

Perceptions of Digital Nudging for Cervical Testing: A Comparison Four Nudge Types

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Abstract. Cervical cancer consumes many lives around the world. Many of these lives could be saved if more women were screened for cervical cancer. This study explored the potential of digital nudging through short electronic messages as a means of increasing women's participation in cervical screening programs. A questionnaire-based study was designed to explore Norwegian women's perceptions towards five different types of nudges, with a total of 280 respondents. The results show that women were generally positive towards text message nudging. The type of nudge had a significant effect on the respondents' perceptions. Messages that invited to an explicit appointment was perceived most positively, and incentives nudges were perceived least positively. About 87% of the participants expressed that it was desirable to receive such invitations via text messages although younger participants were more positive towards digital text messages than older participants. The results may be useful in designing more effective campaigns for increased participation in cervical cancer screening programmes.

Keywords: digital nudging, persuasion, motivation, perception, cervical cancer screening, short messages.

1 Introduction

Cervical cancer typically affects women between the ages of 25-69 and is one of the cancer types that can be prevented if diagnosed early through screening. In 2018 The World Health Organization (WHO) issued a goal to eliminate cervical cancer worldwide [1]. It is therefore commonly recommended that all women between the ages of 25-69 regularly attend screening, which involves taking a pap smear. Still, many women are not regularly tested. In Norway, statistics indicate that approximately 250,000 women of screening age have not participated in screening during the last ten years [2]. In 2018, there were 12.8 diagnosed cancer cases per 100,000 women. Moreover, 50% of those who were diagnosed with cervical cancer had not followed the national recommendations regarding screening frequency [3]. It has been shown that there are varying reasons why women do not participate in cervical screening, e.g., forgetting to schedule an appointment [4, 5, 6], having to actively book an appointment [7], and insufficiently motivating invitations [7].

In Norway, all women in screening age receive invitations to participate in cervical screening. In 2020, approximately 40% of these invitations were sent through physical mail, and 60% electronically. According to a study on non-attendees to the Norwegian cervical screening program, the current invitation strategy was ineffective in motivating women to participate in screening [7]. Moreover, it was suggested that changing the invitation strategy may help increase attendance.

Persuasive technology (PT) has been widely used to ethically change, shape, or influence behavior [8, 9] in several areas, including public health [10]. PT often involves the use of digital nudges [11] to influence changes in behaviors. Thaler and Sunstein defined a nudge as a choice architecture that alters people's behavior in a predictable way without constraining the options or significantly altering the economic incentives [10]. Several studies have demonstrated that nudges have been effective in influencing behavioral changes in health-related context [12, 13, 14]. Health-related nudges are often implemented using persuasive messages communicated through Short Message Service (SMS) text messages [15]. Digitalization is an important step in making the health services more efficient [16] and several studies have shown that digital text message invitations have been effective in many healthcare contexts including screening [15, 17, 18].

The goal of the current study is to explore whether and how digital nudging can contribute to getting more women to participate in screening programs to reduce the number of incidences of cervical cancer. According to Jung and Mellers [19] successful implementation of nudges depends on how the public perceives the nudges. If the public does not accept nudging it may provoke strong reactions and prevent the nudging from being effective [20]. Four common digital nudge types, that is, social norms (our desire to choose the same as others), default (the convenience of a default choice), affect (attach emotions to choices), incentives (being penalized or rewarded for a choice) [21], and no nudge, were addressed and women's perceptions to these nudges were investigated using a quantitative approach involving a questionnaire. The study is structured around four research questions:

1. *Motivation*: Do women find each of the nudge types motivating?
2. *Ethics*: Do women find it ethically justifiable to receive a message with the different nudges?
3. *Acceptance*: Do women want to receive an invitation to cervical screening through a text message?
4. *Experience*: Do different age groups respond differently to the nudges?

The different nudges were contrasted. Motivation was chosen as a key dimension in the study as motivation is one of three elements that change behavior [9]. Perceived ethics were chosen as another key dimension as responsible nudging is a fundamental assumption [22, 23, 24]. Moreover, public acceptance is an important criterion for policy makers when adopting such technologies with the best intentions for the citizens in mind [20], and gaining the public's trust [25]. Acceptance to such digitalization measures were also addressed to corroborate reports of the positive report of text messages as substitutes for letters and telephone reminders within healthcare [18]. Finally,

age was identified as a key factor as several studies have documented correlations between age to technology acceptance [26].

