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RESEARCH

What is the scope to test a smoking cessation intervention aimed at young people admitted to hospital?

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SUMMARY

- The hospital setting introduces a number of challenges to implementing this type of intervention, including recruitment barriers and high attrition rates.
- Patient engagement in smoking cessation is likely to be affected by the reason for admission and patients' stage of change
- To be successful, smoking cessation interventions may need to be tailored to the patients' degree of motivation, as evidenced by their stage of change

Key Words
Smoking cessation; interventions; photoageing

ABSTRACT

Background

Young adults are reluctant to use evidence-based smoking cessation interventions. Subsequently, they are less successful at giving up smoking compared to older adults. This highlights the need for innovative strategies to engage young people in smoking cessation. A novel intervention using photoageing technology has been shown to be an effective trigger for smoking cessation.

Aims

To conduct a pilot study deploying photoageing technology to trigger smoking cessation attempts in young adults admitted to hospital.

Method

A randomised controlled trial was designed. Thirty participants were recruited from a regional hospital in Melbourne, Australia. Participants were allocated to the intervention and control groups on alternate weeks. All participants received brief smoking cessation advice. The intervention group was digitally aged using the APRIL Face Aging Software. The primary outcomes were measured at six weeks' post-intervention and included number of quit attempts, nicotine dependence, and progression through the stages of change model.

Results

At six weeks' post-intervention, there was no difference in quit attempts between the two groups (Mann-Whitney U=111 and p=0.484). There was also no difference in nicotine dependence (Mann-Whitney U=106 and p=0.403) or stage of change (χ^2=1.71 and p=0.634) between the groups.

Conclusion

Hospitalisation is associated with a number of barriers, which prevent the implementation of photoageing technology in this setting. Of these barriers, participant recruitment and retention pose the greatest challenge. Due to these considerations, it was not possible to demonstrate an effect size with any confidence.

BACKGROUND

Cigarette smoke is the leading cause of preventable death and disease in Australia.[1] It claims the lives of approximately 15,000 Australians each year and is responsible for 1 in 10 deaths.[2] Since 1995, the number of young adult smokers in Australia has more than halved.[3] Despite this improvement, 1 in 5 adults aged 18–30 still smoke. Of these smokers, approximately 70 per cent smoke daily.[3,4]

Addressing the issue of smoking in the young adult population is imperative to prevent the long-term sequelae associated with cigarette smoke. However, triggering behavioural change in young adult smokers poses many challenges. They are less successful at quitting compared to older smokers and underutilise evidence-based smoking cessation interventions.[5,6] Given these difficulties, clinicians must find innovative ways to engage young people in smoking cessation.

Generation Y is known for its love of technology. Recently, researchers have harnessed the power of technology to engage young people in smoking cessation. The use of Internet-based interventions, mobile phone applications, and social media interventions have yielded mixed results.[7–9] However, a novel intervention using photoageing technology has been shown to be an effective trigger for behavioural change.[10,11] The intervention involves taking a picture of the participant's face, and digitally ageing the image through the use of wrinkling/ageing algorithms to produce a picture of the participant as an aged smoker. When implemented in a community pharmacy setting, the intervention reduced nicotine dependence and produced significantly more quit attempts when compared to smoking cessation advice alone.[10]

It may not be technology alone that will deliver a successful intervention. A combination of technology and timing may provide the key to triggering behavioural change in this population. The literature suggests that timing is the key to triggering behavioural change. An intervention must be delivered at a time when the patient is open to advice—a concept known as a "teachable moment". A teachable moment is defined as the point at which a health event motivates the patient to adopt a risk-reducing behaviour.[12] Previous research has demonstrated hospitalisation to be a powerful teachable moment with regard to smoking cessation.[13] It represents a unique opportunity, where patients are primed and ready to quit smoking.

This study hypothesises that people presenting to hospital will have a greater sense of being vulnerable to serious pathology and more likely to attempt to stop smoking. Furthermore, we hypothesise that the intervention will trigger more quit attempts and reduce nicotine dependence compared to usual care.

OBJECTIVE

A pilot study deploying photoageing technology to trigger smoking cessation attempts in young adults admitted to hospital.

METHOD

This study obtained approval from Mercy Health HREC. Project reference number: R16/25W. The methods described below replicate the methods deployed in a previous large scale randomised trial.[10]

Recruitment

A pilot randomised controlled trial was conducted. Thirty participants were recruited from a large regional hospital located in the western suburbs of Melbourne, Australia. Participants were recruited according to the following eligibility criteria: male or female smokers, aged 18–35, admission to the medical or surgical ward or emergency department, not using any smoking cessation medication or therapy, able to give consent and no beards or facial piercings that cannot be removed. Participants recruited to the study were allocated to the control group and intervention group on alternate weeks in order to minimise selection bias and contamination between the groups. At the conclusion of recruitment, there were 15 participants in the control group and 15 in the intervention group.

