.068
Perceived Behavioural Control (low-high; 3-21)	17.2 (3)	18.1 (3)	17.2 (2.9)	.022
<b>Satisfaction with decision</b> (low-high; 6-30) $F[2, 120]=.24, p=.78$				.004
	24.1 (2.9)	24.3 (3.7)	23.8 (3.3)	

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**Figure Legends**

- Figure 1: Decision scenario with framing intervention**
- Figure 2: Summary of content of information on decision options**
- Figure 3: Study procedure flow chart**
- Figure 4: Decision information presented on computer screen**
- Figure 5: Initial preference in opt-in, opt-out and choice conditions**
- Figure 6: Final decision in opt-in, opt-out and choice conditions**

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**Figure 1: Decision scenario with framing intervention**

Imagine that you are in the consultation with your doctor. The doctor is discussing with you what treatments you could have for your cancer. Your doctor suggests that you have chemotherapy. Chemotherapy may offer a good chance of destroying any cancer cells that may have been left behind.

***There is an opportunity to take part in a clinical trial. You are suitable to take part in this trial. (Opt-in)***

***All patients are automatically entered in a clinical trial. You are suitable for this trial and will be automatically entered. There is an opportunity to be removed from this trial. (Opt-out)***

***You are suitable to take part in a clinical trial. You have two options. Option one is to have the standard treatment. Option two is to take part in the clinical trial. (Choice)***

The clinical trial is known by the short-form TACT. The clinical trial compares two different chemotherapy treatments, A and B. Treatment A involves drugs that have been used for your type of cancer for many years. Treatment B uses drugs called Taxanes. At present, taxanes are only used for treating breast cancer which has already spread to other parts of the body. The TACT trial aims to find out whether adding a taxane drug called Docetaxel to other chemotherapy drugs will reduce the chance of breast cancer coming back. If you decide to take part, a computer will randomly allocate you to either treatment A or B.

**Question for Opt-in**

- Do you want to take part in the trial?
1. Yes, I want to take part in the trial
  2. No, I do not want to take part in the trial
  3. I am uncertain about my decision (Included in the initial decision preference only)

**Question for Opt-out**

- Do you want to be removed from the trial?
1. Yes, I want to be removed from the trial
  2. No, I do not want be removed from the trial
  3. I am uncertain about my decision (Included in the initial decision preference only)

**Question for Choice**

- Do you want to take part in the trial or have the standard treatment?
1. I want to take part in the trial
  2. I want to have the standard treatment
  3. I am uncertain about my decision (Included in the initial decision preference only)

Figure 2: Summary of content of information on decision options

TACT trial	Standard treatment
<ul style="list-style-type: none"> <li>• Purpose of the trial</li> <li>• Treatment details: Drugs being tested; number of cycles, frequency of cycles, duration of treatment, and method of treatment delivery.</li> <li>• Possible side effects of both drugs</li> <li>• Method of treatment allocation and the rationale for randomisation</li> <li>• Advantages of taking part in the trial (access to potentially more effective treatment, closer monitoring of your health, helping future patients, randomisation)</li> <li>• Disadvantages of taking part in the trial (random allocation to treatment, uncertainty of additional benefits, additional clinic visits, unexpected side effects)</li> </ul>	<ul style="list-style-type: none"> <li>• Purpose of treatment</li> <li>• Treatment details: drugs involved, number of cycles, frequency of cycles, duration of treatment and method of treatment delivery</li> <li>• Possible side effects</li> <li>• Advantages of having the standard treatment (treatment not selected randomly, known side-effects)</li> <li>• Disadvantages of having the standard treatment (no opportunity to receive new treatment)</li> </ul>

Figure 3: Study procedure flow chart

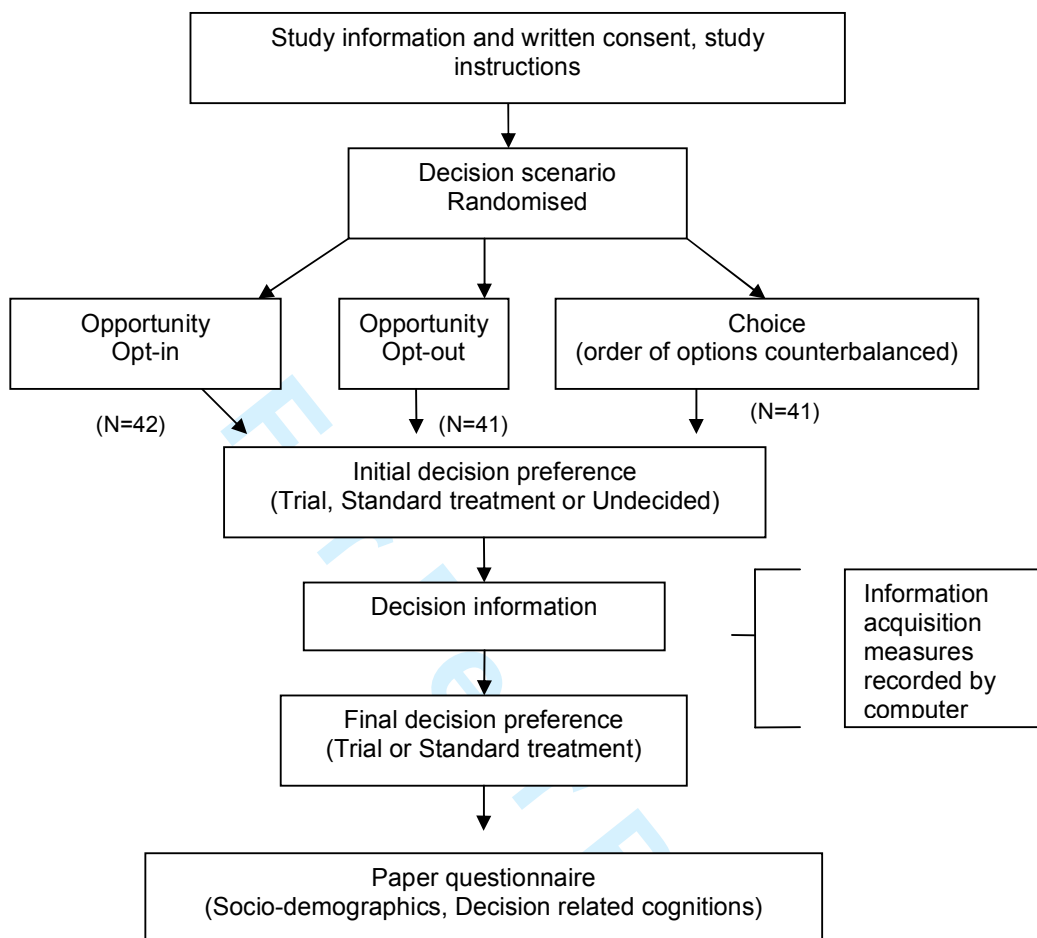
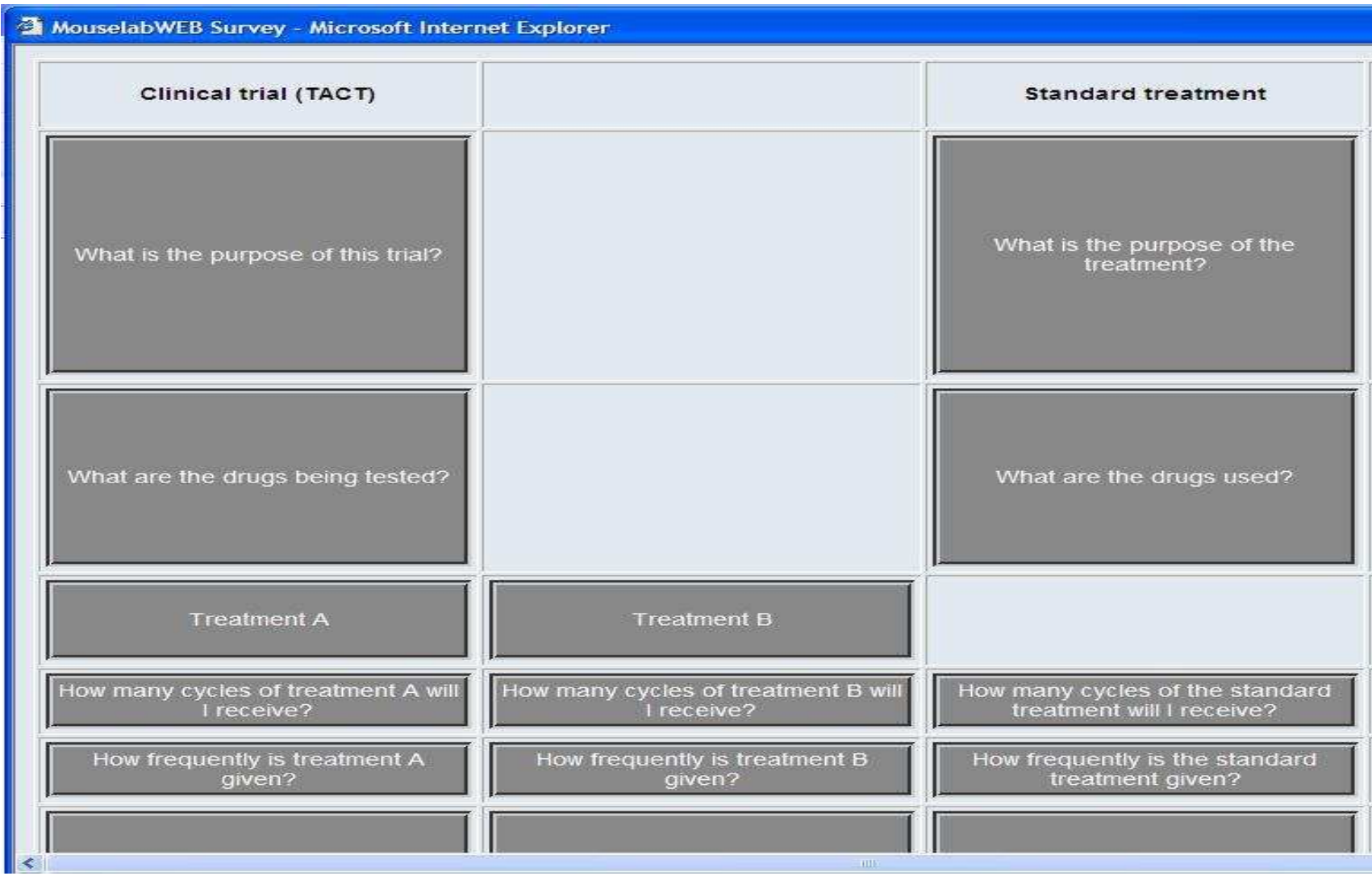
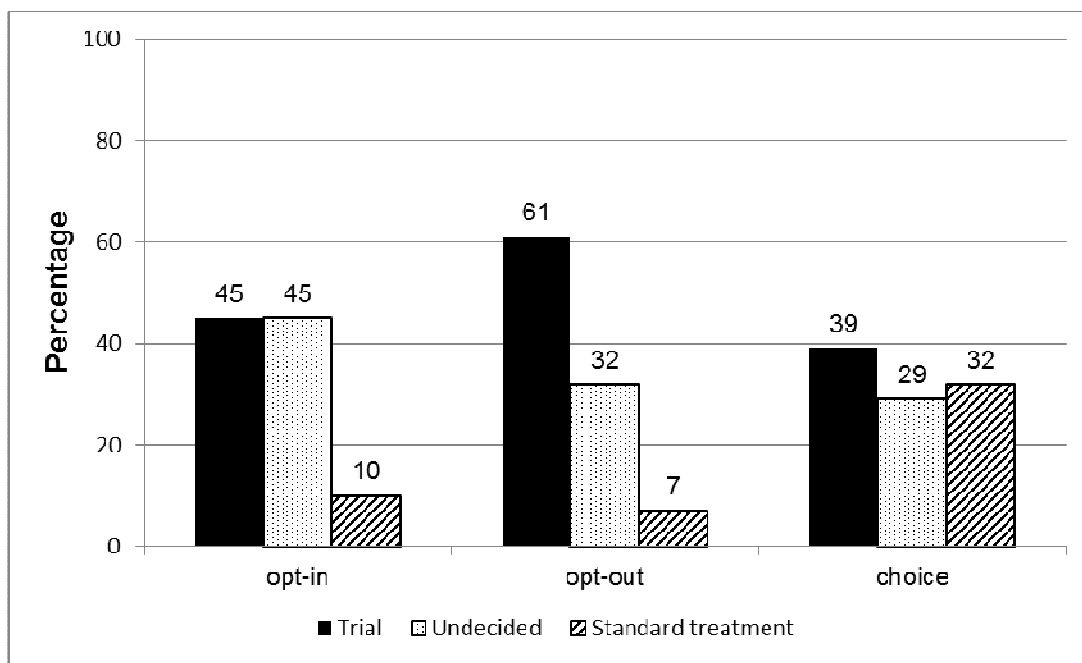