Related studies typically investigated the effectiveness of the nudges. The method deployed in this study differs from what is commonly used in related studies as it focused on how the recipients perceived the digital nudges.

The rest of this paper is organized as follows: Section 2 presents related works. Section 3 introduces the methodology and the questionnaire design. The results are presented in section 4 and discussed in section 5. Concluding remarks are provided in section 6.

2 Related work

Persuasive technology has been widely used to change, shape, or influence behavior in a variety of application domains [9]. Persuasive technology typically builds on three different elements, namely motivation, ability, and triggers [27] which must coincide to change behavior. A review of 85 studies showed that persuasive technologies have been used by governments and policy makers to improve the health and wellness of the population [10], and that it has been an effective approach for changing behaviors that affect public health. As much as 92% of these studies reported positive outcomes, and that persuasive technology was most frequently used in conjunction with mobile and handheld devices.

Nudging is one facet of persuasive technology, which has been used to guide, change, or influence human behavior within many areas such as nudging for better decisions within computer security [28, 29, 30], nudging in human-robot interaction [31], nudging people together [32], nudging visitors at cultural heritage sites [33], nudging learning decisions [34], nudging in the supermarket [35, 36] and for healthier food choices [37]. According to Thaler and Sunstein [11] small details can have a significant impact on people's behavior. A nudge should not exclude any alternatives, it is only supposed to influence people's behavior in a predictable way. It should be easy to avoid. Based on this principle researchers have designed online environments that guide users towards desired behaviors by making small changes in how information is presented. Such changes require little effort and are cost-efficient. According to Schneider [38] people are nudged every day as how something is presented affects our decisions. There are also situations where nudging can be ineffective, for example a study on physical activity trackers [39] showed that feedback based on social comparison was only motivating if the participants were performing close to the group they were compared to.

Research indicates that women do not attend screening because they either forget to schedule appointments [4, 5, 6], need to initiate the scheduling action themselves [7], do not perceive the screening important [7], or are not motivated by the invitations [7].

Digital nudging has increasingly been utilized to improve the health of the population [12, 13, 14]. Harrison et al., [40] argued that some nudges can be more effective than others in certain health interventions, especially if provided at the time decisions are made. Lehmann et al. [14] studied how a nudge containing information about a scheduled appointment affected health care workers' likelihood of taking a flu vaccine.

A total of 122 health workers were divided into two groups; one group received the scheduled appointment and the other only received an encouragement to take the vaccine. The results showed that participants who received the scheduled appointment were more likely to take the vaccine. People may be more likely to choose the default option when faced with several choices because it does not require any active considerations or effort.

A large randomized controlled study of how eight different persuasive message variants influenced people's willingness to sign up as organ donors was carried out in the UK [13]. The nudges included social norms, loss/gain frames, reciprocity, and affect. The reciprocity nudge had the most positive effect on getting people to sign up as organ donors. People were told that if they would ever need an organ donor, they would probably want people to sign up.

Nudging has also been employed to increase participation in screening programs [22], including cervical screening [12]. Some of the most used interventions to increase screening attendance are persuasive messages, pre-screening reminders, personalized letters, and scheduled appointments [22, 24]. According to a review of 109 studies related to nudging in screening [22] the outcome of a nudge is dependent on the context. One target population may react completely differently than another. It is therefore important that the design and implementation of a nudge are adapted to fit the context. Several studies have addressed the question of nudging in screening, and whether this may be effective or not. However, there are fewer empirical studies on how nudging has performed in screening, especially cervical screening. A few exceptions include Huf et al. [12], who investigated how text message reminders impacted cervical screening rates in an area of London with declining screening rates. The recruited participants were grouped in different age cohorts. The youngest cohort either received no text message reminder or got a reminder directly from their medical general practitioner (GP). This was done to test the effect of a text message reminder. The older cohort was exposed to different nudges to see which one was the most efficient, including a social norms nudge and two gain-and loss frame nudges and a message directly from their GP. Results showed that SMS reminders improved overall attendance. The message from the GP proved most effective and the message with no nudge had the second-highest effect, while the effects of the social norms nudge and the two gain- and loss nudges only had marginal effects.