Sample Size

A sample size of 15 participants per group was required to confirm a moderate effect size (d=0.14) within 95% confidence intervals.[14]

Baseline Questionnaire

On commencement, all participants completed a baseline questionnaire, which included demographic information, and baseline measures of the primary outcomes measures for nicotine dependence and stage of change. The Fagerström Smoking Dependence Scale was used to determine nicotine dependence.[15] A smoking-specific stage of change questionnaire was used to stratify participants according to their motivation to quit smoking.[16]

Intervention

Participants in both groups were given brief smoking cessation advice as per The Royal Australian College of General Practitioners (RACGP) guidelines.[17] The

intervention group also received the APRIL Age Progression Software intervention. The program uses a digital picture of the participant's face, and ages the picture through the use of wrinkling/ageing algorithms. The algorithms are based on photographs of 2,000 people and on published data regarding facial changes associated with ageing.[18] The software is designed to produce two versions of the participant's face: one in which the participant ages as a non-smoker and one in which the participant's face demonstrates the effects of smoking on aging (Figure 1). Participants view these effects in real-time, as their face morphs throughout the process.

Primary Outcomes

The primary outcomes of the study were measured at six weeks' post-intervention by telephone. They included the number of quit attempts made by the participant, nicotine dependence using the Fagerström Smoking Dependence Scale, and progression through the stages of change model.

Data Analysis

SPSS Version 23 (IBM Corp. Armonk, NY) was used for analysis at a significance level of p=0.05. Baseline demographics, nicotine dependence, and stage of change were compared between the two groups using Chi-square for categorical variables and Mann-Whitney U test for continuous variables. The primary outcomes at six weeks' post-intervention were analysed using Mann-Whitney U test to compare the number of quit attempts and nicotine dependence and Chi-square test for stage of change.

RESULTS

One hundred and twenty-seven patients were screened for eligibility of which 30 met the inclusion and were enrolled into the study. Ninety-seven patients were excluded from the study, of which 93 were non-smokers and four declined to take part in the study. Fifteen participants were recruited into the intervention group and 15 into the control group. Five participants in the intervention group (33.33 per cent) and two participants in the control group (13.33 per cent) were lost to follow-up.

The baseline demographics of the two groups are illustrated in Table 1. There were no statistically significant differences in baseline demographics between the groups. The mean age was 27.53 in the intervention group and 28.2 in the control group (p=0.717). There were slightly more males in the intervention group and slightly more females in the control group, but this was not statistically significant (p=0.464).

The baseline number of cigarettes smoked, nicotine dependence, and stage of change are depicted in Table 2. There were no differences in baseline outcome measures between the groups. The intervention group contained fewer light smokers and one heavy smoker. However, this was not statistically significant (Mann-Whitney U=94.5 and p=0.230). There were no differences in baseline nicotine dependence or stage of change between the groups. The control group contained more participants with moderate nicotine dependence; however, this was not statistically significant (Mann-Whitney U= 111 and p=0.484).

Primary Outcomes

At six weeks' post-intervention, the three outcome measures were compared between the intervention and control groups (Table 3). The intervention group recorded two quit attempts while the control group had three. This finding was not statistically significant (Mann-Whitney U=111 and p=0 .484). Half of the participants in the intervention group experienced a reduction in nicotine dependence, while 15 per cent of the control group reduced their nicotine dependence. Although this was intriguing, the results were not statistically significant (Mann-Whitney U=106 and p=0.403). Furthermore, the groups showed no statistical difference in stage of change after the intervention (χ^2=1.71 and p=0.634).

DISCUSSION

Our findings suggest that while it is possible to deliver photoageing technology in the hospital setting, hospitalisation introduces a number of challenges. Difficulties in recruitment, high attrition rates, and a lack of measureable effect suggest that this intervention is better suited to other clinical environments.

In Australia, young adults are infrequently admitted to hospital. People aged 20–34 comprise only 12.7 per cent of hospital admissions each year.[19] Furthermore, young people aged 15–34 account for only 25 per cent of all emergency department presentations.[20] Therefore, young adults make up a small proportion of patients within the hospital system. Hence, recruiting young adult smokers

to this study was a challenging prospect. This was reflected in the small sample size of 30 participants.

The small sample size was compounded by high rates of attrition. Approximately 25 per cent of participants were lost to follow-up. This is in keeping with previous studies on photoageing technology.[11,12] The small sample size and high rates of attrition had serious implications on our study's findings. We found that photoageing technology did not increase the number of quit attempts made by young adult smokers admitted to hospital. It can be argued that the study was insufficiently powered to detect a measurable difference between the groups. A type two error is therefore possible. However, alternative explanations must be considered. We propose that this lack of measureable effect may be related to the absence of a teachable moment.