Figure 4: Decision information presented on computer screen



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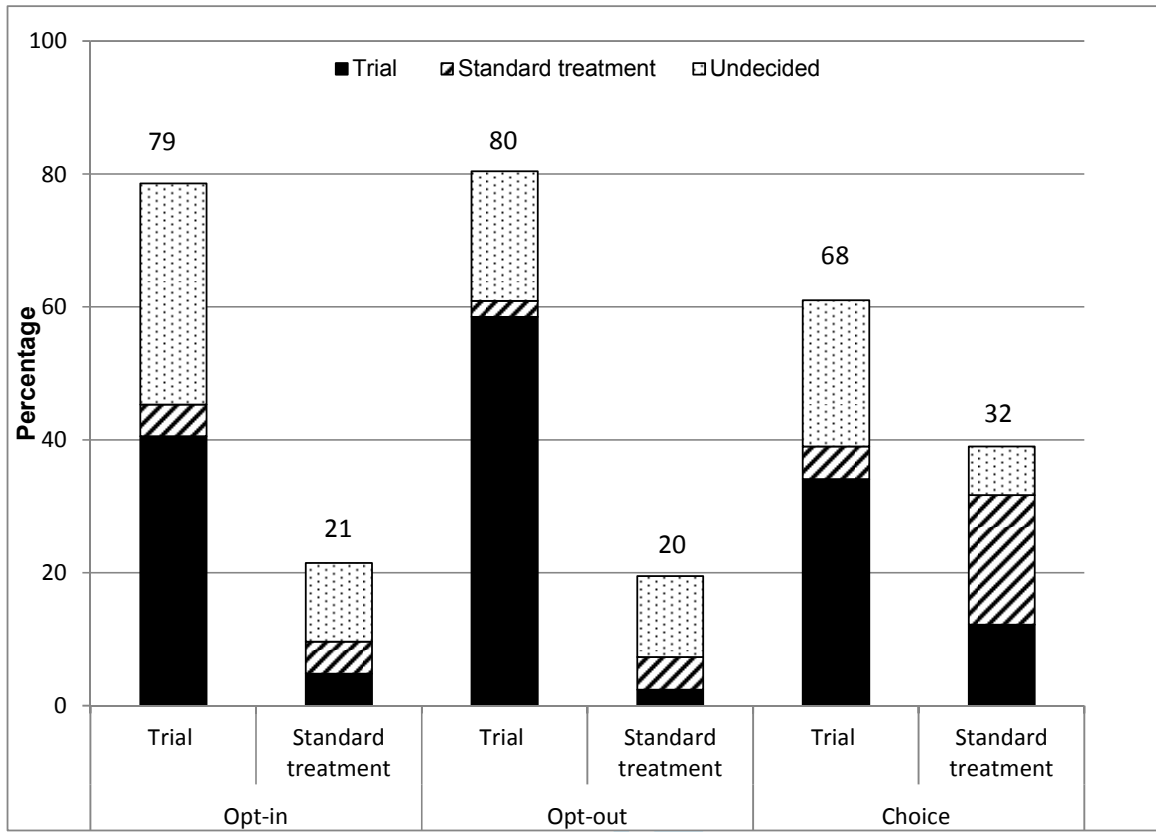
Figure 5: Initial preference in opt-in, opt-out and choice conditions



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Figure 6: Final decision in opt-in, opt-out and choice conditions stacked by initial preference



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7 **Title: Framing options as choice or opportunity: does the frame influence decisions?**<sup>1</sup>  
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**Abstract**

**Objective:** Health professionals must enable patients to make informed decisions about healthcare choices through unbiased presentation of all options. This study examined whether presenting the decision as 'opportunity' rather than 'choice' biased individuals' preferences in the context of trial participation for cancer treatment.

**Method:** Self-selecting healthy women (N=124) were randomly assigned to the following decision frames: opportunity to take part in the trial (opt-in), opportunity to be removed from the trial (opt-out), and choice to have standard treatment or take part in the trial (choice). The computer-based task required women to make a hypothetical choice about a real-world cancer treatment trial. The software presented the framed scenario, recorded initial preference, presented comprehensive and balanced information, traced participants' utilisation of information during decision making and recorded final decision. A post-task paper questionnaire assessed perceived risk, attitudes, subjective norm, perceived behavioural control and satisfaction with decision.

**Results:** Framing influenced women's immediate preferences. Opportunity frames, whether opt-in or opt-out, introduced a bias as they discouraged women from choosing standard treatment. Using the choice frame avoided this bias. The opt-out opportunity frame also affected women's perceived social norm; women felt others endorsed the trial option. The framing bias was not present once patients had had the opportunity to view detailed information on the options within a patient decision aid format. There were no group differences in information acquisition and final decisions. Sixteen per cent changed their initial preference after receiving full information.

**Conclusions:** A 'choice' frame, where all treatment options are explicit is less likely to bias preferences. Presentation of full information in parallel, option-by-attribute format is likely to 'de-bias' the decision frame. Tailoring of information to initial preferences would be ill-advised as preferences may change following detailed information.

**Keywords:** framing; informed decision making; patient choice; trial participation; opt-in/opt-out; decision aids



## Introduction

Healthcare policies worldwide recommend patients be enabled to make informed decisions about their healthcare choices, especially when the decision is 'preference sensitive' i.e. there is no single best option available.<sup>1</sup> To enable informed decision making, it is essential that health professionals a) present all available options and information about options in a balanced manner and b) encourage patients to engage with the information to evaluate it in accordance with their own values.<sup>2,3,4</sup> Balance refers to complete and unbiased presentation of all the relevant options and the information about those options—in content and in format—in a way that enables individuals to process this information without their choices being influenced by the presentational aspects.<sup>5</sup>

From years of research in decision psychology, we know that the way information is presented can have unintended effects on the way it is attended to, perceived and processed. These unintended effects include biases in people's judgements and choices. This 'framing effect' is described as biasing people's judgements and choices because people make different decisions when the same information is packaged differently.<sup>6</sup> A classic example of the framing effect is presenting risk information either positively or negatively. For example, people's preferences are seen to reverse when the same decision problem is presented either in terms of 'losses' (400 of 600 patients will die) or 'gains' (200 of 600 patients will be saved).<sup>7-9</sup> Framing effects are believed to occur due to a focussing phenomenon.<sup>10,11</sup> When faced with a decision, people construct a mental representation of the decision which contains the information needed to make the choice.<sup>12</sup> As the capacity of the working memory is limited, not all aspects of the decision situation can be included in this representation. A major determinant of what information enters the mental representations is the description of the decision situation, as people attend selectively to the information provided. Information explicitly presented about the decision is more likely to be included within the representation for evaluation than information implicit in the decision problem. The resulting mental representation is then used to make decisions quickly without too much cognitive effort, but this means that relevant information about the decision may be omitted. Different presentations of the same situation can therefore induce people to form markedly different mental representations, which in turn, lead to different choices.