Gotlieb et al [41] proposed the use of gamification to nudge more women to attend cervical screening using a smartphone app, however, no results have been published. Klasjna and Pratt [42] investigated whether the combination of a text message and an app could increase cervical screening rates. The study involved 1,464 women who were at least six months overdue for screening. The participants received a text message that they were overdue for screening with a link to an app they could download to schedule an appointment. The results showed that scheduling an appointment through an application was more acceptable among younger women. Only 10% ended up making an appointment, and only a quarter of these downloaded and used the app. The researchers concluded that the text messages had more impact than the app.

Several approaches, frameworks, and toolkits for designing digital nudges have been proposed [43]. Two common frameworks are the MINDSPACE framework [21] and

Caraban et al.'s [44] framework for technology-mediated nudging in HCI. MINDSPACE consists of nine elements for behavior change. Caraban et al.'s [44] framework based on a systematic review of nudge types that have been identified in the field of HCI comprises 23 nudging mechanisms organized into 6 categories, namely facilitate, confront, deceive, social influence, fear, and reinforce.

However, some nudge types that can be found in both frameworks are more commonly used in health interventions. The default nudge is frequently mentioned as one of the most effective nudges [21, 44, 40]. Nudges based on social norms are described as effective nudges [45], and they have similarities with Fogg's social cues for designing persuasive technology [9], that is what is considered an acceptable way of behaving within a group of people or a society. Emotional messages that depend on affect are considered powerful in decision-making [46] and have therefore been used in several studies [12, 13, 46]. Affect nudges can be implemented by presenting something in a manner that makes the recipient afraid of missing out or afraid of losing something. Economic (monetary) incentives nudges are believed to influence behaviours, as individuals dislike losing more than they like winning the same amount. Volpp et al. [15] investigated whether incentives could motivate weight loss. The participants deposited an amount of money and were told that they would get it back if they lost weight. Results showed that the incentives worked, as the participants lost a significant amount of weight. It has also been reported that incentives have helped individuals stop smoking [17].

Some screening programs have been criticized for resulting in over-diagnosis [22] and provoked a discussion about whether nudging in screening is ethical. One view is that nudging is ethical if participants are free to choose. Hofmann and Stanek [22] argue that nudging in screening is ethical if the benefits of screening outweigh the disadvantages. They contend that it is not a question of whether to nudge or not, but rather how to nudge ethically.

3 Method

3.1 Experimental design

A questionnaire-based study was designed where the respondents' responses to four common digital nudge types and one control were observed. Women at different age groups between 25-69 years old were targeted as age has been shown to be a factor that can affect attitudes to and perceptions of technology. There were thus two main independent variables, namely nudge type and age. The within-groups independent variable nudge type had five levels, namely fear, default, social norm, incentives, and control. The between-groups independent variable age had three levels. Three main dependent variables were observed, namely perceived motivation, perceived likelihood of action and perceived ethical justifiability.

The data was gathered through an anonymous online questionnaire. The motivation for this procedure was that cervical screening is a sensitive and private topic, and it was deemed more likely to solicit responses from a larger sample of women because of the

anonymity and non-confrontative nature of the questionnaire. Also, the study was carried out during the COVID-19 pandemic and social distancing regulations complicated the administration of physical interviews. Finally, an interview-based study dealing with sensitive medical information would require comprehensive ethical approval permits and data-storage permits which was not feasible for the available time frame of the project.

3.2 Participants

A total of 280 women successfully completed the questionnaire. Of these, 154 respondents (55.6%) were between 25-39 years old (younger cohort), 87 respondents (31.4%) were between 40-54 years old (middle aged cohort), while 36 respondents (13%) were 55 years old or older (senior cohort). We decided to use the same age cohorts as deployed in the national cervical screening program in Norway. The respondents were recruited using convenience sampling using the first author's network.

Table 1. Message (nudge) examples.

Type	Message
Fear (affect)	About 300 women are diagnosed with cervical cancer in Norway annually, of which approximately 70 dies. It is now time to take a new pap smear. Schedule an appointment with your GP.
unbiased/neutral information (default)	It is now time to take a new pap smear. You have received a scheduled appointment with your GP on 20.04.2021 at: 09.30. Click here to change the appointment.
exploiting social norms (social norms)	Approximately 400,000 women take a pap smear each year, so should you. It is now time to take a new pap smear. Schedule an appointment with your GP.
reward/penalty (incentives)	You have received a scheduled appointment with your GP on 20.04.2021 at: 09.30 to take a pap smear. You will be charged a fee of €50 for not attending the scheduled appointment. Click here to change the appointment.
neutral reminder (control)	It is now time to take a new pap smear. Schedule an appointment with your GP.

