



Colorectal Cancer Screening: How self-affirmation and the type of screening procedure can influence patient's likelihood to participate

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Abstract

Title

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Summary

This study examines whether a self-affirmation intervention can increase the intention to participate in colorectal cancer screening and increase the acceptance of a threatening health message. It also assesses whether the type of screening procedure offered has an impact on screening uptake.

In this study, 129 participants answered an online questionnaire. All participants were presented with a short text informing about colorectal cancer by highlighting its severity and potential risk factors. Half of the participants received a self-affirmation intervention including 10 value statements before they were exposed to the text. The control group was asked to make the same value statements about a celebrity. After reading the text, half of the participants were recommended colonoscopy as the screening procedure and the other half a fecal immunochemical test (FIT). Each recommendation was followed by information on the corresponding test.

No significant effect was found for the type of colorectal cancer screening procedure on the likelihood to participate. Self-affirmed participants within the high-risk group (> 49 years) stated a significantly lower likelihood to participate in a colorectal cancer screening program than individuals in the control group. No significant impact of self-affirmation on message acceptance was found.

When targeting high-risk individuals with a high level of vulnerability, a self-affirmation intervention can be a useful tool to reduce defensive reactions towards threatening health messages and also promote behavior change. This study suggests that a weak message or absence of threat can potentially lead to adverse effects of self-affirmation.

Keywords: Screening, Colorectal Cancer Screening, Self-affirmation, Colonoscopy

Resumo

Título

Rastreamento de câncer colorretal: Como a autoafirmação e o tipo de procedimento pode influenciar a probabilidade do paciente participar do rastreamento

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Resumo

Este estudo examina como a autoafirmação pode aumentar a intenção de participar em testes de rastreamento do cancro colorrectal e a aceitação de mensagens sobre riscos de saúde. Avalia igualmente se o tipo de procedimento de rastreamento tem um impacto na captação de participantes. Neste estudo, 129 participantes responderam a um questionário online. Todos receberam um pequeno texto com informação sobre o cancro colorrectal, destacando a sua gravidade e potenciais fatores de risco. Metade dos participantes recebeu uma intervenção de autoafirmação, incluindo 10 declarações de valor individual antes de serem expostos à informação sobre a doença. O grupo de controlo fez declarações de valor sobre uma celebridade. Após lerem o texto sobre a doença, à metade dos participantes foi recomendada a colonoscopia como procedimento de rastreamento e à outra metade um teste imunológico fecal (FIT).

Não foi encontrado nenhum efeito significativo para o tipo de procedimento de rastreamento do cancro colorretal na probabilidade de participar. Participantes auto-afirmados do grupo de alto risco declararam uma probabilidade significativamente menor de participar num programa de rastreamento do cancro colorrectal do que os indivíduos do grupo de controlo.

Não houve impacto de autoafirmação na aceitação da mensagem. Focando em indivíduos de alto risco com um alto nível de vulnerabilidade, uma intervenção de autoafirmação pode ser uma ferramenta útil para reduzir as reações defensivas contra mensagens relacionadas a riscos de saúde e também promover mudanças de comportamento. Este estudo sugere que uma mensagem fraca ou ausência de ameaça pode levar a efeitos adversos de autoafirmação.

Palavras-chave: Rastreamento, Rastreamento de câncer colorrectal, Autoafirmação, Colonoscopia

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1. Introduction

Colorectal cancer (CRC) is the second most common and also the second deadliest type of cancer in Europe (International Agency for Research on Cancer, 2022). Cases are predicted to rise in the future due to lifestyle habits like e.g. smoking, alcohol consumption, unhealthy diet and obesity (Digestive Cancers Europe, 2019). In 2018, nearly 46% of the patients diagnosed with colorectal cancer died (Digestive Cancers Europe, 2019). Another 1,1 million global death cases are expected until 2030 (Arnold et al., 2017).

According to Digestive Cancers Europe (2019) one determining factor for its death rate is the time of detection. A majority of the patients get diagnosed with stage 3 or 4 cancer, which is rather late. One possible explanation could be that the early stages of CRC are most likely asymptomatic or only occur with mild symptoms and therefore remain unnoticed by patients. But survival rates could be significantly increased if CRC would be detected early enough. If detected early enough, CRC can be prevented and cured. A patient diagnosed with stage 1 cancer has a survival rate of 90% compared to a patient diagnosed at stage 4 with only 10% (Digestive Cancers Europe, 2019).

Colorectal Cancer (CRC) Screening Programs have been implemented across the globe to detect potential lesions in the colon at an early stage and prevent colorectal cancer from developing (World Health Organization, 2020). It is known that CRC Screening has the potential to increase survival rates by at least 20%, increase patient comfort and the quality of life by reducing the number of cases where invasive surgery is necessary and therefore reducing the recovery time (Digestive Cancers Europe, 2019). Additionally, they have the potential to decrease health related costs for patients and the healthcare system up to three billion euros per years (Digestive Cancers Europe, 2019).

Despite its potential advantages, the uptake on Screening Programs is rather low (Adler et al., 2014). Even in countries where Screening Programs have been established for years, a lack of screening adherence and surveillance exist (Basu et al., 2018). Several studies focus on identifying potential patient barriers that might be responsible for rather low participation rates and the defensive processing of health threatening information. Previous studies have also included a self-affirmation intervention as a potential factor to reduce information avoidance and encourage better health choices such as the participation in breast cancer screening programs.

Nevertheless, there is a lack of studies that focus on how self-affirmation could impact the participation in Colorectal Cancer Screening Programs.

This study aims to investigate whether a self-affirmation intervention can (1) increase the willingness to participate in a CRC Screening Program, (2) can increase the acceptance of threatening health messages and (3) if offering the FIT as a potential screening procedure can increase colorectal cancer screening participation.

2. Literature Review

2.1 Cost Effectiveness & Relevance

Overall, colorectal cancer screening programs have the potential to decrease colorectal cancer incidences and reduce mortality rates and are seen as a cost-effective intervention (Senore et al., 2019). According to Frazier et al. (2000) could a onetime colonoscopy at the age of 55 potentially reduce mortality rates by up to 50%. Furthermore, colorectal screening programs have the potential to give patients an average gain of 6.3 years of life (also varying from 14 years when diagnosed at stage one to only 1.5 years when diagnosed at stage 4) (Joranger et al., 2020).

According to statistics, only 13% of colorectal cancer patients get diagnosed at stage one, 31% at stage two, 32% at stage three and 24% at stage four (Digestive Cancers Europe, 2019). Since costs increase with a discovery of colorectal cancer in a later stage, colorectal cancer appears to be a significant financial burden on the healthcare system (Digestive Cancers Europe, 2019). The expected lifetime cost for a patient diagnosed with colorectal cancer at age 70 is estimated to be 47,300€, varying depending on the cancer stage at the time of discovery (Joranger et al., 2020). The total cost for a patient diagnosed at stage one amounts approx. 26,639€, 38,130€ at stage two, 56,800€ at stage three and 69,890€ at stage four (Joranger et al., 2020). With colorectal screening programs, not only overall costs (Digestive Cancers Europe, 2019; Joranger et al., 2020) and costs of primary treatment can be reduced, but also the cost related to recurrences (Joranger et al., 2020). Savings occurring from preventing one colorectal cancer case are estimated to be around 47,300€ (Joranger et al., 2020).

Another gain resulting from the implementation of a screening program is a more favorable stage distribution allocating at earlier discovery stages (Joranger et al., 2020). According to Digestive Cancers Europe (2019) this could result in savings of more than 3 billion euros in health care costs, assuming that 50% of the patients would be diagnosed at stage one. When looking at the cost-effective analysis from Frazier et al. (2000) it becomes clear that the cost-effective ratio is strongly influenced by compliance rates.

2.2 Colorectal Cancer Development

To understand how colorectal cancer can be prevented, it is essential to understand the development of cancerous cells (carcinomas). One of the reasons why people do not think they have to undergo colorectal cancer screening and most colorectal cancers are detected in an advanced stage, is because cancer cells grow very slowly and are most likely asymptomatic in an early stage (Simon, 2016).

Only when reaching a size of several centimetres, symptoms like cramping or bleeding occur (Simon, 2016). The development of colorectal cancer can take several years or even a decade. It starts with a benign, precancerous polyp (adenoma) which is an accumulation of abnormal cells within the top layer of the colon wall (intestinal mucosa) (Simon, 2016). With time, the occurrence of genetic changes of those precancerous cells enables them to grow deeper into the bowel wall and eventually become more modified and spread to local lymph nodes or even to metastatic sites. Overall, the larger the size of the polyp the higher the chance of the adenoma turning into colorectal cancer (Simon, 2016). Therefore, it is of high importance to detect adenomas at an early stage, so they can be easily removed and prevented from developing into a malignant tumour that could eventually spread to other parts of the body (Simon, 2016). Figure 1 shows the different stages of development from a small adenoma to malignant cancer.

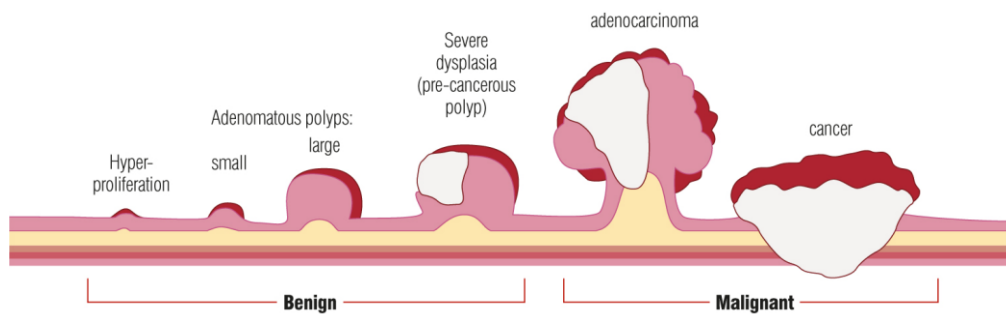


Figure 1 Colorectal Cancer Development
Source: Guts UK (2019)

2.3 Screening Tests

There are different types of screening tests which come with different advantages and limitations – the most common ones being endoscopic tests and stool-based tests (Ferlizza et al., 2021). Endoscopic tests can be a sigmoidoscopy or colonoscopy. While both have a high sensitivity (> 95%) when it comes to the detection of colorectal cancer and also have the possibility for therapeutic treatment at the same time, they differ when it comes to screening intervals and examination reach (Simon, 2016).