We hypothesise that the majority of our cohort did not experience a teachable moment during their hospital admission. Our findings suggest that this was influenced by three key factors: stage of change; reason for admission; and the setting. The participant's stage of change was an important predictor of a quit attempt. Our findings demonstrate that patients in the pre-contemplation stage are unlikely to make a quit attempt. Previous research on behavioural change supports this notion and emphasises the need for high levels of motivation to trigger behavioural change.[21] This indicates that screening patients for stage of change may help to identify those most likely to respond to smoking cessation interventions. This notion is supported by the current RACGP smoking cessation guidelines.[17]

We postulated that patients who are admitted to hospital with a condition related to their smoking are more likely to stop smoking or reduce their nicotine dependence. Previous research has demonstrated that in order for a teachable moment to occur, the inciting event must increase the patient's sense of vulnerability.[12] Therefore, patients admitted to hospital with a smoking-related illness may feel vulnerable to the adverse effects of cigarette smoke and experience a teachable moment. Conversely, patients admitted with pathologies unrelated to their smoking may not experience the same trigger.

Every hospital contains multiple environments and not all are conducive to implementing this intervention. Throughout recruitment, we found it difficult to engage with participants in the emergency department. This is unsurprising for a number of reasons. First, most patients present to the emergency department because they deem their symptoms to be serious or life-threatening.[22,23] As a result, they are anxious, distressed, and focused on their presenting complaint.[23] Second, the chaotic, cramped, and communal environment often hampered communication. Therefore, we postulate that these personal and environmental factors contributed to poor patient engagement in our study. Subsequently, this intervention is better suited to other clinical environments.

Despite the aforementioned difficulties encountered, this study produced a number of intriguing results. Our study found that approximately 50 per cent of participants in the intervention group reduced their nicotine dependence. Reducing nicotine dependence is an important step towards making a quit attempt. In fact, smokers with a lower level of dependence are more likely to make a quit attempt.[24]

One of the strengths of this study was the inclusion of both male and female participants. Originally, photoageing technology was designed specifically for women. Subsequently, only one previous trial has evaluated the efficacy of this intervention in males. Our study found the intervention to be just as efficacious in males and females, with two males making a quit attempt and three females. This is in keeping with the previous study and lends weight to the argument that males can benefit from this technology.[10]

There were four key limitations of this study. First, the use of subjective outcome measures is prone to reporting bias. Subsequently, future research should endeavour to biochemically confirm self-reported quit attempts through the use of salivary cotinine tests or carbon monoxide breath testing. Second, the study would have benefited from a longer follow-up period of three to six months. Third, generalisation of our results is limited as this was a single centre study conducted in the outer suburbs of Melbourne. Finally, the study had a small number of participants and high attrition rate. With such small numbers, we cannot show an effect size with any real degree of confidence.

In comparing our study to previous research using photoageing technology, we noted the incongruence of our findings. However, this pattern has been observed in other novel smoking cessation interventions. Internet-based interventions have produced inconsistent results, underpinned by heterogeneous methodology.[7] Similarly, mobile phone based interventions have produced mixed long-term benefits.[9] iPhone apps have been hampered by a lack of evidence-based interventions, resulting in poor quality evidence.[25] This indicates that photoageing technology, along with other technologies, require further investigation to validate their efficacy.

Nevertheless, our findings have important clinical implications. We have demonstrated that while photoageing technology can be delivered in the hospital environment, the setting poses a number of challenges. Young adult smokers are infrequently admitted to hospital. Of those admitted, very few are sufficiently motivated to quit smoking. Therefore, we cannot recommend implementing this intervention in a general hospital setting. Furthermore, our findings suggest that patients in the pre-contemplation stage are unlikely to respond to smoking cessation interventions. Therefore, it may be beneficial to screen patients for stage of change to select those most likely to respond to treatment.

Ultimately, further research is required to validate the efficacy of this intervention. There is potential value in expanding this technology in other settings, such as general practice and allied health clinics. With the advent of smart phones, a study investigating the efficacy of a smart phone app would provide an intriguing insight into the necessity for face-to-face interventions. Generation Y is known for its love of technology and the ability to interact electronically may be a key component for engagement in efficacious smoking cessation interventions.

CONCLUSION

Promoting behavioural change in young adult smokers is challenging. Hospitalisation is associated with a number of barriers, which prevent the implementation of photoageing technology in this setting. Of these barriers, participant recruitment and retention pose the greatest challenge. Due to these considerations, it was not possible to demonstrate an effect size with any confidence. However, there may be benefit in screening patients for stage of change if only to select those who may respond to triggering interventions.