3.3 Materials

A questionnaire was designed for the purpose of this study. Four digital nudge types were incorporated into the questionnaire (see Table 1).

Note that the main difference between the neutral reminder and the neutral information nudges were the presence of the proposed appointment.

Each nudge was associated with three 5-item Likert questions addressing motivation, change and ethics, namely: Did you become motivated to take a smear test? Is it more likely that you will take a smear test? and Do you think it is ethically acceptable for authorities to send this message?

The messages were presented as messages on a smartphone to make these appear more authentic (see Fig. 1), placing the respondents in the specific mindset of text message context, as it has been pointed out that the presentation of nudges can be as influential as the nudge itself [38].

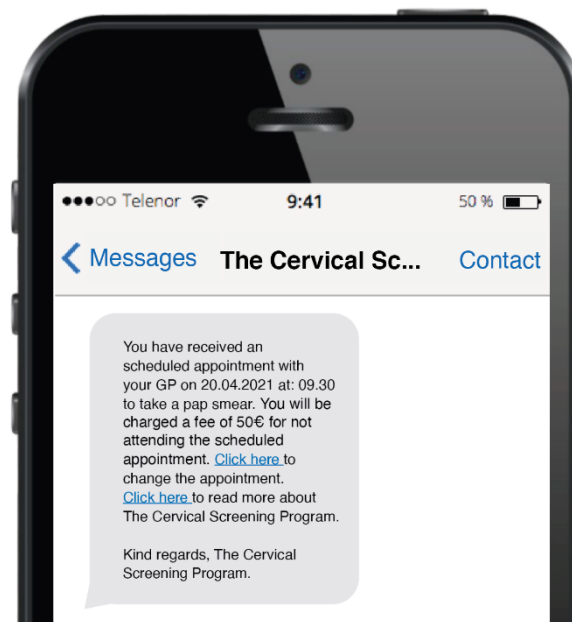


Fig. 1. Visual presentation of the messages.

In addition, the questionnaire asked respondents about their age range, whether they had taken a smear test previously, or had any negative experiences with smear tests. The questionnaire also asked about the respondents' opinions regarding whether it is important to get regularly tested, whether they are motivated to be tested, whether it is desirable to receive such notification using short messages, and whether they found the topic of cervical testing too personal (5-item Likert scales). Respondents were also invited to provide additional comments as free text.

The questions were written in Norwegian (free translations of individual questions are provided herein). The questionnaire was implemented using Google Forms. The questionnaire was subjected to several rounds of pilot testing with subsequent minor adjustments before it was deployed.

3.4 Procedure

Respondents were invited via personal contacts and through social media. The total number of invitees were not recorded, which makes it challenging to calculate the response rate.

The participants spent between 5-7 minutes to complete the questionnaire. The questionnaire was deployed for approximately one month during March 2021. Participation was voluntary and anonymous as there was no need to link any data across multiple sessions [47].

3.5 Analysis

The Likert responses were analyzed using two-way repeated measures ANOVAs with the different nudges as a within-group factor and age as a between-group factor. The Likert responses were ordinal which called for non-parametric testing procedures. However, it has been argued that it can be acceptable to analyze Likert responses using parametric tests [48] and this allowed us to explore possible interactions. This study therefore reports parametric results. Non-parametric tests were also conducted to validate the parametric tests. In cases where the assumption of sphericity was not satisfied, Greenhouse-Geisser corrections were applied. The responses to the questionnaire were analyzed using the JASP statistical software package version 0.13.1.0. The textual comments were manually processed using thematic analysis [49] which involves identifying reoccurring themes.

4 Results

Fig. 2 shows how the five messages affected the respondents' motivation to take a pap test. Clearly the default nudge was perceived as most motivating (a skew towards positive responses) followed by the affect nudge, social norm nudge, and no nudge. The incentives nudge was the least effective in motivating the participants (a balanced set of responses). The differences between the nudges effect on motivation was statistically significant ($F(3.583, 985.279) = 42.132, p < .001$). Post Hoc tests showed that there was a significant difference between all nudges ($p < .05$), except the social norm nudge and no nudge ($p = .434$).

Neutral responses may indicate uncertainty associated with a message. The no nudge message yielded the highest portion of neutral answers (31%), while the incentives nudge (16%) and the default nudge (18%) exhibited the lowest portion of neutral answers.