A colonoscopy is an invasive procedure which is usually repeated every 10 years and allows full visualization of the colon (Deutsches Krebsforschungszentrum, 2021). It also includes bowel preparation to enhance visibility and requires a hospital or ambulant visit in a special facility (Deutsches Krebsforschungszentrum, 2021; Simon, 2016). Colonoscopy screening is more expensive than other tests and also includes a risk of 0.1%-0.2% of bleeding and bowel perforation (Ferlizza et al., 2021).

The fecal occult blood test (FOBT) or a fecal immunochemical test (FIT) are designed to detect hemoglobin in the stool. Both non-invasive tests can be performed annually by the patients themselves at home and are low cost options (Deutsches Krebsforschungszentrum, 2022). They allow the detection of distal and proximal colorectal cancer (Simon, 2016). Nevertheless, because of its higher sensitivity (60%-85%) (Simon, 2016) and the fact that no special diet is needed, nowadays the FIT replaces the FOBT (Ferlizza et al., 2021). In case the FIT has a positive result, the patient will be referred to a colonoscopy for a more precise examination (Ferlizza et al., 2021).

2.4 Opportunistic versus Organized Screening Programs

So far, colorectal screening programs vary across countries and/or have not yet been successfully implemented (Cardoso et al., 2020). Screening programs differ based on the type (opportunistic vs. organized), the targeted age group and the type of test that is primarily used for the screening procedure (e.g. FIT vs. Colonoscopy).

Within an organized screening program, every eligible individual receives the same information and is offered an equal chance to participate in screening (National Screening Unit, 2022). In case of a positive finding, every individual will receive further support, testing and treatment (International Agency for Research on Cancer, n.d.). Another advantage is, that organized programs are usually monitored and managed by the regional or national health service (International Agency for Research on Cancer, n.d.), which opportunistic programs are not. Within an opportunistic screening program only patients that got offered a test or check-up by their primary care practitioner or that have requested a test or colonoscopy themselves, might receive one (National Screening Unit, 2022).

2.5 Participation and the Type of Screening Procedure

Several studies investigate if the type of colorectal cancer screening procedure offered could potentially influence participation rates. Quintero Enrique et al. (2012) detected that participation rates for the fecal immunochemical test (FIT) and Colonoscopy differ. According to their study, participation rates for the FIT were higher than for colonoscopy. Those findings were supported by a study from Gupta et al. (2013), that investigated the effectiveness of a mailed outreach invitations for colonoscopy and FIT. According to their results, the outreach was more effective for FIT than colonoscopy and also the overall participation for FIT was significantly higher than for colonoscopy (Gupta et al., 2013).

Adler et al. (2014) analysed the effect of offering different screening options to participants in Germany. While only 36.6% of their participants agreed to undergo colonoscopy as the screening procedure, 97% of the individuals that refused to undergo colonoscopy, were willing to participate in a non-invasive screening procedure. Senore et al. (2013) also discovered that offering the option to take a FIT to people that had previously refused to undergo flexible sigmoidoscopy as a screening procedure could potentially increase participation rates.

Overall, men seemed to be more willing to undergo flexible sigmoidoscopy while women seemed to be more willing to take the FIT (Senore et al., 2013). Particularly, feeling uncomfortable with the bowel preparation which is needed prior colonoscopy and the fear of colorectal cancer itself and potential pain associated with colonoscopy were the main reasons that led individuals to refuse colonoscopy (Adler et al., 2014). To those individuals non-invasive procedures, such as the fecal immunochemical test (FIT) or a blood test, seemed a lot more convenient. 82.6% chose the blood test, stating they felt uncomfortable with handling stool samples. Most people that chosen the FIT did so, because they had already taken the test in the past (Adler et al., 2014) or tend to be more pain adverse (Senore et al., 2013). Offering other (non-invasive) screening procedures besides colonoscopy can significantly increase screening participation rates, especially for those who had no clear preference (Adler et al., 2014). Regardless, Senore et al. (2013) take into consideration that offering multiple screening option could potentially have adverse effects and reduce attendance.

To ensure the successful implementation of colorectal cancer screening programs, not only the test performance but also the participation and compliance with follow-up diagnostic is crucial to ensure long-term effects (Adler et al., 2014; Gupta et al., 2013).

Even though the FIT seems to have lower barriers for first time participation (Inadomi et al., 2012), follow-up rates and further diagnostic evaluation rates are rather low. The study from Singal et al. (2017) showed that approx. 67% of the individuals that previously participated in a FIT, did not undergo the obligatory diagnostic test after a positive FIT result or even repeated the screening procedure at all. One of the main issue might be that people who were more likely to undergo the FIT (and might have refused colonoscopy or flexible sigmoidoscopy) have an overall strong negative attitude towards endoscopy (Senore et al., 2013). Hence, it seems difficult to address and overcome patients anxiety looking at the fact that not even a positive result could help individuals to overcome their feeling of anxiety towards endoscopic procedures (Senore et al., 2013). Consequently, when assessing the completion rate of colonoscopy and FIT over a period of three years, Singal et. al (2017) found the completion rate to be higher for colonoscopy than for FIT.

2.6 Barriers to Colorectal Cancer Screening

To explain why people do or do not engage in disease prevention and detection programs (e.g. screening programs) and to understand which factors will convince individuals to take action, the Health Belief Model was created. To explain the motives of individuals to engage in prevention and detection programs, the model takes different concepts such as susceptibility, seriousness, benefits and barriers into consideration (Karen Glanz et al., 2008). Karen Glanz et al. (2008) examined several studies to identify the strongest predictors for individuals failure to participate in programs to prevent and detect diseases. The strongest predictor throughout all studies were perceived barriers such as inconsistencies in healthcare professionals recommendations and the lack of knowledge (Karen Glanz et al., 2008). The lack of knowledge or awareness have an apparent importance in maintaining a negative attitude regarding colorectal cancer screening (Gimeno García, 2012). Gimeno García (2012) and Gimeno García et al. (2009) found that the level of awareness of colorectal cancer screening programs varies in different countries.

Based on the Health Belief Model, individuals are more likely to change their behaviour to lower the risk of getting a disease when they believe to be vulnerable to the disease, perceived benefits outweigh barriers, and a course of action may be beneficial (Karen Glanz et al., 2008). Consequently, identifying barriers might be far more essential than benefits when it comes to changing one's health behavior (Gimeno García, 2012; Gimeno García et al., 2009).

Several studies tried to identify potential burdens that influence patient adherence to medical recommendations and intention to undergo screening. Besides the lack of awareness and knowledge of CRC Screening Programs (Dressler et al., 2021; Gimeno García, 2012; Jones et al., 2010; Klabunde et al., 2005), the patient's relationship with healthcare professionals seems to be a significant factor that influences participation rates (Dressler et al., 2021; Klabunde et al., 2005; Lasser et al., 2008). While the absence of a doctor's recommendation for a CRC Screening Program implies a negative effect towards participation (Jones et al., 2010; Klabunde et al., 2005; Lasser et al., 2008; Muthukrishnan et al., 2019), patients that received a recommendation from their doctors to participate in a CRC Screening Program, are a lot more willing to do so (Dressler et al., 2021; Klabunde et al., 2005; Lasser et al., 2008).

Other participants of previous studies reported embarrassment (Klabunde et al., 2005), discomfort (Muthukrishnan et al., 2019), the fear of a positive result (Dressler et al., 2021; Gimeno García, 2012; Muthukrishnan et al., 2019), but also the overall fear and worry about the bowel preparation (Gimeno García, 2012; Jones et al., 2010), perceived pain during the procedure and danger related to colonoscopy (Gimeno García, 2012) as reasons why they did not undergo CRC Screening. In some studies also fatalistic views about cancer e.g. 'there was not much that could be done when cancer was diagnosed' (Lasser et al., 2008; Muthukrishnan et al., 2019) or religious explanations like it was 'gods will' (Dressler et al., 2021) were found.

Sometimes logistical reasons seemed to be an issue such as not knowing on how to conduct a test (Dressler et al., 2021; Muthukrishnan et al., 2019) or how to gain access to a screening test (Jones et al., 2010). Participants that suffered from mental illness (Dressler et al., 2021), comorbid medical illness or experiences psychosocial stressors (Lasser et al., 2008) showed lower participation rates.

Furthermore, factors like the absence of trust in healthcare professionals (Lasser et al., 2008), lack of symptoms (Lasser et al., 2008) and a low prioritization of CRC Screening kept people from participating in CRC Screening Programs. However, knowing someone who had previously participated in CRC Screening showed a significant positive effect on the uptake on CRC Screening Programs (Dressler et al., 2021).

It seems essential to identify and understand potential burdens that keep individuals from changing their behavior and particularly from participating in screening programs, to be able to implement successful interventions to increase uptake rates.

2.7 Risk Perception

Overall, one might believe that the existence of threat leads individuals to change their risky behaviors, for example to a healthier lifestyle. Previous research has shown, that not solely the existence of threat will motivate individuals to change their behavior, but also most importantly the personal feeling of being at risk (Renner et al., 2015). When considering the likelihood of getting a disease, individuals often overestimate their own risk while at the same time their comparative risk perception is rather low (Renner et al., 2015). This finding can be explained with the optimistic bias, where individuals tend to believe that they are less likely affected by potential threats or hazards compared to others (Harris et al., 2008; Weinstein, 1989). The optimistic bias was found to be stronger for events that seemed to be controllable (Harris et al., 2008; Renner et al., 2015), rare or relatively harmless (Harris et al., 2008).