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3 Most framing research in the healthcare context has focussed on the way information about  
4 probabilities of outcomes associated with different options is presented; for example, presenting the  
5 probabilities positively vs. negatively<sup>13,14</sup> or in absolute vs. relative terms.<sup>15,16</sup> Relatively little research  
6 has investigated how framing the presentation of decision options affects people's choices. Research  
7 from outside the health context, however, suggests that people's choices and perceptions of options  
8 vary when the decision options are presented in slightly different ways. A commonly used frame in  
9 everyday conversation is the offering of options as an opportunity (i.e. a single option is explicit and  
10 the decision is presented as an opportunity to pursue that option) rather than a choice (i.e. all options  
11 are explicit and the decision is presented as a choice between two or more options).<sup>10</sup> Unlike the  
12 choice frames which make all available options explicit, the available alternatives are often implicit  
13 within the opportunity frames. The effect of this type of framing on people's decisions and information  
14 seeking was first demonstrated in a non-medical context by Jones et al.<sup>10</sup> Presenting an option as an  
15 opportunity was found to be associated with an increased willingness to choose that option and a  
16 reduction in questions about other alternatives, compared with when the option was presented as a  
17 choice.<sup>11,17</sup> Many health-related options are presented as opportunities - for instance "Would you like  
18 to have this test/treatment/take part in the trial?"- where the alternative of continuing without a  
19 test/treatment or having standard treatment is implicit. There is evidence to suggest that this type of  
20 framing may be, advertently or inadvertently, taking place in routine clinical practice. For example,  
21 health professionals are reported to use communication methods that emphasise benefits over risks,  
22 make explicit or implicit recommendations, and position an option as the only sensible choice.<sup>18-24</sup>  
23 However, presenting options as an opportunity or choice is rarely recognised as a 'frame' that may  
24 influence and/or bias people's choices, causing changes from a situation in which both options are  
25 salient. In consequence, little research has explored systematically the effect of the opportunity  
26 versus choice frame within different decision contexts.

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29 Although opportunity framing makes only one option explicit, there are two types of opportunity frame  
30 which differ in terms of the option that occurs if no action is taken (the default option). The decision  
31 may be presented as an opportunity *to pursue* an option (opt-in) or as an opportunity *not to pursue* an  
32 option (opt-out). The opt-in frame presents the option as novel and implies a loss of that option if no  
33 action is taken. The opt-out frame presents the option as routine and implies the loss of that option if  
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3 action is taken. Within the healthcare context, a number of examples can be found where the options  
4 are presented in either an opt-in or an opt-out frame.<sup>25</sup> For example, most screening and  
5 immunisation options are presented in an opt-in frame where people are invited to have a test or a  
6 vaccine, whereas others such as organ donation and HIV testing are, in some countries, presented in  
7 an opt-out frame where these services are offered as routine/default with an opportunity to refuse  
8 them.<sup>25,26</sup> Evidence in both medical and non-medical contexts suggests that people make different  
9 choices depending on whether the options are presented as opt-in or opt-out; presenting an option in  
10 an opt-out frame is often found to increase the uptake of that option compared to when it is presented  
11 in an opt-in frame.<sup>27-33</sup> The increased attractiveness of the option in the opt-out frame is believed to be  
12 due to the frame's impact on people's representation of the option as socially valued or endorsed by  
13 others, so less cognitive effort is involved in accepting the default, and to the lower levels of regret  
14 experienced by people when harm results from a decision not to take action.<sup>30,34-36</sup>

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27 Most research has focussed on comparing the effects of opt-in and opt-out frames; however, these  
28 frames have rarely been viewed as variants of opportunity frames and contrasted with a choice frame  
29 as a baseline. It is therefore unclear how using opt-out versus opt-in to express an opportunity will  
30 change decisions relative to a choice frame. It may be that, despite the differences in choices  
31 resulting from the opt-in and opt-out frames, the important feature of such frames is that both make  
32 salient the uptake of the option they explicitly present. Both the frames may therefore nudge people to  
33 focus on the option that is explicit in the frame, though one increases the uptake of the option more  
34 than the other by presenting it as a default/routine. Alternatively it may be that the opt-in and opt-out  
35 frames produce take-up rates on either side of choice, as opt-out nudges decision makers towards  
36 uptake of the option while opt-in reduces the chances of them taking the option. A third alternative  
37 would be that opt-in and choice produce similar effects, because in both cases the decision maker  
38 starts from a position of not taking the option and has to take action to do so, whereas opt-out  
39 produces higher uptake because the default is to take the option. While the expected result is unclear,  
40 the choice frame, nonetheless, removes the implicit nudging by presenting all options explicitly and  
41 would therefore seem most appropriate for supporting informed decision making.

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3 Most framing research has evaluated the effect of framing on people's judgements and choices.  
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5 However, it remains unclear if framing leads to judgements and choices that are more or less  
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7 informed. To enable informed decision making, it is crucial that the presentation of options and  
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9 information be complete, unbiased and encourages people to evaluate all available options and their  
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11 attributes in accordance with their own values.<sup>2,3</sup> It is largely unknown whether and which frames bias  
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13 or enhance decision making and in what contexts. This makes it difficult to determine the optimal way  
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15 in which options and information should be presented to ensure choices are not biased. Jones et al<sup>10</sup>  
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17 argue that presenting an option within a choice frame leads to a more complete and balanced  
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19 representation of the decision problem in terms of both explicit presentation of all available options  
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21 and absence of any subtle nudging of people's attention towards or away from a single option.  
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23 Certainly if this framing effect is evident in health-related decisions, presenting options as a choice  
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25 rather than an opportunity is likely to have prescriptive implications for facilitating informed decision  
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27 making.

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29 This article describes the first study to investigate systematically the choice versus opportunity frame  
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31 within a health context. The study evaluates the choice versus opportunity frame – both opt-in and  
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33 opt-out versions - on decisions in the context of trial participation for cancer treatment. Cancer clinical  
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35 trial choices are complex decision contexts as the decisions about trial participation are often nested  
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37 or subsumed within decisions about treatment.<sup>37</sup> The offer of trial participation complicates the  
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39 treatment decision by introducing the prospect of a better outcome but with uncertainties associated  
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41 with treatment allocation, effects and outcomes. Although patients are provided with written trial  
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43 information, often the option is initially offered verbally during consultation with health  
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45 professionals.<sup>37,38</sup> Evidence suggests that patients make these decisions instantaneously, using a  
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47 range of heuristic strategies such as selectively attending to information, forming early impressions  
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49 based on quick evaluations of initial information, or settling on a satisfactory option without  
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51 considering alternatives.<sup>37-43</sup> This suggests that patients are likely to be influenced by the way trial  
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53 options are verbally presented, even before they consider the written information, so the framing of  
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55 the initial description of the decision they receive is important. We **initially** hypothesised that people  
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57 receiving either of the opportunity frames would be more likely to choose the trial than those receiving  
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59 the choice frame, **on the basis that participants in Jones et al. (1998) when faced with opt-in frames**  
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3 tended to choose the option more often, and we would expect opt-out frames to increase this  
4 tendency by making the opportunity the default option. Given the tendency for people to seek  
5 information that confirms their decision<sup>34</sup> we hypothesised that any bias in the initial decision resulting  
6 from the use of opportunity frames could affect the later processing of decision information leading to  
7 less informed decisions.  
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## 13 14 **Method**

### 15 16 **Sample**

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18 All women aged 18 years or older working and/or studying at the University of Leeds, UK were invited  
19 to participate via the University's email distribution list. No women volunteering to participate were  
20 excluded. There are ethical concerns about carrying out this type of research in a sample of patients  
21 making actual trial participation choices as there is a risk of influencing the choices that may affect  
22 their health, illness and possibly mortality. In this applied context, we need to have confidence that  
23 any manipulation, at the least, causes no additional harm and may even benefit the patient making  
24 the choice. This study is therefore carried out in a sample of healthy women making a hypothetical  
25 choice about trial participation but using information from a real-world cancer treatment trial. This  
26 study is expected to provide some proof of concept data, as in a 'phase II' trial addressing whether  
27 these framing effects affect healthcare choices.<sup>44</sup> The Leeds Institute of Psychological Sciences  
28 Ethics Committee approved the study in June 2006. All participants were provided with details of the  
29 University's counselling service and the hospital's clinical psychological services in case personal  
30 issues were raised as a result of taking part in this research.  
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### 44 **Design and procedure**