Although some differences can be observed for how motivated the different age groups are by the messages, these differences were not statistically significant ($F(2, 272) = 0.392, p = .676$).

A majority (90.1%) of the respondents reported that they had taken a pap test at some point, while 8.9% reported that they had not. We did not find any significant difference in the motivational effect of the different nudges for those who had previously taken a pap test versus those who had not ($F(1, 268) = 2.46, p = .118$).

Of the respondents who reported that they had previously taken a pap test at some point 86.7% reported that they had no negative experiences, 12.6% reported that they had negative experiences and 1.1% did not respond to the question. No significant effect of negative previous experience with pap tests on motivations was observed ($F(3, 272) = 0.21, p = .888$).

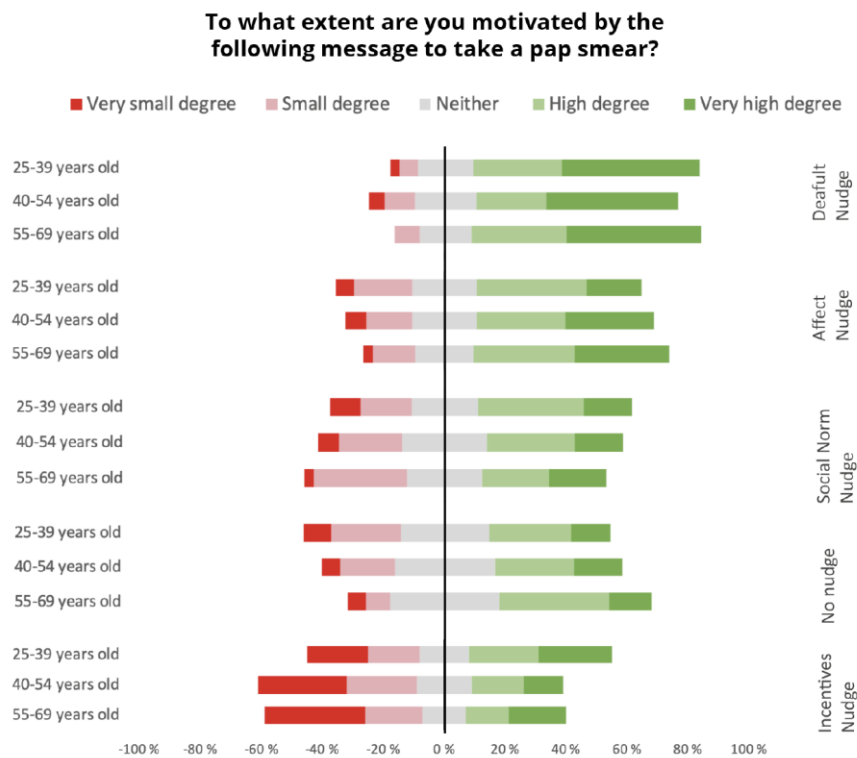


Fig. 2. A diverging stacked bar chart showing to what degree participants were motivated by the messages.

Fig. 3 shows how the five nudge message types were likely to make the respondents take a pap test. The default nudge stands out as the most positively perceived, followed by the affect nudge, social norm nudge, no nudge, and the incentives nudge (balanced distribution of responses). The effect of the different nudge types was statistically significant ($F(3.373, 917.508) = 40.929, p < .001$). Post Hoc tests confirmed that there was

a significant difference between all the nudges ($p < .05$), except for the social norm nudge and the incentives nudge ($p = .247$), social norm nudge and no nudge ($p = .799$), and incentives nudge and no nudge ($p = .276$). There was no significant effect of age ($F(2, 269) = 0.865, p = .422$).