Furthermore, the optimistic bias also increased with the presence of a stereotyped individual who was more vulnerable to the unpleasant event (Harris et al., 2008; Weinstein, 1980). In addition, Harris et al. (2008) also investigated potential influences of self-esteem, anxiety and defensiveness towards threat. According to their findings, a higher level of self-esteem and defensiveness, as well as a lower level of anxiety, leads to an increase in comparative optimism. A lower perception of one's own risk was moderately associated with a positive self-evaluation (Harris et al., 2008). This aligns with the findings from Renner et al. (2015) who discovered that events that were perceived as more personally threatening or severe, led to a lower optimistic bias.

Weinstein (1989) gives two potential explanations for why people act based on optimistic biases. On one hand it protects individuals from being afraid to experience a certain risk or harm, and on the other hand, it could potentially support one's belief and desire to be better than others. Furthermore, people tend to believe that if they did not suffer from a negative event in the past, it is more unlikely that it will happen in the future (Weinstein, 1987).

2.8 Self-Affirmation

Previous studies have researched the potential impact of a self-affirmation intervention on health and well-being decision making and on the general acceptance of health messages. Self-affirmation interventions can be implemented in various ways.

Either by making an individual speak orally about an important value (W. M. P. Klein et al., 2015), by writing an essay about one's most and least important value or by answering a survey (Howell & Shepperd, 2012; W. M. P. Klein et al., 2015), or even a survey including value statements (Zhu & Yzer, 2019) .

The complex process of decision making is linked to several influencing factors, such as the experience of risk or threat. When perceiving high risk or the feeling of threat, the decision-making process is influenced by defensive reflexes which might also be caused through a narrower perspective on the information (potentially threatening) received (Sherman, 2013). The topic of defending the self was initially addressed by Steele (1988), who suggested the existence of an ego protective self-system. According to Steele (1988), this system has the ability to explain individuals' behavior that facilitates them to see themselves as morally adequate and adaptively.

The goal of every individual is to maintain the perception of themselves among others as generally good, competent, and capable of free choice (Steele, 1988). If this perception of self-integrity is threatened, individuals tend to engage in primary defensive actions to reduce the threat and restore the image of their self-concept (Sherman, 2013; Steele, 1988). It is relevant to note that this phenomenon does not necessarily signify the resolution of the actual threat rather than learning how to overcome the implications of the threat to their self-concept (Steele, 1988). The self-system is flexible, meaning by reaffirming their general integrity (their general worth and goodness) and self-concept, individuals can restore their perception of self-integrity, regardless of the affirmation being related to the threat or not (Cohen & Sherman, 2014). Simply said, they can tackle one particular self-threat by affirming another aspect of themselves (Steele, 1988).

Sherman (2013) argues that self-affirmation can have the following three different effects on information processing and reactions in 'threatening situations'. First, self-affirmation can potentially help individuals to cope better with stress by increasing the needed self-resources. Second, it can potentially facilitate individuals so see a threat from a broader perspective by taking the threatening event to a different level of construal. This helps the individual to also see positive aspects of oneself instead of only identifying with the threatened part of the self. Third, self-affirmation can help to separate the threat from the self which reduces the association between people's threat evaluation and their self-evaluation (Sherman, 2013).

When specifically looking into the effect of self-affirmation on the perception of threatening health recommendations, research shows that especially health recommendation can be perceived as a psychological threat and consequently increase resistance (Ehret & Sherman, 2014). High risk patients are most likely to be defensive and least open to health related risk messages (Falk et al., 2015). Previous literature investigated the influences of self-affirmation as a potential solution to increase adherence to treatment and screening recommendations. According to self-affirmation theory (Steele 1988), individuals are driven to protect their self-integrity. People like to think of themselves as a good and moral person who acts according to cultural and social norms (Sherman & Cohen, 2006).

When confronted with information that threatens their self-integrity, individuals show defensive responses to minimize the threat and maintain self-integrity (Sherman & Cohen, 2006; Steele, 1988). Self-affirmation theory claims that individuals are less likely to experience affliction and show less defensive reactions when being self-affirmed (Cohen & Sherman, 2014). The reflection on one's own values or meaningful aspects of oneself can potentially lead to self-affirmation, reinforcing self-worth and adequacy (Cohen & Sherman, 2014). Consequently, it is suggested that a self-affirmation intervention can potentially improve individuals engagement with health information instead of dismissal by helping individuals to deal with stress and threatening information (Cohen & Sherman, 2014).

Based on self-affirmation theory, several studies have shown that a self-affirmation intervention can increase message acceptance (Ehret & Sherman, 2014; Epton et al., 2015), especially for those who had been previously ambiguous towards cancer prevention recommendation. In addition, it also strengthened the correlation between perceived ambiguity and vulnerability (Ehret & Sherman, 2014; W. M. P. Klein et al., 2015), meaning participants evaluated their own risk of getting cancer as higher when they were ambiguous and had been self-affirmed first (W. M. P. Klein et al., 2015).

Furthermore, previous studies have shown that self-affirmation can potentially reduce participants avoidance of medical screening information and risk feedback (Howell & Shepperd, 2012), and increases participants accessibility of threat related cognitions. This counts especially for high relevance patients, for whom a self-affirmation intervention positively affected the perceived quality of health related messages, increased participants intention to take precautions (van Koningsbruggen et al., 2009), their intention to change, and their overall subsequent behaviour (Epton et al., 2015).

By tracking potential neural mechanisms of affirmation, Falk et al. (2015) found self-affirmation to be a beneficial factor that helped participants at high risk to see the self-relevance and value in messages that would have otherwise been perceived as threatening. Consequently, Falk et al. (2015) suggest that self-affirmation could be a great tool to help patients to view information in ways they can better interiorize and hence increase positive health behaviours of those who are at high risk and more likely to be resistant or defensive to threatening health messages.

Nevertheless, it is important that individuals feel the existence of a level of threat (Ferrer et al., 2015). In case the targeted individual does not feel threatened by the health message (Ferrer et al., 2015) or the message itself is too weak (W. M. Klein et al., 2011), a self-affirmation intervention can potentially have adverse effects. Before using self-affirmation strategies to promote screening programs, it is important to assess its theoretical viability and identify the potential target group (Ferrer et al., 2015). A self-affirmation intervention can be most beneficial for patients at a moderate to high risk for developing cancer and people that experience higher psychological threat (Ehret & Sherman, 2014) towards colorectal cancer screening.

Based on that, Ehret & Sherman (2014) highlight the importance to understand the potential threat that might hinder people to change their behaviour before utilising threatening information and self-affirmation interventions. In case no threat is experienced by participants, a self-affirmation could result in decreasing motivation to change behaviour or even lead to overconfidence (Ehret & Sherman, 2014).

So far, the concept and effects of self-affirmation have been studied in various fields such as academic performances, psychological stress responses (Sherman, 2013) and threatening health information (Harris & Napper, 2005; Howell & Shepperd, 2012; W. M. Klein et al., 2011; Sherman, 2013; Sherman & Cohen, 2002). Previous research has been conducted on the topic of a self-affirmation intervention and its ability to potentially change the risk perception linked to alcohol consumption (W. M. P. Klein et al., 2015) and caffeine consumption (van Koningsbruggen et al., 2009) on the likelihood to develop breast cancer. Further experimental studies including self-affirmation strategies have been conducted to evaluate differences in message acceptance for breast cancer patients (Ehret & Sherman, 2014) and potential patients with a genetic disease (Ferrer et al., 2015).

Yet, not many studies have been conducted on the impact of a self-affirmation intervention within the promotion of colorectal cancer screening programs.

To conclude, this study argues that (1) a self-affirmation intervention leads to an increase in willingness to participate in a colorectal screening program; (2) a self-affirmation intervention will increase acceptance of a threatening health message; (3) offering the FIT as a potential screening procedure can increase colorectal cancer screening participation. To test those three hypotheses, two self-affirmation conditions (self-affirmed, not self-affirmed) and two different types of programs, colonoscopy and fecal immunochemical test (FIT) will be compared.

3. Method

3.1 Participants

To assess the effect of a self-affirmation intervention on the willingness to participate in colorectal cancer screening programs, an online survey was distributed via email. 129 participants completed the survey online. Participation was voluntary and anonymous. No incentive was provided. 69% of all participants were female and 31% were male. Age was assessed with an open answer question. 25.6% were aged 35 and younger, 11.6% between 36 and 50, 34.1% between 51 and 65 and 13.2% over 65 years old, giving a mean age of ~ 50 years old. Participants' countries of origin were Germany (75.2%), Spain (17.1%) and the UK (7.8%) with their first language being German, Spanish, and English.

3.2 Materials

To test the role of self-affirmation on participants' judgments, self-affirmation was manipulated into two conditions: self-affirmation and no self-affirmation. The condition of self-affirmation presented participants (experimental group) with a survey including 11 value statements that were developed and validated by Zhu & Yzer (2019) and are based on the original attribution questionnaire developed by Napper et al. (2009). The 11 value statements, used as the self-affirmation manipulation, included statements like *'I love to learn new things'*, *'I am trustworthy'* and *'I treat all people equally regardless of who they might be'* which had to be rated on a scale from 1 = Not like me at all – 7 = Like me.

In the condition of no self-affirmation (control group), participants were presented with the same statements but asked to answer them about a distant known person, namely Queen Elizabeth II, e.g., *'she loves to learn new things'*, *'she is trustworthy'*, and *'she treats all people equally regardless of who they might be'* (1 = Not at all – 7 = Extremely). See Appendix B for the full 11 statements survey.

The experimental group as well as the control group received the same general health message giving a short definition of colorectal cancer, its main factors and severity. The message also included a sentence stating that colorectal cancer was preventable and curable.

To test the influence of the type of screening procedure offered, a manipulation of the type of screening recommendation was implemented, resulting in two experimental conditions: fecal immunochemical test (FIT) and colonoscopy. One group received general information about colorectal cancer and its risk factors and the recommendation to participate in a fecal immunochemical test (FIT) that would occur every two years and would be conducted at home. The other group received information about colorectal cancer and its risk factors and the recommendation to participate in a colonoscopy screening program that would occur every 10 years and would be conducted in a medical facility.

