



## Testing with feedback improves recall of information in informed consent: A proof of concept study



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### ABSTRACT

**Objective:** This study investigates whether applying educational testing approaches to an informed consent video for a medical procedure can lead to greater recall of the information presented.

**Methods:** Undergraduate students (n=120) were randomly assigned to watch a 20-min video on informed consent under one of three conditions: 1) tested using multiple-choice knowledge questions and provided with feedback on their answers after each 5-min segment; 2) tested with multiple choice knowledge questions but not provided feedback after each segment; or 3) watched the video without knowledge testing.

**Results:** Participants who were tested and provided feedback had significantly greater information recall compared to those who were tested but not provided feedback and to those not tested. The effect of condition was stronger for moderately difficult questions versus easy questions.

**Conclusions:** Inserting knowledge tests and providing feedback about the responses at timed intervals in videos can be effective in improving recall of information.

**Practical implication:** Providing informed consent information through a video not only standardizes the material, but using testing with feedback inserted within the video has the potential to increase recall and retention of this material.

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### 1. Introduction

The use of multimedia formats in delivering patient education has increased dramatically as technology has improved [1]. With the increasing accessibility and use of healthcare information on the Internet [2] as well as patient preference for multimedia [3] and calls for active engagement of patients in health care decision [4], which is central to the informed consent process, informed consent is one area where using such technology could be particularly beneficial [5]. It could provide standardized information at reduced costs and provider time, and create opportunities for interactive, tailored feedback to patients [6].

Prior to receiving a high-risk medical procedure, patients are legally and ethically entitled to receive information about the

procedure, as well as anticipated benefits and risks of the procedure, in order to make an informed decision and provide consent [7]. Informed consent requires patients to process and remember complex information about medical procedures and anticipated outcomes to ensure that the correct decision is made [8]. The informed consent process usually involves a discussion between the patient and the healthcare provider that is not standardized. Physicians receive little training in how to conduct informed consent discussions, most do not meet the minimum standards when they do so, and even when they deliver complete informed consent, they tend to overestimate patients' comprehension of the information [9,10]. As a result, informed consent is often not effective in helping patients understand the procedure and its implications for their health [11,12].

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### 1.1. Using technology to improve information retention in informed consent

Evidence that the traditional consent discussions can be improved upon with the use of technology has been accumulating [13]. Multimedia presentations (e.g., video and text) have been developed in an effort to facilitate and improve informed consent. In a systematic review of interventions to increase patient understanding in informed consent for medical and surgical procedures, Schenker et al. [13] reviewed 44 studies, of which 15 studies evaluated multimedia interventions. In a similar proportion to other types of interventions, the majority (73%) of the multimedia interventions improved comprehension. Nehme et al. [5] reviewed 22 multimedia programs used to consent surgical patients and found that 73% showed an improvement in patients' comprehension. Patients were extremely satisfied with the quality of the information provided in the interventions, finding them easy to use and informative, suggesting that these types of interventions are feasible.

Approaches such as interpolating brief testing throughout the presentation of information have been effective in educational settings [e.g.,14] and could be applied in medical ones. Dynamic testing approaches, informed by cognitive psychology, engage learners in retrieval practice, thereby facilitating encoding, retention, and a deeper understanding of information [e.g.,15–17]. Although testing has traditionally been used for assessment only, the simple act of taking a test can improve learning and long-term retention [18,19]. It is possible, for example, that retrieving information modifies its representation in memory in a way that it becomes more accessible for recall in the future [20]. With multiple choice questions, retrieval is invoked in the process of trying to select the correct answers; this is more pronounced with more difficult answers that incorporate competitive or plausible incorrect alternatives [21]. Testing can also increase the retention of subsequently presented new information [22]. Szpunar et al. [14] found that testing individuals after short segments (approximately 5 min) of viewing an online video of a lecture improved test scores on subsequent tests by reducing mind wandering and increasing the frequency of note taking, thereby sustaining attention to the lecture content.

Providing feedback after testing in the form of the correct answer has been found to enhance learning and produces greater benefits than testing without feedback [e.g.,15] by allowing test-takers to maintain correct responses and to correct errors [23]. Providing feedback with multiple-choice questions is especially important as this type of format exposes test-takers to erroneous information in the form of lure items (incorrect answers) and can lead to acquiring false knowledge [23]. Selecting the lure items in a multiple-choice test often leads to selecting the same incorrect items on subsequent tests [24].

### 1.2. The effect of anxiety

Multiple studies have shown that anxiety can interfere with learning and information retention [25]. A high level of anxiety can interfere with several aspects of cognition that are critical for successful learning, such as paying attention and information processing [26]. Falagas et al. [27] reviewed 23 studies that addressed patient understanding of informed consent and found low level of understanding of the information provided and of the risks associated with surgery, which may be attributed to stress and anxiety associated with the upcoming surgery. Thus we examined whether high anxiety while watching the video might interfere with learning and could be ameliorated by receiving feedback.

### 1.3. The current study

In this experimental study, we investigated whether simple testing or testing with feedback during an informed consent video for a medical procedure (thyroidectomy) can improve retention of information relative to watching the video without testing or feedback. We hypothesized that: 1) Individuals watching a 20-min video about thyroidectomy surgery and its risks will have greater information recall if they are tested periodically or tested and provided with feedback on the correct answer during the video than if they are not tested at all; 2) Individuals who are given feedback will have greater information recall than individuals who are tested but do not receive feedback; 3) Information recall will be greater for difficult questions than easy questions for individuals receiving feedback; and 4) Individuals who display greater anxiety before the video will have poorer information recall, but less when tested and given feedback.

## 2. Methods

### 2.1. Recruitment

Undergraduate students were recruited to participate through an Introductory Psychology course if they were 18 years of age or older, able to read and speak English, and did not have a history of thyroid cancer. Participants received one college credit to compensate for their time.

### 2.2. Procedures

Participants were tested individually in a 45-min laboratory session. After providing consent to participate in the study, participants completed a baseline measure of anxiety and then randomly assigned to one of three conditions, described below, where they watched a video on a desktop computer in a private testing room. The knowledge questions (primary outcome measure) were inserted into and answered within the video. Random assignment was done using the Research Randomizer software [28].

The 20-min patient education video was developed for use as a supplement to informed consent for a medical procedure (thyroidectomy). The script was written at a 10th grade level by a head and neck surgeon (MU) and reviewed by endocrinologists and head and neck surgeons. In the video, a physician describes thyroidectomy surgery, the risks of the surgery, aftercare, and potential sequelae. Graphics are inserted throughout the video.

Participants were randomized to one of the three conditions: a testing condition (Testing), a testing plus feedback condition (Testing + Feedback), and an attention control condition (Control). In all three conditions, participants were informed that the video was divided into four segments of approximately five minutes each and after each segment they would be asked to answer four questions (for a total of 16 questions). Participants in the Testing and Testing + Feedback conditions received four questions that tested their knowledge about the material presented in that segment. Participants in the Control condition answered four questions about health locus of control [29], in order to keep time and attention consistent. The Testing + Feedback condition received the same four test questions as the Testing condition but these participants were also provided with immediate feedback indicating whether each answer was correct, signified by a green checkmark. If an answer was incorrect, a red X would appear on the screen and the correct answer would be indicated with a green checkmark.

Immediately after watching the video, all participants completed the anxiety measure again and the same 16 knowledge questions that had been presented during the video in the Testing

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