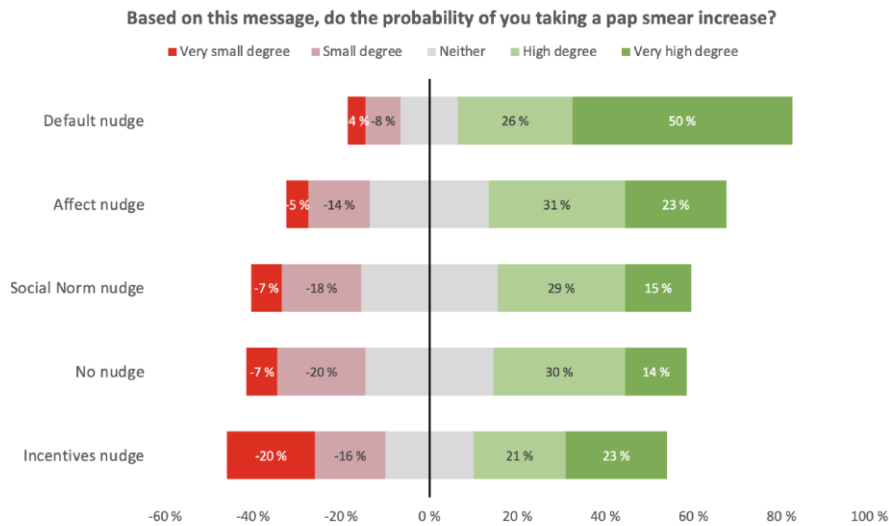


Fig. 3. A diverging stacked bar chart showing the respondents' perceived probability of taking a smear test after receiving the messages.

Fig. 4 plots the degree to which the respondents find it ethically justifiable to receive the nudge messages. Again, the default nudge is associated with most positive responses, closely followed by the no nudge. Next follows the social norm nudge and affect nudge – both with a skew towards positive responses. The incentives nudge, however, stands out with mostly negative responses. Participants' views on the ethical justifiability of the different nudges were statistically significant ($F(3.621, 988.465) = 100.995, p < .001$). Post Hoc tests showed that there were significant differences between all the nudges ($p < .001$) except the default nudge and no nudge ($p = .119$), and social norm nudge and no nudge ($p = .119$). There were no significant differences attributed to age ($F(2, 270) = 0.069, p = .933$).

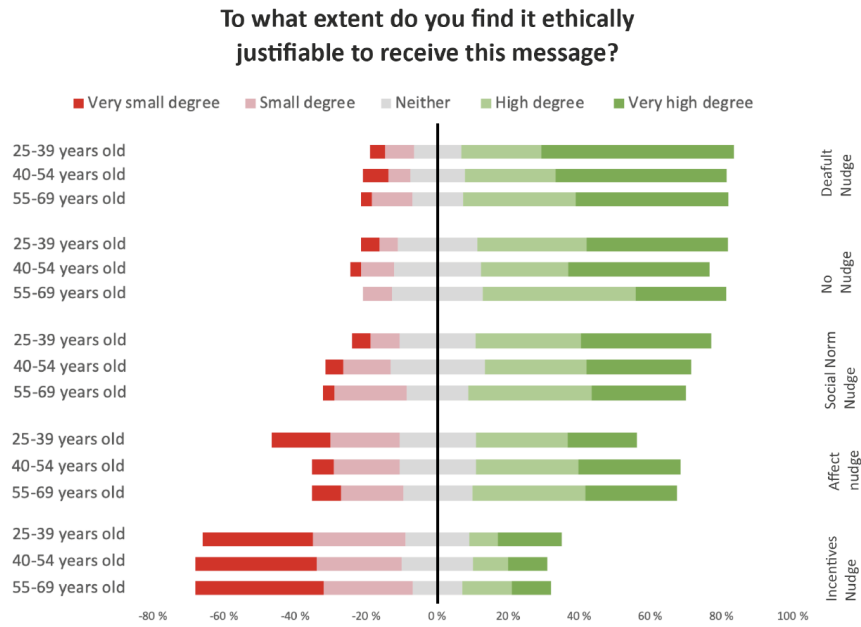


Fig. 4. A diverging stacked bar chart showing to what degree participants found it ethically justifiable to receive the messages.

Fig. 5 shows the extent to which respondents within the three age groups find it desirable to receive invitations to take pap tests through short electronic messages. The youngest cohort was more positive than the older cohort, and this difference was statistically significant ($F(2, 274) = 5.109, p < .007$). Post Hoc tests showed a significant difference between the youngest group and the middle group ($p = .027$), as well as between the youngest group and the oldest group ($p = .036$). There was no significant difference between the middle group and the oldest group ($p = .834$).