Acceptance of the health message was evaluated with the following question: *'To what extent did you find the information given easy to understand, - relevant, - manipulative, - exaggerated, -irritating, - credible?'*, to be answered in a rating scale from 1 = Not at all to 7 = Extremely.

To measure perceived message effectiveness, 6 statements such as *'To what extent did you think deeply about the information provided, - try to disregard the information, - think this information provided a strong argument for undergoing screening, - learn something you did not know before, - become concerned about your health and – become motivated to collect more information about screening'* were included in the survey. Participants were asked to answer in ratings scales from 1 = Not at all to 7 = Extremely.

To assess perceived cognitive risk and the perceived likelihood of developing cancer, the following 3 questions were introduced:

'What do you think is the likelihood of you developing colorectal cancer within the next 10 years?', *'What do you think is the likelihood of other people developing colorectal cancer within the next 10 years?'* and *'Compared to others, what do you think is the likelihood of you developing colorectal cancer.'* Participants were asked to answer in ratings scales from 1 = Not likely at all to 7 = Extremely likely.

Perceived program efficiency was tested with 3 statements *'Please indicate to what extent participating in a Colorectal Cancer Screening Program will lower your risk of getting colorectal cancer'*, *'-is a good way for you to prevent getting colorectal cancer'*, *'- has no impact on your future health'*, to be answered in a scale from 1 = Not at all to 7 = Extremely.

To finally measure whether the introduction of the self-affirmation manipulation and the anticipated efforts (type of program) had an impact on participants willingness to participate in a colorectal cancer screening program and referral intentions, participants were asked to rate *'How likely will you participate in a Colorectal Cancer Screening Program'*. To measure the role of these variables in the intention to recommend, which allow us to explore the differences in seeking help for the self and for others, participants were asked *'How likely will you recommend a Colorectal Cancer Screening Program to a family member or friend'*. These questions were rated on a scale from 1 = Not likely at all to 7 = Extremely likely.

To control for previous knowledge and familiarity about colorectal cancer and CRC Screening Programs, participants had to state (Yes/No) whether they had ever heard about CRC or CRC Screening Programs before, knew anyone who has or had CRC or someone who had eventually died from it.

They were also asked if they had ever participated in a CRC Screening Program themselves and if so, it was asked what kind of screening they had participated in, e.g., colonoscopy or fecal immunochemical test (FIT). If participants had not participated in CRC Screening, they were asked to rate to what extent reasons like e.g. age *'I am too young'*, healthy lifestyle *'I have a healthy diet'* and *'I am very active'*, lack of symptoms *'I do not have symptoms'*, fear *'I am scared of the result'* and lack of knowledge *'I have not heard about colorectal cancer screening before'* (1 = Not at all – 7 = Extremely) affected their non-participation. Demographics, such as age, gender, country of origin, first language, and highest level of education were collected as demographic variables. The full questionnaire can be found in Appendix B.

3.3 Procedure

First, participants received an introduction stating that the following research aimed to better understand the potential influences of colorectal screening program participation. They were informed that their participation was completely anonymous and voluntary and that they could choose if they wanted to take the survey in English, German or Spanish.

Participants were then randomly assigned to one of the 4 surveys corresponding to the 4 experimental conditions (*self-affirmation & colonoscopy*, *self-affirmation & FIT*, *No self-affirmation & colonoscopy*, *No self-affirmation & FIT*). Before starting to answer the initial questions, participants were told that their answers aimed to better understand how people deal with new challenges in their lives, such as significant diseases. They were informed that the survey was split into two parts. First, they would be asked to reflect on their own values and give their opinion on how they approach new challenges (self-affirmation, experimental group) or about another persons' values and abilities to cope with new challenges (no self-affirmation, control group).

After being presented with the survey corresponding to the self-affirmation manipulation, participants were given information about one of the screening programs, FIT or colonoscopy. Corresponding to the survey they were assigned to, participants then received either a statement recommending colonoscopy as a screening program (colonoscopy condition) or a fecal immunochemical test (FIT) (FIT condition).

After that, participants were asked to answer the questions and statements to evaluate the acceptance of the health message, perceived message effectiveness, perceived cognitive risk and the perceived likelihood of developing cancer, perceived program efficiency, willingness to participate in a colorectal cancer screening program and referral intentions.

Subsequently, participants were presented with the questions aimed to control for previous experiences with and awareness of colorectal cancer and colorectal cancer screening programs. Finally, demographics were collected. A small debrief about the study was presented at the end.

3.4 Design

The study design consisted of two self-affirmation conditions (self-affirmation, no self-affirmation) and two types of CRC Screening Programs (Colonoscopy, fecal immunochemical test (FIT)). A between subject design was used.

4. Results

4.1 Participants

One hundred and twenty-nine participants ($M_{age} = 50.36$ years, $SD = 1.41$ years) completed the survey voluntarily after being invited to participate in the study by email. Previously, thirty-one answers were not considered because of incompleteness. SPSS Software was used to conduct the analysis with the valid sample of 129 answers. From this sample, 121 participants had heard about colorectal cancer before; 104 participants were aware of the existence of colorectal screening programs and 81 knew someone who had participated in colorectal cancer screening. Approximately half of the sample, 51 individuals, had previously participated themselves in colorectal screening out of which 11 took the fecal immunochemical test (FIT) and 41 underwent colonoscopy. To better understand and control for why people had not participated in a colorectal screening program until that point, they were asked to rate potential reasons. The most common reasons stated for not having participated in a CRC screening program yet were 1. not having any symptoms (72%), 2. having a healthy diet (56%), 3. being too young (51%) and 4. being active (47%).

When controlling for age and only taking the eligible age group of age > 49 into consideration, not having symptoms remains the most stated reason (66%) but age becomes less relevant (23%) and the reason to not be able to find time for colorectal cancer screening gains relevance (29%).

The majority of participants showed a positive attitude (perceived message effectiveness) towards the informative text given (finding the text easy to understand (95%), relevant (93%) and credible (91%)) and also stated that they thought deeply about the information provided (95%), that the content provided as a strong argument (88%) to undergo screening, that they learned something new (44%) and that they were motivated to collect more information (44%) on the topic. 22% admitted to trying to disregard the information provided.

Looking at further demographics, 69% of all participants were female and 31% were male. 26.4% completed a Master's degree, 21.7% a Bachelor's degree and 1.6% a Phd. 22.5% just finished Middle School and 22.5% achieved their high school degree. Participants' countries of origin were Germany (75.2%), Spain (17,1%) and the UK (7.8%) with their first language being German, Spanish, and English. The survey was translated into three languages, English, German and Spanish and was completed in one of these languages depending on the participants' choice.

4.2 Exploring Data - Correlation Analyses

To explore the data and have a better understanding of the pattern of results, a correlation analysis between the dependent measures was conducted. When running a Spearman correlation analysis, a strong positive monotonic relationship ($r_s(127) = .69, p < .001$) between the likelihood to participate in colorectal cancer screening and the likelihood to recommend such a program to a friend or family member was found.

Further moderate positive monotonic correlations were found for the likelihood to participate and the perceived program efficiency, in this case viewing colorectal cancer screening programs as a successful method to prevent ($r_s(126) = 4.77, p < .001$) or lower the risk to develop colorectal cancer ($r_s(127) = .51, p < .001$). A similar pattern of results was found for the likelihood to recommend a colorectal cancer screening program and the perception of colorectal cancer screening as a successful prevention method ($r_s(126) = .43, p < .001$) and a program that can reduce the risk of developing CRC ($r_s(127) = .54, p < .001$).

A higher message effectiveness was also correlated with the likelihood to recommend CRC screening ($r_s(127) = .50, p < .001$) as well as perceived program efficiency, in particular associating CRC screening with a lower risk to develop colorectal cancer ($r_s(127) = .43, p < .001$). Positive monotonic correlations were found for the acceptance of the health message ($r_s(127) = .32, p < .001$) and perceived message effectiveness ($r_s(127) = .39, p < .001$), with the likelihood to participate in CRC screening. Participants that stated a higher perceived cognitive risk about themselves showed a higher perceived message effectiveness ($r_s(126) = .29, p = .001$) a higher likelihood to recommend CRC screening ($r_s(126) = .26, p = .003$).

Considering, that according to the Deutsche Gesellschaft für Gastroenterologie, Verdauungs- und Stoffwechselkrankheiten (2022) every adult starting at the age of 50 is entitled to undergo colorectal cancer screening, the sample was divided by age into two groups (group 1: 20-49 years old; group 2: >49 years old). When controlling for the eligible age group (only including participants age > 49 in the sample), the pattern of the results had changed. The positive monotonic relationship between the likelihood to participate and a positive perceived program efficiency, lower risk ($r_s (79) = .39, p < .001$) and prevention ($r_s (78) = .36, p = .001$), become weaker as well as the correlation between the assumption that CRC screening can prevent cancer and the likelihood to recommend a CRC screening program ($r_s (78) = .36, p = .001$).

Nevertheless, a positive monotonic correlation between age and the perceived cognitive risk about others became significant ($r_s (79) = .23, p = .041$). A significant weak negative monotonic correlation between perceived message effectiveness and a negative perceived program efficiency (believing that colorectal cancer screening has no effect on one's future health) ($r_s (78) = -.31, p = .005$) appeared as well. To see the full correlation results, please check Appendix A.

4.3 Testing the Hypotheses - Kruskal-Wallis-Test

Since the conducted data did not fulfil the normality assumption, which is essential for conducting ANOVAs, the Kruskal-Wallis-Test, a more robust non-parametric test, was used to test the hypotheses and determine whether significant differences between the experimental groups and the control groups could be found. The Kruskal-Wallis-Test does not require a normally distributed dependent variable and can be used to compare multiple groups. Nonetheless, it does not have the ability to directly compare interaction effects which would be interesting to do within the study's 2x2 design.