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46 The study employed an experimental between-subjects design with random allocation to one of the  
47 three decision-framing conditions: (1) Decision problem framed as an *opportunity* to take part in a  
48 clinical trial (opt-in); (2) Decision problem framed as an *opportunity* to be removed from a clinical trial  
49 (opt-out); (3) Decision problem framed as a *choice* between taking part in a clinical trial or having  
50 standard treatment. As the order in which options are presented may influence people's choices<sup>45-46</sup>,  
51 the sequence in which the trial and standard treatment alternatives were described in the *choice*  
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3 frame was counterbalanced so that half received the trial option first (T-S) and half the standard  
4 treatment option first (S-T).  
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9 The study was carried out in a decision lab using computers situated on partially-enclosed desks. The  
10 Mouselabweb software programme<sup>47</sup> was used to manage the randomisation to condition, present the  
11 decision information and task, and trace participants' information usage concurrently with the task. At  
12 the beginning of the session, participants received written instructions outlining how the session would  
13 proceed. The software programme asked participants to input the identification number and reference  
14 number appearing on the instructions sheet. The reference number specified to the MouselabWeb  
15 programme which framing condition the participant was allocated to: 1. opt-in, 2. opt-out, 3. choice S-  
16 T, and 4. choice T-S. Participants were allocated to the framing conditions in randomly permuted  
17 blocks with the pattern 1, 2, 3, 1, 2, 4, 1, 2, 3... and so on to ensure that there were equal numbers of  
18 participants in each framing condition, with the choice condition being counterbalanced. Participants  
19 were unaware that they were allocated to different framing conditions using the reference number.  
20 Following evidence from previous literature<sup>18,37,38</sup> and input from a practicing oncology consultant on  
21 the study team, the study was designed to mimic how cancer treatment and trial options are offered in  
22 a real-world setting. Treatment and trial decisions are sometimes first presented and discussed  
23 verbally during clinical consultations, before the written information is provided. To replicate this  
24 process in a controlled laboratory setting, we first presented participants with a brief decision scenario  
25 (Figure 1) and asked them to indicate their initial preference in response to the scenario. Following  
26 the scenario, they received detailed information about the trial and standard treatment options (Figure  
27 2) and were asked for their final decision preference. Participants filled out the paper questionnaire  
28 after completion of the computer task. Figure 3 summarises the study procedure. The study was  
29 piloted on the first nine participants and modifications were made to the study materials following  
30 participant feedback and data inspection. Participants from the pilot were included in the main data as  
31 the modifications were not expected to change the key aspects of their behaviour.  
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51 <Insert Figures 1, 2 and 3 about here>

## 52 Materials

### 53 *The decision scenario and framing intervention*

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3 Participants were asked to imagine they had been diagnosed with early stage breast cancer, had had  
4 the lump removed by surgery and were discussing treatment options with their doctor, who suggested  
5 chemotherapy. Participants were told that the clinic was offering participation in a clinical trial, known  
6 by the acronym TACT (Taxotere as Adjuvant chemotherapy); TACT was an international phase-three  
7 chemotherapy trial for early stage breast cancer, carried out by the local cancer unit.<sup>48</sup> A breast  
8 cancer scenario was used as it is one of the most common and high profile cancers, likely to be  
9 known to most people through media or experience of family/friends. To enhance the validity of the  
10 scenario, participants were asked to consider the impact this diagnosis would have on specific  
11 aspects of their life such as work, social life and daily chores and to recollect the experiences of any  
12 family and friends who had experienced cancer.<sup>49</sup>  
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23 The decision scenario and the accompanying questions eliciting initial and final decision preference  
24 were framed either as a 'choice' or an 'opportunity'. The choice frame explicitly stated that there were  
25 two options and asked participants to choose between those options. The opportunity frames made  
26 only the trial option explicit and asked participants to decide whether to follow or not to follow that  
27 option. There were two versions of the opportunity-frame: opt-in and opt-out, both with the same  
28 option explicit but differing in the defaults. The opt-in condition presented the decision as an  
29 opportunity to take part in the trial with standard treatment as the implicit default. The opt-out  
30 condition presented the decision as an opportunity to opt-out of the trial with trial participation as the  
31 default (Figure 1).  
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#### 42 *Detailed decision information*

43 The information about the TACT trial and the standard treatment was adapted for use on the  
44 computer (Figure 2). The information about the two decision options was arranged in adjacent  
45 columns. The information was presented in concealed boxes labelled by questions relating to the box  
46 content which were accessed by clicking on the box (Figure 4). The box remained open as long as  
47 the cursor was inside the box and closed when the cursor was moved out of the box. Each box  
48 opening counted as an acquisition of information. The information readability score was 8.0  
49 (equivalent of an eighth grader / age 14 level)<sup>50</sup>.  
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## Measures

Data were elicited by two methods – responses recorded by the computer during the decision task and the paper questionnaire completed after the task – and assessed the following:

### *Responses recorded by the computer:*

- Decision preference - initial decision preference was assessed before the receipt of detailed information using a categorical response: take part in the trial, have the standard treatment or undecided. The final decision preference was assessed after the receipt of full information using a categorical response: take part in the trial or have the standard treatment. (Figure 1). The option of refusing both options was not presented **because**, in real-world practice, this is not often considered a reasonable option.
- Information acquisition measures - MouselabWeb software recorded the total number of information boxes acquired, the number of times they were reacquired, and the amount of time spent on each box (Figure 4). From these data, process tracing indices were computed<sup>51</sup>: depth of search was calculated separately for trial and standard treatment information as the proportion of available information examined; reacquisition rate was calculated as the total number of information pieces examined minus the total number of first acquisitions, divided by the total number of information pieces examined. A higher depth of search and reacquisition rate indicates a more systematic decision process.

### *Paper questionnaire:*

- Socio-demographic information: age, ethnic origin, occupation, educational level, marital status, personal history of cancer diagnosis and treatment, and people known with cancer in the social network.
- Decision cognitions about risks included: perceived likelihood and severity of side effects for the trial and the standard treatment using 7-point Likert scales, scored 1=not at all likely/not at all severe to 7=very likely/very severe.
- Decision cognitions informed by the *Theory of Planned Behaviour* (TPB)<sup>52</sup> included: *attitude* towards taking part in the TACT trial assessed using four semantic differential scales ('Bad-Good', 'Beneficial-Harmful', 'Risky-Safe' and 'Reassuring-Worrying'), scored 1 to 7; two *subjective norm* items ('people who are important to me' and 'my doctor'), scored 1=strongly disagree to 7=strongly agree; three *perceived behavioural control* items assessing whether



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3 or not taking part in the trial is up to the participant, scored 1=strongly disagree to 7=strongly  
4 agree. The Cronbach's alpha for the three scales were 0.77, 0.49 and 0.44 respectively<sup>2</sup>.

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7 • Satisfaction with the decision was assessed using the six-item validated Satisfaction with  
8 Decision Scale<sup>53</sup> assessing the degree to which participants felt their decision was of good  
9 quality, informed, consistent with personal values, satisfactory and implementable (scored  
10 1=strongly disagree to 5= strongly agree). Higher scores indicate higher satisfaction with the  
11 decision (Cronbach's alpha = 0.85).  
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### 16 Data analysis

17 First, homogeneity of framing groups with respect to demographic characteristics was assessed using  
18 analysis of variance (ANOVA) and chi-squared tests. Second, analyses were performed to identify the  
19 effects framing had on women's decision making. If differences are found between the frames in  
20 terms of information acquisition, decision related cognitions and final decision outcome measures,  
21 there are two ways these might arise (and, indeed, both might be present):  
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27 1) The frame, because of the internal representation of the problem it invokes, leads to changes in the  
28 ways people acquire information and think about the decision, and this leads to changes in the option  
29 they choose. Here the frame is affecting the decision in the usual way we expect in framing effects.  
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32 2) It may be that the initial decision people make leads to changes in the ways they acquire  
33 information and think about the decision, and affects the option they choose. This could occur, for  
34 example, if people spent more time looking at information related to the option they initially chose. If  
35 the frame affects the initial decision, it would then affect the final decision through the impact the initial  
36 decision has on processing  
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43 In identifying whether the first or the second case applies, the role of the initial decision provides  
44 evidence. In the second case, frame will affect the initial decision, but the effect on other outcomes  
45 will be via the initial decision. In this case the initial preference should explain differences in the other  
46 outcomes and the effect of frame should no longer be significant when initial decision is included in  
47 the model.  
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55 <sup>2</sup> The two items assessing subjective norms used two different referent groups. As people may have different  
56 beliefs about different referent groups, the two items are not expected to show high internal consistency. The  
57 internal consistency of the three items assessing perceived behavioural control was lower than the usual cut-offs  
58 (0.44). However, a factor analysis on these items indicated that all three items had loadings of >0.6 on a single  
59 factor, suggesting that the items were measuring the same underlying construct.  
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3 Framing effects on initial preference and final decision were examined using chi-squared tests and  
4 multinomial logit analyses. Multinomial logit analyses examined the group differences in initial  
5 preference using two sets of models; the first set compared the 'trial' category with the 'standard  
6 treatment' and 'undecided' categories; the second set provided comparisons of the 'standard  
7 treatment' and 'undecided' categories. In each set of models, the choice group served as the  
8 reference category against which each of the opportunity frame groups was compared. The output  
9 from these models indicates the change in the predicted odds of an outcome for a unit change in the  
10 predictor (denoted by the beta co-efficient). Framing effects on information acquisition, decision  
11 cognitions and decision quality were assessed using multivariate analyses of variance (MANOVA).  
12 Significant univariate effects were followed up using pairwise comparisons with Bonferroni  
13 adjustment.