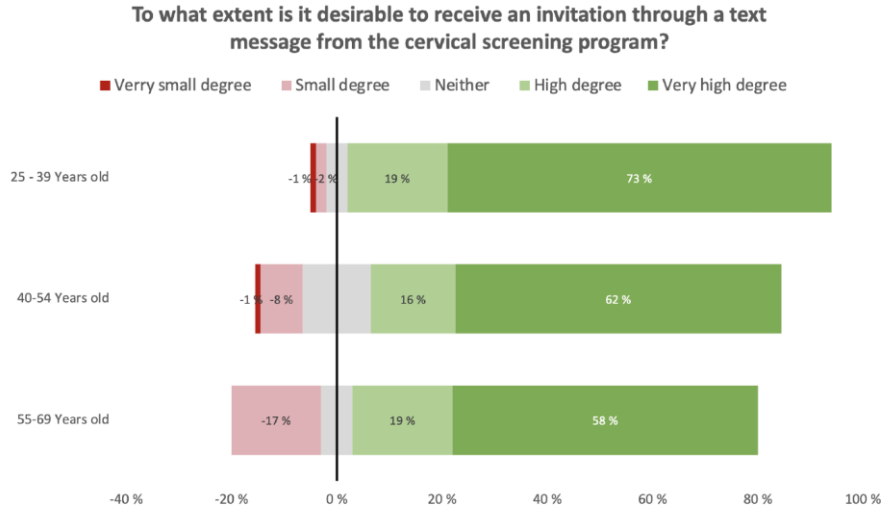


Fig. 5. Respondents' attitudes towards receiving pap test invitations via short electronic text messages.

A total of 42 respondents provided additional comments. Thematic analysis of these data resulted in three emerging themes; fixed appointments, form of delivery of the invite, and where to take the test. Eight respondents believe that fixed appointments may increase attendance. The argument was that even if one receives a notification with an invitation to schedule an appointment, one may forget to do so. On the other hand, it was also stated that a notification of a fixed appointment could be perceived as invasive by the receivers.

Six respondents commented that they believed electronic text messages were more likely to make the recipient take a pap test compared to a letter sent via postal mail.

A total of nine respondents commented on reservations taking the pap test at one's regular general practitioner (GP). It was commented that the waiting time could be long at the regular GP, that the information and follow-up procedure was unsatisfactory, and that one would prefer to have the test done with a specialist instead.

5 Discussion

The results show that persuasive messages in the form of digital nudges have the possibility to increase participation in cervical screening and thus agree with several previous studies [12, 24, 50]. The nudge type with the highest potential to increase participation in cervical screening was the one including a scheduled appointment (default nudge), followed by the nudge with an emotionally informed message (affect nudge). When faced with several choices people tend to choose the default option because it involves the least effort. Moreover, it may be a type of nudge that respondents were

familiar with, as it is the type of message that is currently used in the country of the study. Familiar choices may be perceived as safe.

One explanation for why the emotional message (affect nudge) received the second-highest positive responses may be that the message was perceived as intimidating and unpleasant, as it contained the negative words death and cancer. This may have alerted the respondents to realize the importance of screening, but the possible consequences of not participating. Previous studies have also shown that messages relying on fear can change behaviour [12, 13, 46].

The social norm nudge and no nudge resulted in similar results which were less favourable than that for the default nudge and affect nudge. Both messages had the highest portion of neutral responses suggesting that participants were indifferent to, or uncertain of, these messages.

A possible explanation as to why the message without a nudge was perceived as motivating by some may be because it was less complex compared to the other nudges. This was the shortest message and therefore probably required less cognitive effort from the recipient. Similar positive effect of no nudge was also found in [12].

A possible explanation as to why some respondents did not perceive the social norm nudge as motivating could be that the statistical facts presented did not match their expectations. In a previous study [39] it was found that social comparison only motivated the participants if the comparison were close to the participant's performance. According to Dolan et al., [21] descriptive norms should match the expectations people have, to be the most efficient. It is therefore possible that some respondents expected that the number of women attending screening should be higher than the numbers presented.

One possible explanation why the incentives nudge (penalty for missing the appointment) received the least positive responses may be that they do not want to pay the fee. Most people would probably have chosen to avoid a fee if possible. One respondent commented that it may be problematic with a fee for not showing up to a scheduled appointment. Negative perceptions of such penalties are aligned with the view that indicated that people are sensitive to costs and monetary losses.

The observation that there were no significant differences in which women from the different age groups are influenced by the nudges is consistent with a previous study that reported no difference in how women from different age groups reacted to a message with a scheduled appointment [50]. This indicates that it is not necessary to adapt the messages to different age groups, but that a one fits all approach should suffice.

Since the respondent reacted differently to the different nudges it seems that the most positively perceived nudges show more potential as pap testing motivators than the others. Similar results have also been observed in the context of organ donation where eight messages were tested, and the most successful message resulted in the recruitment of more organ donors [13]. Small changes in the text may result in considerable differences. For example, two messages were nearly identical, except that the message with the Incentives nudge contained an additional sentence with a fee for not showing up to the scheduled appointment.