Likelihood to participate

When conducting the Kruskal Wallis test for the whole sample including 129 participants, there was no significant difference found between the group that received the self-affirmation intervention and the control group on the likelihood to participate in a colorectal cancer screening program ($H(1) = .85, p = .357, M_{SA} = 5.33, M_{NSA} = 5.69, SD_{SA} = 1.96, SD_{NSA} = 1.74$) or to recommend such a program ($H(1) = .56, p = .454, M_{SA} = 5.73, M_{NSA} = 5.97, SD_{SA} = 1.67, SD_{NSA} = 1.72$). These findings slightly change when considering only participants that have the eligible age to participate in a CRC screening program (age > 49).

A statistically significant difference for the self-affirmation vs. control group (no self-affirmation) was found for the likelihood to participate in CRC screening. Contrary to the hypothesis, individuals that received the self-affirmation intervention tend to be less likely to participate in a colorectal cancer screening program ($H(1) = 5.93, p = 0.015, M_{SA} = 5.18, M_{NSA} = 6.24, SD_{SA} = 2.16, SD_{NSA} = 1.54$). Comparing the different screening types that were recommended (colonoscopy vs. FIT), a significant difference was found for the likelihood to participate. Individuals presented with colonoscopy as the recommended screening procedure tended to be more likely to participate in a colorectal screening program than individuals that received the FIT recommendation ($H(1) = 3.05, p = .081, M_{RFIT} = 5.14, M_{RColo} = 5.87, SD_{RFIT} = 2.09, SD_{RColo} = 1.51$).

Overall perceived risk

Another main effect of the screening type was found on the perceived cognitive risk of others developing colorectal cancer in which the colonoscopy condition led to higher perceived risk of others developing colorectal cancer ($H(1) = 3.81, p = .051, M_{RFIT} = 4.64, M_{RColo} = 5.24, SD_{RFIT} = 1.69, SD_{RColo} = 1.45$). No significant effect of the screening type was found on individuals own perceived risk ($H(1) = 2.39, p = .122$) and no significant difference was found between the self-affirmation group and control group in terms of their own perceived risk ($H(1) = .01, p = .911$) and perceived cognitive risk about others ($H(1) = .12, p = .726$).

Perceived program efficiency

When testing the effects of self-affirmation and type of screening recommendation on the perceived program efficiency, no significant differences were found. The self-affirmation intervention had no significant influence on the assumption that colorectal cancer screening can potentially prevent the development of colorectal cancer ($H(1) = .13, p = .702$) or lower the risk of developing the disease ($H(1) = .14, p = .704$). Neither did the type of screening recommended have an impact on perceiving colorectal cancer screening as a preventive method ($H(1) = .45, p = .501$), or a measurement to reduce the risk of developing colorectal cancer ($H(1) = .47, p = .492$).

Perceived message effectiveness and health message acceptance

When testing for potential effects on the perceived message effectiveness, no significant difference was found for the self-affirmation intervention ($H(1) = .65, p = .420$) nor the type of screening program recommended ($H(1) = .88, p = .348$).

At the same time, no significant differences were found for the self-affirmation intervention ($H(1) = .11, p = .745$) and type of screening recommendation ($H(1) = .01, p = .909$) on the health message acceptance.

4.4 Testing Control Measures

To assess, whether other factors could have a potential influence on the likelihood to participate, overall risk perception as well as perceived message effectiveness and message acceptance, control measures were implemented. The study controlled for potential influences of previous participation, the type of test that had been previously conducted and previous knowledge about colorectal cancer and colorectal cancer screening.

The likelihood to participate differed depending on participants previous knowledge about colorectal cancer and colorectal cancer screening programs. Participants that had previously heard about colorectal cancer or new someone who suffered or even died from the disease, were more likely to participate in a colorectal screening program ($H(1) = 4.39, p = .036, M_{PKY\text{es}} = 5.57, M_{PKN\text{o}} = 4.56, SD_{PKY\text{es}} = 1.85, SD_{PKN\text{o}} = 1.59$) or to recommend such a program ($H(1) = 3.95, p = .047, M_{PKY\text{es}} = 5.88, M_{PKN\text{o}} = 5.33, SD_{PKY\text{es}} = 1.61, SD_{PKN\text{o}} = .87$). Additionally, participants that were aware of colorectal screening programs, were more likely to participate in a colorectal screening program ($H(1) = 10.30, p = .001, M_{PKSY\text{es}} = 5.73, M_{PKSN\text{o}} = 4.69, SD_{PKSY\text{es}} = 1.81, SD_{PKSN\text{o}} = 1.78$) or recommend such a program ($H(1) = 5.31, p = .021, M_{PKSY\text{es}} = 5.96, M_{PKSN\text{o}} = 5.41, SD_{PKSY\text{es}} = 1.58, SD_{PKSN\text{o}} = 1.52$).

When focusing on the overall risk perception, individuals that had previously participated in a colorectal cancer screening program were found to perceive their own risk of developing colorectal cancer as higher compared to those who had not participated ($H(1) = 6.85, p = .009, M_{Y\text{es}} = 3.71, M_{N\text{o}} = 2.89, SD_{Y\text{es}} = 1.71, SD_{N\text{o}} = 1.56$). Besides, a significant difference between the participants that had previously taken the FIT and participants that had undergone colonoscopy, was found. Individuals that conducted the FIT tend to perceive their own risk as marginally higher ($H(1) = 3.91, p = .048, M_{FIT} = 4.45, M_{C\text{olo}} = 3.50, SD_{FIT} = 1.13, SD_{C\text{olo}} = 1.80$). This effect became even stronger and highly significant when only considering people age >49 ($H(1) = 7.12, p = .008, M_{FIT} = 4.88, M_{C\text{olo}} = 3.35, SD_{FIT} = .84, SD_{C\text{olo}} = 1.65$). Also, the perceived risk of others seemed to be significantly higher for those, who had taken the FIT ($H(1) = 4.65, p = .031, M_{FIT} = 6.09, M_{C\text{olo}} = 5.03, SD_{FIT} = 1.04, SD_{C\text{olo}} = 1.51$).

Program efficiency, in terms of considering colorectal cancer as a useful measure to lower the risk of developing colorectal cancer, was found to be significantly higher for participants that had previously participated in colorectal cancer screening ($H(1) = 15.52, p < .001, M_{Yes} = 6.29, M_{No} = 5.33, SD_{Yes} = 1.65, SD_{No} = 1.91$) or overall had previous knowledge about colorectal cancer ($H(1) = 5.87, p = .015, M_{PKYes} = 5.79, M_{PKNo} = 4.89, SD_{PKYes} = 1.87, SD_{PKNo} = 1.36$). Furthermore, previous participants also perceived colorectal screening as a successful measurement to prevent colorectal cancer ($H(1) = 6.92, p = .009, M_{Yes} = 6.25, M_{No} = 5.76, SD_{Yes} = 1.56, SD_{No} = 1.53$).

Perceived message effectiveness ($H(1) = 9.13, p = .003, M_{Yes} = 5.49, M_{No} = 4.78, SD_{Yes} = 1.17, SD_{No} = 1.26$) and health message acceptance ($H(1) = 8.39, p = .004, M_{Yes} = 6.43, M_{No} = 6.13, SD_{Yes} = 1.19, SD_{No} = .94$) were found to be significantly higher for former participants. And additionally, participants that were aware of colorectal screening programs, also showed a higher message acceptance ($H(1) = 6.71, p = .010, M_{PKSYes} = 6.34, M_{PKSNo} = 6.00, SD_{PKSYes} = 1.08, SD_{PKSNo} = .93$). Complete results can be found in Appendix A.

4.5 Potential Interaction Effects

To have a better understanding of the findings, instead of just looking at the main effects of a self-affirmation intervention and the type of screening recommendation, it is of high importance to consider potential interaction effects. Therefore, the sample was split into two subgroups where one group included all participants that had received the self-affirmation intervention and the second one included those who did not. Effects for potential interaction effects with the type of screening recommendation, previous participation in colorectal cancer screening and the used screening type on all dependent variables were analysed.

Within the self-affirmed group, participants that received colonoscopy as the recommended screening procedure had a significant higher likelihood to participate in colorectal cancer screening than participants who received the FIT recommendation. ($H(1) = 4.69, p = .030, M_{SARCo} = 5.91, M_{SARFIT} = 4.77, SD_{SARCo} = 1.47, SD_{SARFIT} = 2.18$). No potential interaction was found for self-affirmation and the type of screening recommendation on the overall perceived likelihood of developing colorectal cancer within the next ten years.

In addition, a significant difference between individuals who have undergone screening in the past and those who have not, concerning their perceived likelihood of others developing colorectal cancer, and their acceptance of the health message was found.

Consequently, individuals that have previously participated in colorectal cancer screening and were self-affirmed, perceived others likelihood significantly higher ($H(1) = 4.49, p = .034, M_{SAYes} = 5.38, M_{SANo} = 4.51, SD_{SAYes} = 1.35, SD_{SANo} = 1.69$) and also had a significantly higher acceptance of the health message ($H(1) = 6.29, p = .012, M_{SAPYes} = 6.55, M_{SAPNo} = 6.03, SD_{SAPYes} = .74, SD_{SAPNo} = 1.01$). No potential interaction was found between self-affirmation and the previously conducted screening test on the overall risk perception.

Focusing on the control group (no self-affirmation), marginal significant effects were found for the type of screening recommendation and the overall perceived risk to develop colorectal cancer within the group of not affirmed individuals. Individuals that were recommended to undergo colonoscopy showed a significantly higher risk perception for themselves ($H(1) = 2.89, p = .089, M_{SARCo} = 3.56, M_{SARFIT} = 2.83, SD_{SARCo} = 1.61, SD_{SARFIT} = 1.51$), and others ($H(1) = 3.16, p = .076, M_{SARCo} = 5.38, M_{SARFIT} = 4.55, SD_{SARCo} = 1.34, SD_{SARFIT} = 1.79$).