## 24 25 Results

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27 One hundred and twenty-four women, aged between 18 and 54 years (Mean=26 years, SD=8.5), took  
28 part in the study. No participants dropped-out once an initial contact had been made. The sample was  
29 predominantly Caucasian (75%); over half (66%) were students and 75% were single. Three percent  
30 had been previously diagnosed with cancer<sup>3</sup> and the rest (97%) knew someone with cancer in their  
31 social network, of whom 30% were close relatives, 43% were distant relatives and 24% were friends,  
32 colleagues or other acquaintances. There were no differences among the framing conditions with  
33 respect to age ( $F[2,119]=1.7$ , n.s.), number of people known with cancer ( $F[2,121]=.15$ , n.s.), ethnicity  
34 ( $\chi^2 =4.2$ ,  $df=2$ , n.s.), marital status ( $\chi^2 =2.2$ ,  $df=2$ , n.s.) and experience of cancer ( $\chi^2 =2.1$ ,  $df=2$ , n.s.)  
35 (Table 1). Significant differences among framing conditions were observed by occupation ( $\chi^2 =6.3$ ,  
36  $df=2$ ,  $p<.05$ ) but further analyses revealed no significant differences between students and staff with  
37 respect to initial preference and final decision, information acquisition, decision cognition and quality  
38 measures. Framing effects were examined by comparing the opt-in (N=42), opt-out (N=41) and  
39 choice (N=41) framing conditions. The two counterbalancing versions of the choice frame were  
40 collapsed into a single category as no significant differences were found between the two versions  
41 with respect to any of the dependent measures.

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57 <sup>3</sup> To test the possibility that women with a diagnosis of cancer may have thought and acted differently, analyses  
58 were conducted with and without these participants. As there was no difference between the findings, the results  
59 for the whole sample are reported.

<Insert Table 1 about here>

### ***Framing effects***

#### *Framing effect on initial preference*

When asked about their initial preference following the decision scenario and before receipt of full information, 64% indicated a definite preference (48% to take part in the trial; 16% to have the standard treatment), and 36% were undecided.

Framing affected initial preferences ( $\chi^2 = 13.18$ ,  $df=4$ ,  $p=.010$ , effect size  $w=0.33$ ) (Figure 5). A post-hoc power calculation, using G\*Power<sup>54,55</sup> and the effect size  $w$  from the statistical test output, indicated that the power of the  $\chi^2$  test of whether framing affects initial preferences is 0.85, suggesting that the study was adequately powered to test this hypothesis. Those in the opportunity frames were less likely to choose the standard treatment rather than the trial when compared to those in the choice frame (for opt-in,  $\beta=-0.14$ ,  $p=0.042$ , Odds Ratio = 0.259,<sup>4</sup> with 95%CI 0.070 to 0.954; and for opt out;  $\beta= -1.9$ ,  $p=.008$ , Odds Ratio =0.148, with 95%CI 0.036 to 0.601). Women in the opportunity frames were also more likely to be undecided than to choose the standard treatment (for opt-in;  $\beta= 1.6$ ,  $p=.016$ , Odds Ratio = 5.146 with 95%CI 1.356 to 19.524; and for opt-out  $\beta=1.5$ ,  $p=.041$  Odds Ratio = 4.694 with 95%CI 1.068 to 20.631). There were no significant differences between the opt-in and opt-out conditions. Although these models are underpowered due to the sample size, they provide further insight into the differences between groups illustrated in Figure 5.

<Insert Figure 5 about here>

#### *Framing effect on final decision*

After receipt of full information, 76% decided to take part in the trial and 24% decided to have the standard treatment. No significant results were found by the chi-squared test of the distribution of the final decision across the three framing conditions ( $\chi^2=1.9$ ,  $df=2$ ,  $p=.38$ ,  $Eta=0.125$ ) (Figure 6). Logistic regression analyses confirmed these findings.

<Insert Figure 6 about here>

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<sup>4</sup> The odds ratio relates to the change in odds of taking up an option between the base group and the focal group to which it applies. It is calculated as the odds after a unit change in the independent variable (dummy variables for group membership in this case) divided by the odds for the base category. An odds ratio greater than 1 represents an increasing chance of taking the option, and an odds ratio below 1 indicates a decreasing chance. Here the odds ratio of 0.259 indicates a decreasing chance of choosing standard treatment with odds of 1:3.86 ( $3.86=1/0.259$ ).

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3 Of those who had indicated a definite preference before receiving full information, 16% changed their  
4 decision after receipt of full information; 10% switched to taking part in the trial and 6% to having the  
5 standard treatment. Logistic regression analyses showed no differences by frame in the propensity to  
6 change decision (Table 2).  
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10 <Insert Table 2 about here>

11 *Framing effect on information acquisition measures*

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13 **MANOVA analysis on the information acquisition measures showed** no significant main effects of opt-  
14 in, opt-out and choice framing on total amount of information acquired and reacquisition rate  
15 (F[8,238]=1.05, p=.39) or depth of search (F[8,238]=.84, p=.57) (**details of the measures in each**  
16 **group of dependent variables can be found in Table 3**).  
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21 <Insert Table 3 about here>

22 *Framing effect on decision cognitions*

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24 **Details of the dependent variables in each analysis can be found in Table 4.** There were no significant  
25 multivariate effects of frame for perceived risk and severity of side effects (F[8, 236]=1.2, p=.31). A  
26 significant multivariate effect of frame was found for the Theory of Planned Behaviour measures (F[6,  
27 236]=2.9, p=.009); with a significant univariate effect for subjective norm (F[2, 119]=4.3, p=.015).  
28 Pairwise comparisons with Bonferroni correction indicated that participants in the opt-out condition  
29 were more likely to **infer that the trial would be** an option recommended by significant others than  
30 those in the choice condition (p=.021).  
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40 To explore **the route by which the frame affected** subjective norm, differences in subjective norm were  
41 first examined by initial preference. Second, the effect of frame on subjective norm was investigated  
42 with initial preference as a covariate. A significant multivariate effect of initial preference was found for  
43 the TPB measures (F[6,236]=5.9, p<.001) with a significant univariate effect for attitude and  
44 subjective norm. Pairwise comparisons with Bonferroni correction indicated that those who preferred  
45 the trial had a more favourable attitude to the trial and greater subjective norm perceptions compared  
46 to the standard treatment choosers and the undecided (all p<0.001). To examine if the effects of  
47 frame on the TPB variables remained significant after controlling for the differences by initial decision,  
48 initial decision was included as a covariate in a MANCOVA. The multivariate effect of frame remained  
49 significant (F[6,234]=2.7, p=.014) with a significant univariate effect for subjective norm (F[2,118]=3.4,  
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3  $p=.037$ ) and similar findings in pairwise comparisons for subjective norm ( $p=.038$ ) to those found  
4 without the covariate. These findings suggest that framing **affected** women's subjective **norm in the**  
5 **way usually associated with framing effects and not just via an impact on initial choice.**  
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#### 10 *Framing effect on satisfaction with decision*

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12 The effect of framing on women's satisfaction with the decision was assessed using one way analysis  
13 of variance. The findings suggest that the three framing conditions did not differ with respect to  
14 satisfaction with the decision ( $F[2,120]=.24, p=.78$ ) (Table 4).  
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### 18 **Discussion**

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20 This study is the first, to the authors' knowledge, to test the effect of the opportunity versus choice  
21 frame for a healthcare decision. We demonstrated a framing bias arising from presenting trial  
22 participation as an opportunity, whether opt-in or opt-out, versus as a choice, as women's immediate  
23 preferences varied depending on the frame. When the decision was presented as an opt-in or opt-out  
24 opportunity, women were more likely to prefer the trial option or to be undecided than to have the  
25 standard treatment, compared to when it was presented as a choice. This bias was possibly due to  
26 the opportunity frames focussing women's attention on the trial option which was explicit in these  
27 frames; the choice frame avoided this bias possibly by drawing attention to other alternatives. The  
28 opt-out opportunity frame also affected women's evaluations of **the degree to which the trial option**  
29 **would be endorsed by significant others (health professionals).** Sixteen per cent of participants  
30 changed their initial preference about trial participation after receiving detailed information but  
31 information acquisition and final decision preference were not affected by the frames. Findings from  
32 this study suggest presenting the decision as a 'choice' is less likely to bias people's preferences.  
33 Further, encouraging people to view balanced and comprehensive information presented in a parallel,  
34 option-by-attribute format *before* eliciting preferences can 'de-bias' the decision frame, removing its  
35 effect on choice.  
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53 Unlike past studies,<sup>22,26,28,31,35</sup> this study found no difference in preferences between the opt-in and  
54 opt-out framing groups. There are several explanations for this variation in findings. First, the framing  
55 bias may be greater or smaller depending on the type and/or context of the decision, for example  
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3 different levels of effects may be found for donating organs after death, choosing treatment to live  
4 longer, choosing treatments for another person, and so on. Second, the framing bias may depend on  
5 how much detail is provided about the healthcare option. In this study, we made the trial option in both  
6 the opportunity frames explicit, which may have led participants to focus more on this option than on  
7 the implicit option of the standard treatment. Third, the framing bias may be greater or smaller  
8 depending on the values and experiences of the individuals so studies of people making real-world  
9 versus hypothetical decisions may find different effect levels. For example, the lack of difference  
10 between the two opportunity frames may have been due to a **lower rate of choosing to participate in**  
11 **the trial** in the opt-out group than might be expected relative to the opt-in group. This lower  
12 participation rate may reflect the negative attitudes of some participants to trial participation, which in  
13 the opt-out condition could reduce their tendency to accept the default option of the trial. In this study,  
14 it was not possible to assess participants' attitudes to trial participation before the decision as such  
15 measurement may impact the decision by making some values more salient than others. However,  
16 attitudes to trial participation, assessed after the decision, were found to be related to participants'  
17 initial decision of trial participation, particularly so in the opt-out frame. A logistic regression analysis  
18 revealed that attitudes significantly predicted the initial trial participation decision in both opportunity  
19 frames. Although the measure of attitudes was collected after the decision, these findings suggest  
20 that the effect of framing may depend on the nature and strength of pre-existing attitudes towards the  
21 options. Given the possibility of an unmeasured interaction effect of the opt-out frame and pre-existing  
22 attitudes, further research should examine the moderating role of attitudes in framing effects.