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PEER REVIEW

Not commissioned. Externally peer reviewed.

CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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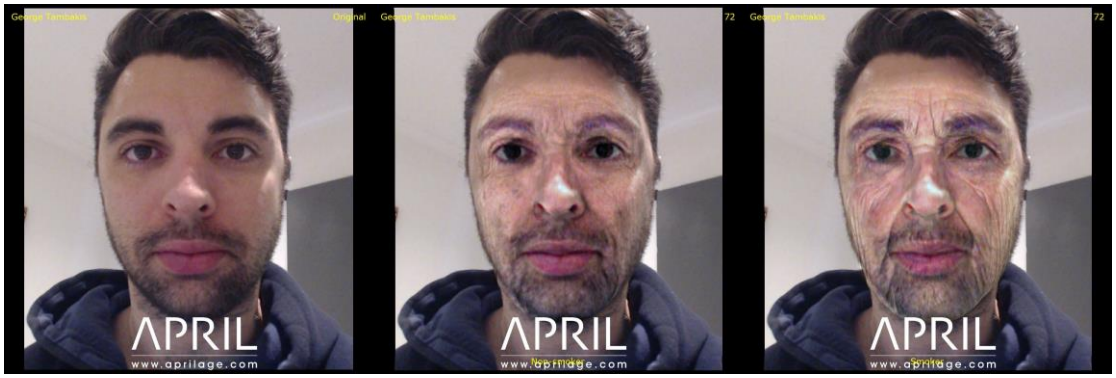
ETHICS COMMITTEE APPROVAL

This study obtained approval from Mercy Health HREC. Project reference number: R16/25W.

Figure 1: Digitally aged photos of a male at 72 years as a non-smoker (middle) and as a smoker (right)



Note: The imaged used here is one of the authors, not a participant from the study. It has been used simply to show how the April Age technology ages a patient.

Table 1: Baseline demographics

Variable	Intervention Group (n=15)	Control Group (n=15)	*P* value
Age mean (SD)	27.53 (4.58)	28.2 (5.26)	0.717[a]
Gender, n (%)			
Male	9 (60)	7 (46.67)	0.464[b]
Female	6 (40)	8 (53.33)	

[a] *T-test*; [b] *Chi-square*

Table 2: Baseline outcome measures

Variable	Intervention Group (n=15)	Control Group (n=15)	*P* value
Number of cigarettes Smoked, n (%)			
<14 (light smokers)	8 (53.33)	10 (66.67)	
15–25 (moderate smokers)	6 (40)	5 (33.33)	
>25 (heavy smokers)	1 (6.67)	0 (0)	
Cigarettes smoked Median	13	13	0.230[a]
Fagerstrom Nicotine Dependence Scale, n (%)			
1–2 (Low)	5 (33.33)	4 (26.67)	
3–4 (Low to moderate)	5 (33.33)	4 (26.67)	
5–7 (Moderate)	4 (26.67)	7 (46.67)	
>8 (High)	1 (6.67)	0 (0)	
Median	4	3	0.484[a]
Stage of Change, n (%)			0.915[b]
Pre-contemplation	4 (26.67)	5 (33.33)	
Contemplation	8 (53.33)	7 (46.67)	
Preparation	3 (20)	3 (20)	
Action	0 (0)	0 (0)	
Maintenance	0 (0)	0 (0)	

[a] *Mann-Whitney U Test*; [b] *Chi-square*

Figure 3: Primary outcomes

Variable	Intervention Group (n=15)	Control Group (n=15)	P value
Number of Quit Attempts, n (%)	2 (13.33)	3 (20)	0.484[a]
Fagerstrom Nicotine Dependence Scale, n (%)			
0 (No Dependence)	1 (6.67)	1 (6.67)	
1-2 (Low)	7 (46.67)	5 (33.33)	
3-4 (Low to moderate)	2 (13.33)	4 (26.67)	
5-7 (Moderate)	4(26.67)	5 (33.33)	
>8 (High)	1 (6.67)	0 (0)	
Median	2	3	0.403[a]
Change in Fagerstrom Dependence Score, n (%)			
Reduced Dependence	4 (26.67)	2 (13.33)	
No Change	11 (73.33)	13 (86.67)	
Increased Dependence	0 (0)	0 (0)	
Stage of Change, n (%)			0.634[b]
Pre-contemplation	4 (26.67)	5 (33.33)	
Contemplation	9 (60)	6 (40)	
Preparation	1 (6.67)	3 (20)	
Action	1 (6.67)	1 (6.67)	
Maintenance	0 (0)	0 (0)	.

[a] *Mann-Whitney U Test;* [b] *Chi-square*