Furthermore, there was a significant difference found between individuals that had previously participated in colorectal cancer screening compared to those who did not, on their own perceived risk. Consequently, individuals that had previously participated in colorectal cancer screening perceived their own risk of developing colorectal cancer as significantly higher to those who did not themselves ($H(1) = 5.06, p = .024, M_{SAPYes} = 3.82, M_{SAPNo} = 2.87, SD_{SAPYes} = 1.50, SD_{SAPNo} = 1.56$). There was no significant effect of previous participation in the perceived likelihood of others developing colorectal cancer for the non-self-affirmed group.

When comparing the types of previously conducted screening tests within the control group, significant differences were found for the type of screening conducted and the overall perceived risk. Individuals that had taken the FIT perceived the risk of others as significantly higher ($H(1) = 7.67, p = .006, M_{NSAColo} = 4.50, M_{NSAFIT} = 6.67, SD_{NSAColo} = 1.55, SD_{NSAFIT} = .52$), as well as the likelihood for themselves ($H(1) = 4.07, p = .044, M_{NSAColo} = 3.50, M_{NSAFIT} = 4.67, SD_{NSAColo} = 1.59, SD_{NSAFIT} = .82$), compared to people that had undergone colonoscopy.

Besides, no effects were found on the likelihood to participate, or to recommend a colorectal cancer screening program, acceptance of the health message, perceived message effectiveness, and the perceived program efficiency concerning the previous type of screening that had been conducted (FIT vs. colonoscopy) in both groups, self-affirmation, and control group.

5. Discussion

The main goal of this study was to assess whether a self-affirmation intervention and the type of screening procedure can have an impact on colorectal cancer screening participation rates. Therefore, this study tested the following three hypotheses (1) a self-affirmation intervention leads to an increase in willingness to participate in a colorectal screening program; (2) a self-affirmation intervention will increase acceptance of a threatening health message; (3) offering the FIT as a potential screening procedure can increase colorectal cancer screening.

To test these hypotheses, the impact of a self-affirmation intervention and the type of screening recommendation on several dependent variables, such as overall risk perception, likelihood to participate, perceived program efficiency, perceived message effectiveness and health message acceptance was assessed. Additionally, it was controlled for potential effects of previous participation experiences, previous knowledge about colorectal cancer and colorectal cancer screening programs and the screening eligible age group (>49).

Risk Perception

Overall, participants estimated their own likelihood of developing colorectal cancer as lower than the likelihood of others developing it. This finding can be explained with the optimistic bias, according to which individuals tend to believe that they are less likely affected by risks and hazards than others (Weinstein, 1989). Optimistic biases can increase with the perceived feeling of embarrassment, which was also stated as a potential burden of participating in colorectal cancer screening in previous literature (Gimeno García, 2012; Klabunde et al., 2005; Muthukrishnan et al., 2019), the perceived preventability based on an individual's own actions, like for example having a healthy lifestyle and the reflection on the past (Weinstein, 1987). This aligns with the current findings of this study considering the stated reasons for not having undergone colorectal cancer screening yet, such as a healthy diet, being active and not having any symptoms.

At the same time, the results of this study show that having previously participated in colorectal cancer screening had a significant effect on the likelihood to participate, likelihood to recommend, overall perceived message effectiveness, perceived program efficiency and acceptance of the health message, and the overall risk perception, including others and ones' own risk. Individuals who previously participate in colorectal cancer screening showed a highly significant increase in their own risk perception compared to those who did not.

This aligns with previous findings that not only perceived frequency (Harris et al., 2008; Weinstein, 1987), but also past experiences (Weinstein, 1987) have the ability to reduce optimistic biases. Comparing those results with the risk perception of others, which only had a marginally significant difference ($p = .066$) between previous participants and non-participants, the gap between one's own perceived risk and perceived risk about others tends to decrease with previous participation experience.

The link of individuals screening participation to their own risk perception based on optimistic biases is of high relevance, since individuals are less likely to engage in preventive behaviour e.g. screening programs, if they perceive their own risk as rather low (Weinstein, 1989). No significant effect of the self-affirmation intervention on the overall risk perception was found in this study. Regardless, previous research suggests that a self-affirmation intervention can potentially decrease the optimistic bias and consequently enhance the willingness to participate in screening programs (W. M. P. Klein et al., 2010).

Self-Affirmation Intervention

Hypothesis 1: Self-affirmation can increase colorectal cancer screening participation

Ferrer et al. (2015) highlight the importance of an existing level of threat when introducing a self-affirmation intervention. They emphasize the high importance of choosing a target group which exists of high-risk patients and people that experience fear of e.g., colorectal screening programs. With dividing the sample size in this study into two age groups (age > 49 and age <50), a high-risk group (age > 49) was created. Focusing on the high-risk group, results showed that the self-affirmation intervention had a significant effect on participants likelihood to participate in colorectal cancer screening. Contrary to our hypothesis, participants that received the self-affirmation intervention and were self-affirmed regarding their general integrity, were less likely to participate in a colorectal screening program. This is also in contrast with other studies that investigated the effect of self-affirmation interventions on cancer screening participation and found that a self-affirmation intervention reduced defensive reactions to threatening health information and also increased the likelihood to participate in screening programs (Howell & Shepperd, 2012; W. M. P. Klein et al., 2010; van Koningsbruggen et al., 2009).

A previous study from W. M. Klein et al. (2011) suggests that the message itself might have been too weak for the self-affirmation intervention to have a significant impact. According to the findings from Ferrer et al. (2015) could the absence of threat within the health message lead to adverse effects when introducing a self-affirmation intervention. This could be a potential explanation for the observed decrease in willingness to participate within the self-affirmed group. Overall, the feeling of vulnerability tends to be very important when it comes to the process of decision making. Previous research has linked the existing level of vulnerability with engagement in practices to reduce risk, like the participation in cancer screening programs (Klein et. al 2011). Hence, a weak message can potentially reduce the level of vulnerability and therefore, also the willingness to change behaviour or even reduce the perceived risk in response to the message (Klein et. al 2011). Nevertheless, this study was not able to prove that a self-affirmation intervention can potentially increase colorectal cancer screening participation.

Hypothesis 2: Self-affirmation increases message acceptance

Contrary to previous research that suggested that a self-affirmation intervention could lead to a more open-minded evaluation of threatening messages and consequently increase health message acceptance (Epton et. Al 2015), especially within high ambiguity (Klein et al 2015) and high-risk patients (Harris and Napper 2005), the results of this study do not imply a direct effect between a self-affirmation intervention and message acceptance. Instead, previous knowledge and experience with colorectal cancer screening significantly enhanced health message acceptance and being aware of colorectal cancer significantly enhanced perceived program efficiency. Harris and Napper (2015) found that a lower risk perception could potentially reduce the impact of self-affirmation on message acceptance, which could potentially explain the current results. Thus, this study was not able to prove that a self-affirmation intervention can increase message acceptance.

Screening Procedure

Hypothesis 3: Offering the FIT as a possible screening procedure will increase colorectal cancer screening rates

Results showed, that the recommendation to undergo colonoscopy lead to a higher stated likelihood to participate in a colorectal cancer screening program than when receiving the FIT recommendation. Having previously participated in colonoscopy lead to an overall higher risk perception of participants, especially for themselves.

Previous studies also showed that individuals that perceived their own risk as generally higher, had a friend or family member that suffered from colorectal cancer, perceived their own health status as poor and were on average younger, chose colonoscopy as the preferred screening procedure (Wong et. al 2010; 2012). This might be caused due to a higher level of awareness of the disease and its severity and therefore, colonoscopy has a higher perceived reassurance due to its higher diagnostic accuracy (Wong et. al 2010). Overall, previous research has studied effectiveness and preferences when it comes to different screening procedures, with diverse findings. Some studies report higher completion rates and a preference for colonoscopy (Singal et al., 2017), while others report higher participation rates and a preference for the FIT (Gupta et al., 2013; Senore et al., 2019).

In Germany, the FIT (previously FOBT) and colonoscopy are offered as parallel options. Besides, statistics have shown that the overall demand for the FIT has decreased from 2009 to 2018 by up to -40%, varying depending on age and sex (Steffen et al., 2020).

Furthermore, Germany praises colonoscopy as the most reliable procedure, which also offers the possibility of discovery and treatment at the same time (Deutsches Krebsforschungszentrum, 2022). The study from Inadomi et al. (2012) suggests cultural differences, when assessing the willingness and preferences when participating in cancer screening programs. This should be kept in mind when analysing the current findings, since over 75% of the participants of this study were German. In addition, nearly 79% of the participants that had previously participated in colorectal cancer screening underwent colonoscopy which might be one explanatory factor for why the results show that individuals tend to prefer colonoscopy. Therefore, one should keep in mind that a diversity of preferences exists (Inadomi et al., 2012). For colorectal cancer screening programs to be efficient and to maximize its outcome, different screening procedures should be offered, keeping patient preferences in mind (Inadomi et al., 2012). To increase compliance, it is important to involve individuals in their own screening decisions Wong et. al (2012).

6. Limitations

This study has several limitations. First of all, the sample size was small, especially when divided into the different subgroups – self-affirmation versus no self-affirmation, FIT versus colonoscopy, and age > 49 versus age < 50. Hence, findings might be not as accurate as if conducted with a larger sample size. Furthermore, only the intention to participate was assessed and not the actual participation in colorectal cancer screening. Therefore, is it not possible to assess whether participants stated likelihood to participate equals their actual participation and whether self-affirmation has only a short or long-term effect. This study experienced a lack of effects of the self-affirmation condition which lead to the rejection of two hypotheses and also contradicted previous findings. Multiple reasons should be considered. The level of threat introduced in the health message was rather weak and was not controlled for, which could have potentially influenced the effect of self-affirmation on message acceptance and the likelihood to participate, as well as risk perception.