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42 The frame did influence women's perceptions of social norm; women were more likely to **infer** that  
43 people who were important to them and the health professionals **would support** the trial option when it  
44 was presented as an opt-out. The opt-out frame presents the trial option as the default, i.e. what  
45 would happen if no action were taken; the implication is that the opt-out frame casts the trial option as  
46 a social norm and by doing so, leaks information about the writer/speaker's preference.<sup>56,57</sup> Consistent  
47 with the explanations offered for the increased attractiveness of default options, the heightened  
48 perceptions of social norm may have contributed to an increased preference for the trial option in two  
49 possible ways. First, the trial option could be seen as an implicit recommendation from the health  
50 professional, thereby providing a rationale for its preference.<sup>30,58</sup> Second, the trial could be seen as the  
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3 morally appropriate option, i.e. something people 'should do', making it harder to opt-out.<sup>31,59</sup> Both  
4 possibilities are consistent with McKenzie et al's<sup>58</sup> explanation that the writer/speaker's choice of  
5 description implicitly leaks information about their own preferences about the option as well as their  
6 beliefs about what others should do. They showed that, compared to opt-in frames, people are more  
7 likely to infer from the opt-out frames that the option described is the writer/speaker's preferred option  
8 and that therefore other people ought to choose the default. It is interesting that, despite the above  
9 possibilities, women's final decisions were unaffected by the frame. It is possible that the effect of the  
10 implicit recommendation in the opt-out frame was tempered by their subsequent evaluation of the full  
11 information. Future research should further explore the relationship between default framing,  
12 subjective norm and deliberation.  
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23 This study not only demonstrates the biasing effect of opportunity frames, but also suggests a  
24 potential way of ameliorating it through provision of balanced and comprehensive information about  
25 the options prior to eliciting preferences. Prior findings indicate that strength of framing biases  
26 decreases when individuals are encouraged to deliberate on the decision problem by providing  
27 detailed information about the options<sup>60-62</sup> or the context<sup>63</sup>, by asking individuals to provide rationales  
28 for their decisions<sup>64</sup> and by inducing individuals to engage in analytical thinking<sup>65</sup>. In this study, it is  
29 possible the detailed information minimised the effects of frame by encouraging more systematic  
30 processing of information. It is worth noting that the content and structure of the information we  
31 provided was designed to encourage active deliberation. The standard treatment and trial information  
32 presented within the computer task was structured with reference to decision aid guidelines.  
33 Equivalent information was presented in parallel, option-by-attribute table format, as illustrated in  
34 Figure 4, which allowed the attributes of each option to be compared and contrasted at a glance.<sup>5</sup>  
35 Most patient information presents treatment options in a fixed linear sequence, which forces patients  
36 to consider the options and their attributes in the given order. The linear presentation of options is  
37 more likely to encourage biasing in what is attended to and/or evaluated, for instance, through  
38 primacy or recency effects.<sup>66</sup> It is possible a more traditional presentation of trial information would  
39 have resulted in a more pronounced framing effect on participants' acquisition, and evaluation, of  
40 decision information. Future research should compare the linear and parallel, option-by-attribute  
41 formats of presentation and explore their impact on framing effects.  
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3 This study is unique in that it investigates a novel aspect of framing, addresses an important clinical  
4 context, employs a robust experimental design and involves measures of what information is attended  
5 to. The study does have potential limitations to its generalization. Nonetheless it provides proof of  
6 concept data, which can underlie further research. First, a self-selecting sample of healthy women  
7 making a hypothetical choice about trial participation may not generalize to patients making these  
8 decisions or to those with other types of cancer. There is evidence that people's values change  
9 depending on their health state<sup>67</sup>, which may influence their treatment choices. We suspect this  
10 sample had relatively stable values as all indicated they had experience of cancer, either as a  
11 previous patient or as an acquaintance of someone with cancer. More importantly, we expect that  
12 these results would be replicated in the real-world and in other contexts, because the study explores  
13 how an individual's construction of a decision problem is influenced by the presentation of options,  
14 rather than the evaluation of the information contained within the decision problem. It is likely that the  
15 same metacognitive processes would be employed by individuals whether or not they were  
16 patients.<sup>68,69</sup> This issue can be explored further in phase III type trials with populations that have more  
17 direct involvement with cancer (e.g. survivors/family/patients). Second, the sample in **this study had a**  
18 **much higher rate of trial participation than is observed in the real world.** This could be due to the  
19 hypothetical nature of the decision<sup>70</sup> or higher levels of education in the sample. We acknowledge that  
20 patients making these decisions in the real-world may be quite different in age, gender or educational  
21 status from participants of this study. Nevertheless, the aim of this study was to demonstrate that  
22 different decision frames can lead to different choices; **this** can be further tested in more  
23 representative populations and contexts.

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44 Third, provision of the 'undecided' option at the initial but not the final decision complicates the  
45 comparison of findings, as 'undecided' may reflect that participants have no clear preference or that  
46 they are not sure enough to express or act on their preference. However, a forced-choice question to  
47 elicit an initial decision preference was not appropriate in this study. It may have biased participants'  
48 subsequent information processing, cognitions and the final decision due to the potential tendency to  
49 feel more committed to the chosen option and process any subsequent information in a way that  
50 confirms this choice<sup>34</sup>. Inclusion of the undecided option helped confirm the focusing effect of the  
51 frames; women receiving the opportunity frames were not only more likely to choose the trial but also  
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3 more likely to be undecided than to choose the standard treatment option. Inclusion of an undecided  
4 option to elicit final decision was also not appropriate because, often in reality, patients must choose  
5 one or the other. Thus, final decision by the initially undecided participants may reflect either a change  
6 from 'no preference' to a clear preference for the trial or the standard treatment option, or the  
7 expression of an initial preference which had not been strong enough to be expressed at the initial  
8 decision stage. Fourth, presentation of options and information via computer may compromise the  
9 study's external validity. As described earlier, this study replicated the clinician-delivered information  
10 in a controlled laboratory experiment to investigate whether framing affects people's information  
11 acquisition (i.e. what information is accessed, for how long and how often) along with their choices  
12 and cognitions. To allow collection of these data, information needed to be presented in such a way  
13 that only one piece of information is visible at a time.<sup>51</sup> The computer based approach was needed to  
14 facilitate presentation of information and acquisition of data, which would have been difficult with  
15 paper-based information.  
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29 These findings have implications for those delivering services to enhance patients' informed decision  
30 making about treatment, testing and trial options. First, the routine practice of presenting healthcare  
31 and clinical trial options using an opportunity frame (opt-in or opt-out) can lead to significant biases in  
32 people's preferences. Bias is less likely to occur when all options are presented explicitly using a  
33 choice frame. Saying "Do you want to have the standard treatment or take part in the trial" instead of  
34 "Do you want to take part in a trial" changes the decision representation to include two options rather  
35 than one, allowing individuals to consider all available options. Framing an option as an opt-out  
36 versus an opt-in seems to leak information interpreted as an endorsement of the option. It is unclear  
37 whether this frame affects informed decision making; it may change the value of a component part of  
38 the evaluation but not the ability to reason systematically about it. For some decisions where there is  
39 a 'correct' behaviour (e.g. illness prevention programmes), it may be argued that framing an option as  
40 an opt-out enables people to make an informed choice, rather than an informed decision, and this  
41 level of engagement with the information is sufficient.<sup>29,30</sup> In these contexts, the opt-out framing may  
42 nudge people towards the desired behaviour without removing their freedom to choose differently.  
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information can de-bias the decision context and enable patients to re-evaluate labile preferences.<sup>62,64</sup>

This is particularly important because in the real-world setting, patients may not often be provided with full information, in an accessible and comparable format, immediately after the initial trial offer. Third, women's trial preferences change when they receive more information and/or have time to consider the decision information.<sup>71,72</sup> Tailoring information according to a first preference will limit the likelihood patients are able to make informed decisions.

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**Conflicts of interest disclosure:**

The authors have no conflicts of interest to declare.

For Peer Review



## Tables

**Table 1: Characteristics of participants by framing groups**

	Opt-in (N=42)	Opt-out (N=41)	Choice (N=41)
Average (SD) age in years	28.2 (9.5)	25.3 (8.7)	25.0 (6.9)
Ethnicity: White, N(%)	32 (76%)	34 (83%)	26 (63%)
Occupation: student N (%)	23 (55%)	33 (80%)	26 (63%)
Marital status: single N(%)	29 (69%)	30 (73%)	34 (83%)
Women with close relatives with cancer N(%)	13 (31%)	15 (37%)	9 (22%)
Average (SD) number of people known with cancer	2.4 (1.5)	2.4 (1.3)	2.3 (1.2)

Table 2: Change in decision by framing conditions

	<b>Opt-in (N=42)</b>	<b>Opt-out (N=41)</b>	<b>Choice (N=41)</b>
<b>Change in decision among those with definite initial preference N(%)</b>	<b>4 (10%)</b>	<b>2 (5%)</b>	<b>7 (17%)</b>
<i>From Trial to Standard treatment</i>	2 (5%)	1 (2.5%)	2 (5%)
<i>From Standard treatment to Trial</i>	2 (5%)	1 (2.5%)	5 (12%)
<b>Final decision among those initially undecided N(%)</b>	<b>19 (45%)</b>	<b>13 (31%)</b>	<b>12 (29%)</b>
<i>Choosing Trial</i>	14 (33%)	8 (19%)	9 (21%)
<i>Choosing Standard treatment</i>	5 (11%)	5 (12%)	3 (7%)