A possible explanation why the message with the scheduled appointment (default nudge) was found as the most ethically justifiable may be that participants were familiar

with this invitation approach and perceived it as normal. According to Hofmann et al. [22] a scheduled appointment is one of the most common ways of nudging in screening programs. Most women also found the message without a nudge and the one with the social norm nudge ethical. None of these messages contained any uncomfortable or confrontative text.

Most respondents indicated that the penalty message (incentives nudge) was not ethically justifiable. According to Thaler and Sunstein [11] a nudge must be easily avoidable. However, the penalty message requires the participants the three choices of attending the scheduled appointment, changing the appointment, or paying the penalty and there are no options for opting out. This nudge may therefore be considered unethical as participation is not voluntary. Previous studies have also shown that participants have not been positive with regards to monetary incentive nudges [51].

Approximately 40% of the invitations to cervical screening in the country of the study are sent via physical mail, and this may explain respondents' positive responses to receiving such notifications electronically. Previous studies have shown that text messages have been effective in health-interventions [18, 52]. The youngest age group was slightly more positive about receiving electronic invitations than the older groups. One possible explanation may be that this group is more accustomed to using new technologies while the older group was generally more accustomed to traditional paper-based regimes.

5.1 Limitations

One potential weakness of the questionnaire was that the nudge presentation orders were not randomized. There is therefore a chance of bias due to presentation order (learning effect). For example, one may have expected that respondents were more positive towards the first nudge and be fatigued when reaching the last nudge. However, the resulting preference order did not match the presentation order which does not give support to any suspicion of presentation order bias.

The incentive nudge was a negative incentive incurring a monetary penalty. It would have been interesting to also see if similar results would be obtained with a positive incentive through the promise of a monetary reward.

An attempt was made to spread the survey in various channels by people in different age groups, to get a representative sample of the population. Also, the questionnaire was only disseminated to women. Still, we cannot be completely certain that the sample is representative of the female population. There is thus a risk that the responses could be biased. Clearly, the younger cohort was much larger than the older cohort, and this imbalance is not representative of the population. Still, the number of responses in the older cohort was considered sufficiently large to provide statistical power.

There was also a mistake in the form where the intended age range of 40-54 years were noted as 40-55 years. Participants that were 55 years old could therefore have assigned themselves to either the middle tier or the senior tier. One may assume that respondents typically would identify with the youngest group of the two when given the option to choose. If we assume that the age distribution is uniform, then 5.8 participants of the 87 participants in the middle age group of 15 participants would be 55

years old. According to this calculation about 2% of the participants could potentially have been incorrectly assigned to the wrong group.

The nudge types selected for this study represent just a small subset of nudge types that have been discussed in the literature. It is therefore possible that other nudge types not addressed herein would have affected the results differently. Moreover, it is also possible that if designed differently the studied nudges would give different results.

5.2 Implications

The method deployed herein differs from other studies as it investigated how participants perceived the messages, while other studies have investigated the effectiveness of messages. Furthermore, the results of this study make a relevant contribution to the ongoing discussion about the ethics of nudging. Several frameworks for ethical nudging exist, but few empirical studies have investigated what is perceived as ethical by the users.

6 Conclusions

This study measured women's perceptions regarding five nudge types for cervical screening testing. A total of 280 women in three age groups responded to a questionnaire presenting the five nudges in the form of simulated text messages. The respondents' perceptions of the nudges in terms of motivation, likelihood of stimulating participation, and ethics were measured using the questionnaire. The results showed that the most positively perceived message was one with a specific invitation to an appointment, while the least positive message was one with a specific invitation to an appointment with a monetary penalty for not turning up (incentives nudge). There were no significant differences across the age groups regarding perceptions to the various nudges implying that the different age groups could be targeted with the same messages. Although most of the participants (87%) were positive regarding receiving invitations to cervical testing via electronic text messages, the younger generation (25-39 years) was more positive towards receiving electronic messages related to cervical testing than the older groups. The empirical results from this study may be helpful for organizations to design effective digital nudges with the goal of implementing effective cervical testing programmes. Future work includes investigating the effect of nudges in context, that is, how effective such nudges are in promoting participation in practice. Another key issue is to investigate the timing of sending such messages as timing may be a determining factor for whether a recipient participates or not.

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