One should also keep in mind that the majority (75%) of the participants was German. In Germany, colonoscopy is overall the more common procedure used for screening and colorectal cancer screening programs have been established for decades. Therefore, results might differ when also considering colorectal cancer screening programs in other countries. Regardless, this study does not take cultural differences into account and therefore results mainly apply to one cultural identity. Nonetheless, cultural differences should be kept in mind and be considered to ensure a more holistic approach. Overall, the data suggests a high degree of heterogeneity based on relevant factors like previous experience, knowledge, age etc.. A more homogenous sample size, including individuals that have similar decision making processes, could lead to more robust results.

Due to the fact that the collected data was not normally distributed, non-parametric tests such as the Spearman correlation and Kruskal-Wallis-Tests were used to analyse the data. Hence, the results of this study might not be as accurate as when conducted with a parametric test and should be treated with caution.

7. Future Research

While investigating the impact of a self-affirmation intervention on colorectal cancer screening participation, the current study included a rather informative text about colorectal cancer, its severity and risk factors, than a provocative threatening health message.

Further research should assess whether a more threatening and persuasive message would have increased vulnerability and consequently also lead to differences in risk perception and likelihood to participate in colorectal cancer screening. Since most of the participants were from Germany, and previous literature has identified cultural differences in screening participation and test preferences, it would be interesting to further investigate potential differences regarding the impact of a self-affirmation intervention between different cultures.

Overall, the existing research on the impact of self-affirmation interventions on screening uptake is limited. Further studies should be conducted with larger sample sizes to validate results, enhance the understanding of what motivates people to participate in screening and give credible managerial implications to successfully increase awareness and participation rates. Since adherence to screening is important for its success, especially for the FIT, where more frequent testing is necessary, future research should consider time as a relevant variable.

8. Management Implications

This study suggested potential adverse effects of a self-affirmation intervention, most likely caused through the absence of a threatening health message. Following, it is important to ensure the existence of threat when using a self-affirmation intervention to promote change in health behaviours. The difference between participants own perceived likelihood and the perceived likelihood of others developing colorectal cancer suggested the presence of an optimistic bias. This should be kept in mind when creating educational healthcare campaigns, since highlighting risk factors and presenting a picture of a diagnosed person can potentially create stereotypes and increase optimistic biases, which could lead to a reduction in participation due to an underestimated level of risk. Overall, the preferences of screening procedures seem to vary. Therefore, it might be essential for healthcare professionals to explain colorectal cancer screening options in detail, to reduce the level of embarrassment, uncertainties, and discomfort. Evidence suggests that it is important to offer the right type of screening to every individual to ensure successful screening and adherence over time. Therefore, promotions should be targeted to individuals' preferences and highlight what is essential to the target group e.g., convenience or accuracy.

9. Conclusion

This study contributed to the current literature assessing influential factors such as self-affirmation on colorectal cancer screening participation. Yet, this study did not find any effect of self-affirmation on message acceptance which did not coincide with previous research. The implemented self-affirmation intervention reduced the willingness to participate in colorectal cancer screening within the high-risk group which was contradictory with previous findings in the literature. However, this might be explained by the absence of threat within the health message. When assessing if offering the FIT could potentially increase screening participation, results showed that participants stated a higher likelihood to participate when recommended colonoscopy, especially when being self-affirmed.

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Appendix A: Data

Spearman Correlation

Korrelationen

	Likelihood_p articipate	Own_likeliho od	Others_likelih ood	Compared_li kelihood	CRCS_lowerri sk	CRCS_preve nt	CRCS_noeffe ct	Likelihood_re commend	Age	pos_attitude_ text	pos_attitude_ info		
Spearman-Rho	Likelihood_participate	Korrelationskoeffizient	--										
		Sig. (2-seitig)											
		N	129										
Own_likelihood	Own_likelihood	Korrelationskoeffizient	,054	--									
		Sig. (2-seitig)	,547										
		N	128	128									
Others_likelihood	Others_likelihood	Korrelationskoeffizient	,152	,204	--								
		Sig. (2-seitig)	,086	,021									
		N	128	128	128								
Compared_likelihood	Compared_likelihood	Korrelationskoeffizient	,073	,562	,251	--							
		Sig. (2-seitig)	,411	<.001	,004								
		N	129	128	128	129							
CRCS_lowerisk	CRCS_lowerisk	Korrelationskoeffizient	,506	,131	,155	,147	--						
		Sig. (2-seitig)	<.001	,141	,080	,097							
		N	129	128	128	129	129						
CRCS_prevent	CRCS_prevent	Korrelationskoeffizient	,477	,101	,139	,174	,701	--					
		Sig. (2-seitig)	<.001	,256	,119	,050	<.001						
		N	128	127	127	128	128	128					
CRCS_noeffect	CRCS_noeffect	Korrelationskoeffizient	-,075	-,052	-,076	-,094	-,294	-,313	--				
		Sig. (2-seitig)	,403	,558	,398	,293	<.001	<.001					
		N	128	127	127	128	128	128	128				
Likelihood_recommend	Likelihood_recommend	Korrelationskoeffizient	,686	,132	,261	,116	,539	,433	-,067	--			
		Sig. (2-seitig)	<.001	,138	,003	,189	<.001	<.001	,453				
		N	129	128	128	129	129	128	128	129			
Age	Age	Korrelationskoeffizient	,173	,273	,110	,001	,176	,128	-,020	,114	--		
		Sig. (2-seitig)	,050	,002	,215	,993	,044	,148	,824	,198			
		N	129	128	128	129	129	128	128	129	129		
pos_attitude_text	pos_attitude_text	Korrelationskoeffizient	,323	,026	,144	,068	,293	,342	-,260	,278	,175	--	
		Sig. (2-seitig)	<.001	,770	,104	,443	<.001	<.001	,003	,001	,048		
		N	129	128	128	129	129	128	128	129	129	129	
pos_attitude_info	pos_attitude_info	Korrelationskoeffizient	,389	,293	,136	,213	,427	,377	-,250	,495	,286	,377	--
		Sig. (2-seitig)	<.001	<.001	,127	,015	<.001	<.001	,004	<.001	,001	<.001	
		N	129	128	128	129	129	128	128	129	129	129	129

** Die Korrelation ist auf dem 0,01 Niveau signifikant (zweiseitig).
* Die Korrelation ist auf dem 0,05 Niveau signifikant (zweiseitig).

Kruskal-Wallis-Test

		Self-Affirmation		Recommendation		Previous Screening Participation		Previous Screening Test		Previous Knowledge CRC		Previous Knowledge CRCS		
		Yes	No	FIT	Colo	Yes	No	Colo	FIT	Yes	No	Yes	No	
Own Likelihood	All	Mean	3.23	3.21	2.97	3.48	3.71	2.89	3.50	4.45	3.21	3.33	3.23	3.17
		SD	1.74	1.59	1.48	1.81	1.71	1.56	1.80	1.13	1.66	1.87	1.73	1.47
		Kruskal-Wallis-H	0.01		2.39		6.85		3.91		0.01		0	
		df	1		1		1		1		1		1	
		Significance Level	0.911		0.122		.009**		.048*		0.905		0.993	
Own Likelihood	50+	Mean	3.29	3.68	3.18	3.71	3.62	3.24	3.35	4.88	3.46	-	3.51	3.10
		SD	1.73	1.55	1.59	1.69	1.64	1.67	1.65	0.84	1.67	-	1.69	1.37
		Kruskal-Wallis-H	1.04		2.01		1.07		7.12		0.14		0.46	
		df	1		1		1		1		1		1	
		Significance Level	.307		.156		.302		.008**		0.707		0.5	
Other Likelihood	All	Mean	4.89	4.98	4.64	5.24	5.25	4.72	5.03	6.09	4.97	4.44	4.98	4.79
		SD	1.60	1.61	1.69	1.45	1.48	1.65	1.51	1.04	1.64	0.88	1.67	1.32
		Kruskal-Wallis-H	0.12		3.81		3.39		4.65		1.20		0.38	
		df	1		1		1		1		1		1	
		Significance Level	0.726		0.051		.066		.031*		0.274		0.54	
Other Likelihood	50+	Mean	4.89	4.97	4.63	5.20	5.11	4.68	4.89	6.13	4.94	-	4.91	5.00
		SD	1.53	1.70	1.73	1.42	1.50	1.70	1.49	1.13	1.60	-	1.66	1.05
		Kruskal-Wallis-H	0.08		1.89		1.31		4.65		0.51		0.01	
		df	1		1		1		1		1		1	
		Significance Level	.775		.170		.253		.031*		0.476		0.922	
Likelihood Participation	All	Mean	5.33	5.69	5.14	5.87	6.39	4.91	6.33	6.64	5.58	4.56	5.74	4.69
		SD	1.96	1.74	2.09	1.51	1.54	1.82	1.70	0.67	1.86	1.59	1.82	1.78
		Kruskal-Wallis-H	0.85		3.05		30.88		0.10		4.39		10.30	
		df	1		1		1		1		1		1	
		Significance Level	0.357		0.081		<.001**		.754		0.036*		0.001**	
Likelihood Participation	50+	Mean	5.18	6.24	5.16	6.07	6.33	4.71	6.27	6.63	5.64	-	5.77	4.70
		SD	2.16	1.54	2.34	1.46	1.62	2.04	1.76	0.74	1.99	-	1.91	2.26
		Kruskal-Wallis-H	5.93		1.69		18.87		0.00		0.61		2.24	
		df	1		1		1		1		1		1	
		Significance Level	.015*		.194		<.001**		.952		0.434		0.135	