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**Table 3: Mean (SD) for information acquisition measures by frame**

	<b>Opt-in (N=42)</b>	<b>Opt-out (N=41)</b>	<b>Choice (N=41)</b>	<b>Partial Eta Squared</b>
<b>Total amount of information examined</b>	Multivariate F[8,238]=1.05, p=.39			0.034
Proportion of information searched	.74 (.20)	.76 (.18)	.69 (.26)	.017
Total time spent on information screen	6.6 min. (2.7)	6.5 min (2.1)	6.2 min (2.7)	.001
Average time spent per information piece	5.4 sec.(2.1)	5.6 sec.(2.1)	5.4 sec.(1.9)	.004
Reacquisition rate	.19 (.09)	.19 (.08)	.19 (.11)	.002
<b>Depth of search</b>	Multivariate F[8,238]=.84, p=.57			.027
Proportion of information examined on trial	.79 (.23)	.85 (.19)	.74 (.28)	.029
Proportion of information examined on standard treatment	.63 (.24)	.59 (.21)	.58 (.29)	.005
Proportion of time spent on trial information	.55 (.12)	.59 (.07)	.53 (.14)	.039
Proportion of time spent on standard treatment information	.16 (.07)	.15 (.06)	.15 (.08)	.004

**Table 4: Mean (SD) for decision related cognitions by frame**

	<b>Opt-in (N=42)</b>	<b>Opt-out (N=41)</b>	<b>Choice (N=41)</b>	<b>Partial Eta Squared</b>
<b>Perceived risk and severity of side effects</b> (low-high; 1-7)				.039
Multivariate $F[8, 236]=1.2, p=.31$				
Severity of trial side effects	5.3 (1)	5.3 (1)	4.9 (1)	.006
Risk of trial side effects	6 (1.2)	6 (1.3)	5.8 (1.1)	.013
Severity of ST side effects	5.4 (1)	5.3 (1)	5.1 (.9)	.011
Risk of ST side effects	5.8 (1.4)	6 (1)	5.8 (1.2)	.024
<b>Theory of Planned Behaviour measures</b> Multivariate $F[6, 236]=2.9, p=.009$				.069
Attitude towards trial (Unfavourable-Favourable; 4-28)	16.7 (.7)	17.1 (.7)	16.9 (4.7)	.001
Subjective norm (low-high; 2-14)	8.9 (4)	10.1 (4)	8.7 (2.1)	.068
Perceived Behavioural Control (low-high; 3-21)	17.2 (3)	18.1 (3)	17.2 (2.9)	.022
<b>Satisfaction with decision</b> (low-high; 6-30) $F[2, 120]=.24, p=.78$				.004
	24.1 (2.9)	24.3 (3.7)	23.8 (3.3)	

## Figure Legends

**Figure 1: Decision scenario with framing intervention**

**Figure 2: Summary of content of information on decision options**

**Figure 3: Study procedure flow chart**

**Figure 4: Decision information presented on computer screen**

**Figure 5: Initial preference in opt-in, opt-out and choice conditions**

**Figure 6: Final decision in opt-in, opt-out and choice conditions**

For Peer Review

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3 **Figure 1: Decision scenario with framing intervention**  
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6 Imagine that you are in the consultation with your doctor. The doctor is discussing with you  
7 what treatments you could have for your cancer. Your doctor suggests that you have  
8 chemotherapy. Chemotherapy may offer a good chance of destroying any cancer cells that  
9 may have been left behind.  
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13 ***There is an opportunity to take part in a clinical trial. You are suitable to take part in this  
14 trial. (Opt-in)***  
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17 ***All patients are automatically entered in a clinical trial. You are suitable for this trial and  
18 will be automatically entered. There is an opportunity to be removed from this trial.  
19 (Opt-out)***  
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21  
22 ***You are suitable to take part in a clinical trial. You have two options. Option one is to  
23 have the standard treatment. Option two is to take part in the clinical trial. (Choice)***  
24  
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26  
27 The clinical trial is known by the short-form TACT. The clinical trial compares two different  
28 chemotherapy treatments, A and B. Treatment A involves drugs that have been used for your  
29 type of cancer for many years. Treatment B uses drugs called Taxanes. At present, taxanes  
30 are only used for treating breast cancer which has already spread to other parts of the body.  
31 The TACT trial aims to find out whether adding a taxane drug called Docetaxel to other  
32 chemotherapy drugs will reduce the chance of breast cancer coming back. If you decide to  
33 take part, a computer will randomly allocate you to either treatment A or B.  
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39 **Question for Opt-in**

40 Do you want to take part in the trial?

- 41  
42 1. Yes, I want to take part in the trial  
43 2. No, I do not want to take part in the trial  
44 3. I am uncertain about my decision (Included  
45 in the initial decision preference only)  
46  
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48  
49 **Question for Opt-out**

50 Do you want to be removed from the trial?

- 51  
52 1. Yes, I want to be removed from the trial  
53 2. No, I do not want be removed from the trial  
54 3. I am uncertain about my decision (Included in  
55 the initial decision preference only)  
56  
57

58  
59 **Question for Choice**

60 Do you want to take part in the trial or have the  
standard treatment?

1. I want to take part in the trial  
2. I want to have the standard treatment  
3. I am uncertain about my decision (Included in  
the initial decision preference only)

**Figure 2: Summary of content of information on decision options**

<b>TACT trial</b>	<b>Standard treatment</b>
<ul style="list-style-type: none"> <li>• Purpose of the trial</li> <li>• Treatment details: Drugs being tested; number of cycles, frequency of cycles, duration of treatment, and method of treatment delivery.</li> <li>• Possible side effects of both drugs</li> <li>• Method of treatment allocation and the rationale for randomisation</li> <li>• Advantages of taking part in the trial (access to potentially more effective treatment, closer monitoring of your health, helping future patients, randomisation)</li> <li>• Disadvantages of taking part in the trial (random allocation to treatment, uncertainty of additional benefits, additional clinic visits, unexpected side effects)</li> </ul>	<ul style="list-style-type: none"> <li>• Purpose of treatment</li> <li>• Treatment details: drugs involved, number of cycles, frequency of cycles, duration of treatment and method of treatment delivery</li> <li>• Possible side effects</li> <li>• Advantages of having the standard treatment (treatment not selected randomly, known side-effects)</li> <li>• Disadvantages of having the standard treatment (no opportunity to receive new treatment)</li> </ul>

Peer Review

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Figure 3: Study procedure flow chart