		Self-Affirmation		Recommendation		Previous Screening Participation		Previous Screening Test		Previous Knowledge CRC		Previous Knowledge CRCs		
		Yes	No	FIT	Colo	Yes	No	Colo	FIT	Yes	No	Yes	No	
CRCS lowers risk	All	Mean	5.59	5.85	5.55	5.89	6.29	5.33	6.43	5.82	5.78	4.89	5.84	5.31
		SD	2.01	1.70	2.04	1.67	1.65	1.91	1.39	2.40	1.89	1.36	1.83	1.95
		Kruskal-Wallis-H	0.14		0.47		15.52		0.13		5.87		3.02	
		df	1		1		1		1		1		1	
	Significance Level	✓	.704	✓	.492	< .001**	✓	.723	0.015*	0.083				
	50+	Mean	5.62	5.91	5.55	5.93	6.20	5.15	6.38	5.38	5.76	-	5.70	6.10
SD		1.99	1.85	2.18	1.66	1.74	2.02	1.44	2.72	1.94	-	2.00	1.29	
Kruskal-Wallis-H		0.48		0.00		10.60		0.68		1.13		0.00		
df		1		1		1		1		1		1		
Significance Level	✓	.489	✓	.983	.001**	✓	.411	0.288	0.962					
CRCS prevents	All	Mean	5.91	6.02	5.80	6.13	6.25	5.76	6.43	5.64	5.98	5.67	6.05	5.66
		SD	1.73	1.36	1.77	1.30	1.56	1.53	1.26	2.34	1.58	1.23	1.52	1.65
		Kruskal-Wallis-H	0.13		0.45		6.92		1.50		2.36		2.63	
		df	1		1		1		1		1		1	
	Significance Level	✓	.702	✓	.501	.009**	✓	.221	0.036*	0.105				
	50+	Mean	5.80	6.09	5.68	6.15	6.18	5.59	6.38	5.25	5.92	-	5.99	5.50
SD		1.91	1.49	2.12	1.28	1.64	1.83	1.30	2.66	1.75	-	1.69	2.12	
Kruskal-Wallis-H		0.02		0.00		3.13		1.67		0.51		0.61		
df		1		1		1		1		1		1		
Significance Level	✓	.886	✓	.948	✓	.077	✓	.196	0.477	0.434				
Likelihood recommend	All	Mean	5.73	5.97	5.78	5.90	6.41	5.46	6.33	6.73	5.88	5.33	5.97	5.41
		SD	1.67	1.47	1.61	1.55	1.28	1.65	1.40	0.65	1.61	0.87	1.58	1.52
		Kruskal-Wallis-H	0.56		0.16		17.48		0.46		3.95		5.31	
		df	1		1		1		1		1		1	
	Significance Level	✓	.454	✓	.693	< .001**	✓	.497	0.047*	0.021*				
	50+	Mean	5.56	6.00	5.68	5.80	6.33	4.97	6.27	6.63	5.76	-	5.87	4.90
SD		1.83	1.72	1.91	1.69	1.35	2.01	1.45	0.74	1.80	-	1.71	2.13	
Kruskal-Wallis-H		1.89		0.06		13.58		0.12		0.72		2.14		
df		1		1		1		1		1		1		
Significance Level	✓	.169	✓	.807	< .001**	✓	.728	0.397	0.144					
Acceptance of health message	All	Mean	6.26	6.25	6.20	6.30	6.43	6.13	6.33	6.82	6.28	5.89	6.33	6.00
		SD	0.93	1.18	1.22	0.85	1.19	0.94	1.31	0.41	1.06	0.93	1.08	0.93
		Kruskal-Wallis-H	0.11		0.01		8.39		1.53		2.75		6.71	
		df	1		1		1		1		1		1	
	Significance Level	✓	.745	✓	.909	.004**	✓	.216	0.097	0.010*				
	50+	Mean	6.38	6.26	6.18	6.46	6.42	6.21	6.35	6.75	6.33	-	6.35	6.20
SD		0.83	1.38	1.41	0.67	1.20	0.95	1.30	0.46	1.10	-	1.16	0.42	
Kruskal-Wallis-H		0.07		0.01		3.15		0.53		0.85		3.62		
df		1		1		1		1		1		1		
Significance Level	✓	.786	✓	.932	✓	.076	✓	.467	0.357	0.957				
Perceived message effectiveness	All	Mean	5.11	5.02	4.95	5.17	5.49	4.78	5.43	5.73	5.10	4.56	5.09	4.97
		SD	1.38	1.15	1.29	1.25	1.17	1.26	1.24	0.91	1.27	1.24	1.33	1.05
		Kruskal-Wallis-H	0.65		0.88		9.13		0.41		1.16		0.46	
		df	1		1		1		1		1		1	
	Significance Level	✓	.420	✓	.348	.003**	✓	.525	0.281	0.500				
	50+	Mean	5.24	5.24	5.13	5.34	5.53	4.85	5.41	6.13	5.23	-	5.23	5.30
SD		1.33	1.26	1.34	1.26	1.12	1.42	1.17	0.64	1.30	-	1.33	1.06	
Kruskal-Wallis-H		0.13		0.55		3.76		2.73		0.35		0.00		
df		1		1		1		1		1		1		
Significance Level	✓	.723	✓	.457	✓	.052	✓	.098	0.553	0.965				

Appendix B: Survey

Survey_ Self-Affirmation | Colonoscopy

This survey aims to better understand how people deal with new challenges in their lives, such as significant diseases.

It includes two parts:
 First, you will be asked about your values and to give your opinion on how you approach new challenges.
 Secondly, you will receive some information about a Screening Program and asked to give your opinion on it.

Please continue to start the survey

Q1: Think about yourself and your loved ones and how you deal with new challenges.

Please state how much you can identify yourself with the following statements:

	Not like me at all	2	3	4	5	6	Like me
	1						7
I love to learn new things.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My friends can trust me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always try to keep my word.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I am always
curious
about the
world.

There are
people in my
life who care
as much
about my
well-being
as their own.

I value my
ability to
think
critically.

My friends
value my
good
judgment.

I can express
love to
someone
else.

I treat all
people
equally,
regardless of
who they
might be.

I must stand
up for what I
believe in,
even in the
face of
strong
opposition.

Despite challenges, I always remain hopeful about the future.



**Now, please read the following text carefully.
You will be asked your opinion about the Screening Program mentioned.**

Colorectal cancer (CRC) is a malignant tumor in the colon or rectum. It is the second most common and second deadliest cancer in the EU.

Out of a diagnosed population of 370,000 approx. 170,000 people die every year which accounts for nearly 46%.

High mortality rates result from late detection and the incidence of this disease is likely to rise significantly in the next decades.

Main factors are age increase, smoking, alcohol consumption, unhealthy diets (red and processed meats), physical inactivity, and obesity.
Over 90% of the people diagnosed with CRC are over age 50.

Nevertheless, colorectal cancer is preventable and curable if detected early enough.

To prevent or reduce the severity of colorectal cancer (CRC), it is highly **recommended to participate in a Colorectal Screening Program.**

Please consider the following Screening Program:

Starting age: **50 years old**

Frequency: **Every 10 years**

Procedure: **Colonoscopy, an ambulatory procedure (conducted at the hospital or ambulant clinic) where an endoscope will be inserted into the bowel to examine it.**

Q2: To what extent do you find the information given...

	Not at all 1	2	3	4	5	6	Extremely 7
easy to understand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
relevant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
manipulative	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
exaggerated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
irritating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
credible	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q3: To what extent did you

	Not at all 1	2	3	4	5	6	Extremely 7
think deeply about the information provided	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
try to disregard the information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
think this information provided a strong argument for undergoing screening	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
learn something you did not know before	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

become concerned about your health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
become motivated to collect more information about screening	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q4: What do you think is the likelihood of **you** developing colorectal cancer within the next 10 years?

Not likely at all	2	3	4	5	6	Extremely likely
1						7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q5: What do you think is the likelihood of **other people** developing colorectal cancer within the next 10 years?

Not likely at all	2	3	4	5	6	Extremely likely
1						7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q6: Compared to others, what do you think is the likelihood of you developing colorectal cancer?

	Not likely at all	2	3	4	5	6	Extremely likely
	1						7
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q7: Please indicate to what extent participating in a Colorectal Cancer Screening Program....

	Not at all	2	3	4	5	6	Extremely
	1						7
...will lower your risk of getting colorectal cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...is a good way for you to prevent getting colorectal cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...has no effect on your future health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q8: How likely will you...

	Not likely at all	2	3	4	5	6	Extremely likely
	1						7
...participate in a colorectal cancer Screening Programs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...recommend a colorectal cancer Screening Program to a family member or friend?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9: Before you finish, please answer the following questions about your experience with the disease and Screening Programs.

Please answer the following questions:

	Yes	No
Have you ever heard of Colorectal Cancer (CRC) before?	<input type="radio"/>	<input type="radio"/>
Have you ever heard of CRC Screening Programs before?	<input type="radio"/>	<input type="radio"/>
Do you know anyone who has/had CRC?	<input type="radio"/>	<input type="radio"/>
Do you know anyone who has died of CRC?	<input type="radio"/>	<input type="radio"/>
Do you know anyone who participated in CRC Screening?	<input type="radio"/>	<input type="radio"/>

	Yes	No
Did you ever participate in a CRC Screening Program?	<input type="radio"/>	<input type="radio"/>

Display This Question:

If _____ *= Yes*

Q10: Which kind of Screening did you participate in?

- Fecal immunochemical test (FIT) / FOBT
- Colonoscopy
- I did not participate in CRC Screening

Display This Question:

If _____ *= No*

Q11: To what extent did the following reasons keep you from participating in CRC Screening?

	Not at all	2	3	4	5	6	Extremely
	1						7
I am too young	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a healthy diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am very active (outdoor activities, gym etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not have symptoms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is difficult to find time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not know whom to talk to about it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I do not know how to schedule an appointment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am concerned about the cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am scared of the result	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have not heard about CRC Screening before	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q12: Which gender do you identify as?

- Female
- Male
- Non-binary
- Rather not say

Q13: How old are you? _____

Q14: Where are you from? _____

Q15: What is your first language? _____

Q16: What is the highest level of education that you have completed?

- Middle School
 - High School
 - Bachelors
 - Masters
 - Phd
 - None of the above
-

You have completed the survey!

Thank you for your participation. Your answers are really important to better understand how we can promote Screening Programs for significant diseases.

Please continue to close the survey.