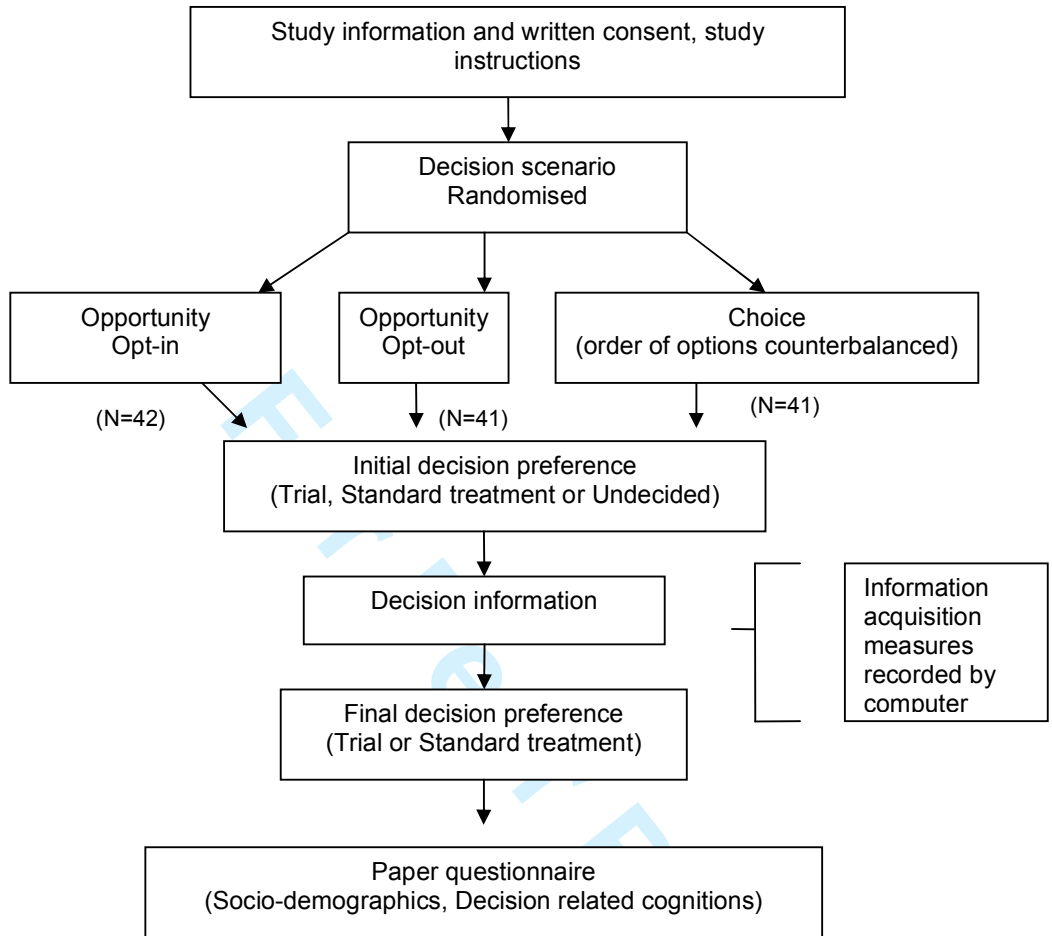
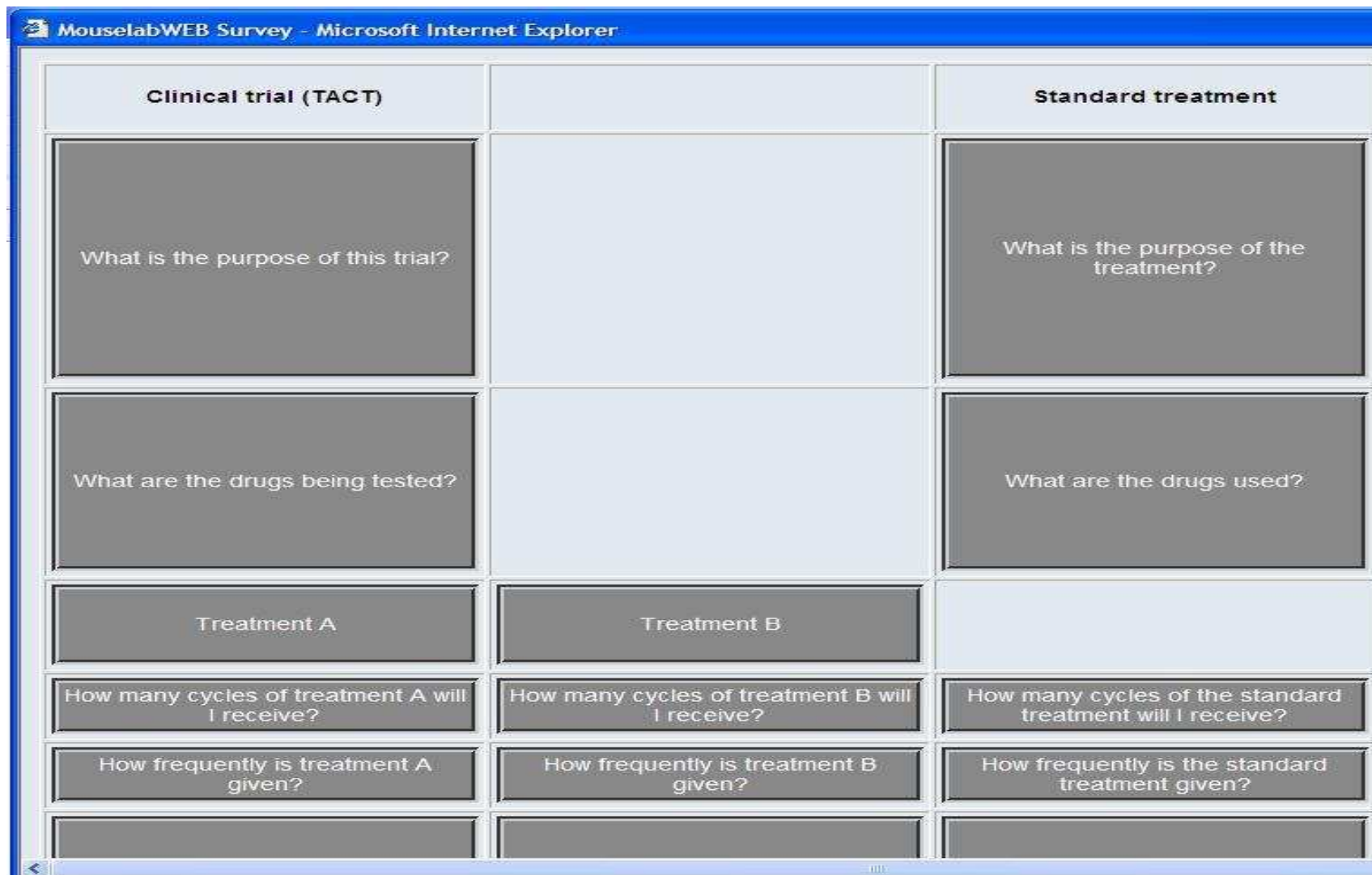


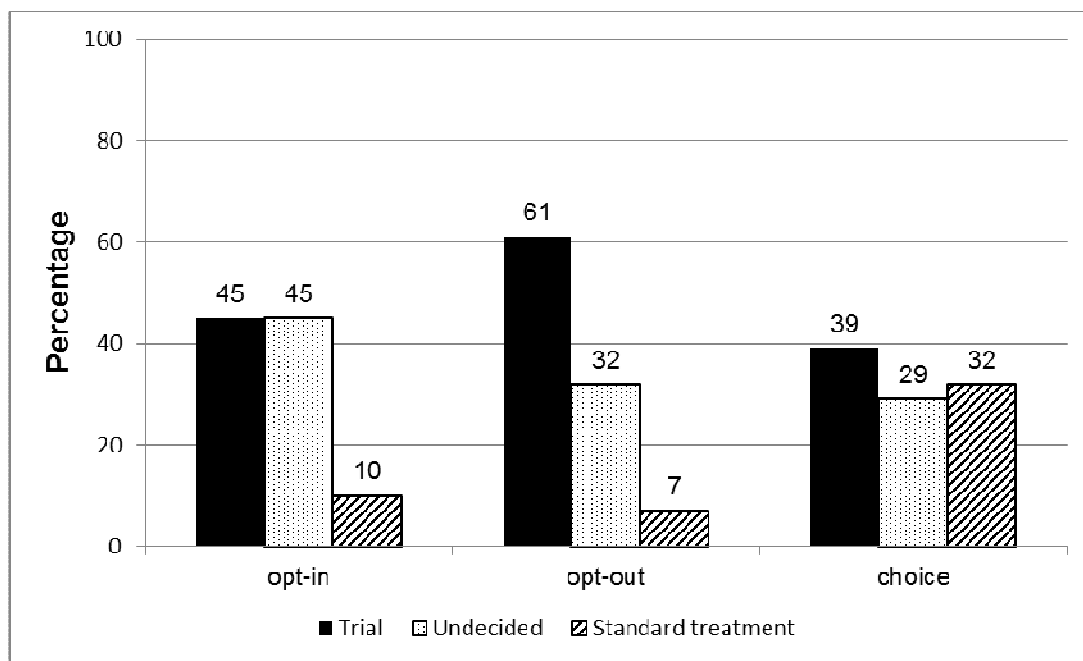


Figure 4: Decision information presented on computer screen



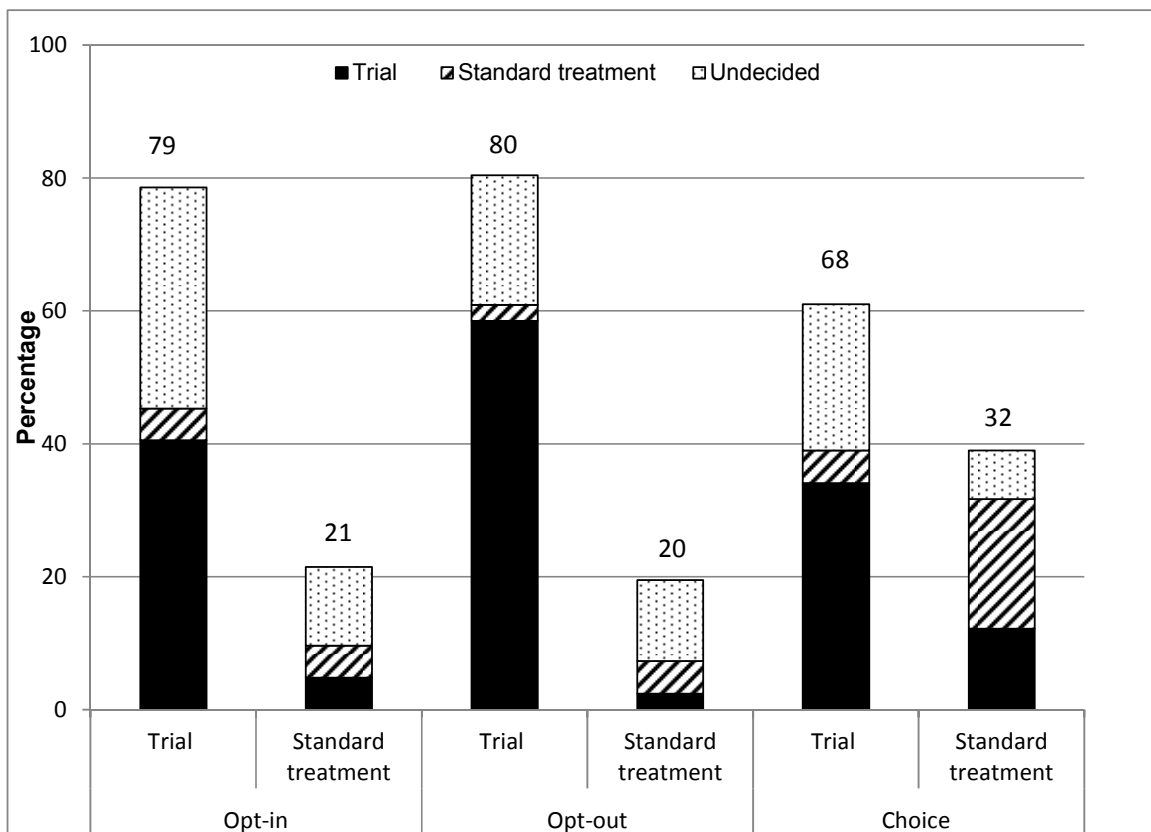
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Figure 5: Initial preference in opt-in, opt-out and choice conditions



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Figure 6: Final decision in opt-in, opt-out and choice conditions stacked by initial preference



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