



# Public effect of the 2022 Colorectal Cancer Awareness Campaign delivered through a metaverse platform

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**Purpose:** The Korean Society of Coloproctology has been conducting Colorectal Cancer Awareness Campaign, also known as the Gold Ribbon Campaign, every September since 2007. The 2022 campaign was held through a metaverse platform targeting the younger age group under the slogan of raising awareness of early-onset colorectal cancer (CRC). This study aimed to analyze the impact of the 2022 campaign on a metaverse platform.

**Methods:** Anonymized survey data were collected from participants in the metaverse campaign from September 1 to 15, 2022. The satisfaction score of the participants was evaluated by sex, age group, and previous campaign participation status.

**Results:** During the campaign, 2,770 people visited the metaverse. Among them, 455 people participated in the survey (response rate, 16.4%). Approximately 95% of the participants reported being satisfied with the information provided by the campaign, understood the necessity of undergoing screening for and prevention of early-onset CRC, and were familiar with the structure of the metaverse. The satisfaction score for campaign information tended to decrease as the participants' age increased. When the participants' overall level of satisfaction with the metaverse platform was assessed, teenagers scored particularly lower than the other age groups. The satisfaction scores for CRC information provided in the metaverse, as well as the scores for recognizing the seriousness and necessity of screening for early-onset CRC, indicated a high positive tendency ( $P < 0.001$ ).

**Conclusion:** Most of the 2022 Gold Ribbon Campaign participants were satisfied with the metaverse platform. Medical society should pay attention to increasing participation in and satisfaction with future public campaigns.

**Keywords:** Online social networks; Colorectal neoplasms; Health campaigns; Early detection of cancer; Cancer screening

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Graphical abstract

# Public effect of the 2022 Colorectal Cancer Awareness Campaign delivered through a metaverse platform


**Purpose** To assess the impact of the 2022 Gold Ribbon Campaign held on a metaverse platform

## Methods




27 Colorectal and early-onset colorectal cancer videos

Campaign promoted on multiple social network




Satisfaction scored by gender, age, and past campaign engagement

## Results



From September 1 to 15, 2022, 2,770 visitors participated, and 455 responded to the survey



95% of the participants reported being satisfied with the information provided by campaign

|   |                   |                   |          |         |       |                |   |
|---|-------------------|-------------------|----------|---------|-------|----------------|---|
| Recognition of the seriousness of early-onset CRC | Strongly agree    | 1                 | 7        | 19      | 92    | 363            | Satisfaction with the information about CRC       |
|   | Agree             | 1                 | 3        | 5       | 51    | 313            |   |
|   | Neutral           | 0                 | 3        | 11      | 38    | 21             |   |
|   | Disagree          | 0                 | 1        | 3       | 3     | 2              |   |
|   | Strongly disagree | 0                 | 0        | 0       | 0     | 0              |   |
|   |                   | Strongly disagree | Disagree | Neutral | Agree | Strongly agree | Recognition of the seriousness of early onset CRC |
| Satisfaction with the information about CRC       |                   |                   |          |         |       |                |   |

High positive tendency (P < 0.001)

## Conclusion

Most of the 2022 Gold Ribbon Campaign participants were satisfied with the metaverse platform. Medical society should pay attention to increasing participation in and satisfaction with future public campaigns.

## INTRODUCTION

Colorectal cancer (CRC) is the third most common type of cancer and second most common cause of cancer-related deaths worldwide [1]. The incidence and mortality associated with late-onset CRC, which occurs in people aged 50 years or older, have shown a decreasing tendency owing to the implementation of various cancer screening programs [2]. By contrast, the incidence of early onset CRC (EOCRC), which develops before the age of 50 years, has dramatically increased over the past several decades, especially in high-income countries [3, 4]. According to a recent study, Korea has the highest incidence of CRC worldwide, with 12.9 cases per 100,000 people and an average annual percentage change of 4.2% among individuals aged between 20 and 49 years diagnosed in 2008–2012 [5].

The incidence of CRC has been reduced through screening and early detection [6]. In addition, preventing CRC through screening is highly recommended as a standard practice [7]. To increase awareness of the importance of early diagnosis of CRC, the cancer

awareness campaign called “Be Clear on Cancer” has been held in the United Kingdom since January 2011 to improve public awareness on CRC and encourage the public to seek urgent medical attention [8]. Moreover, March has been designated as the “National Colorectal Cancer Awareness Month” in the United States since 2000 under the slogan “Getting screened could save your life” [9]. The Korean Society of Coloproctology (KSCP) has designated September as the month of annual colorectal cancer awareness since 2007 [10]. These campaigns are collectively called the Gold Ribbon Campaign to raise awareness on CRC and to encourage screening through colonoscopy. Specifically, the 2022 event was held through a metaverse platform to enable active participation under the slogan “Colorectal Cancer? Also in the young! Even the Generation MZ should not feel safe,” targeting the younger age groups. The Generation MZ is a casual neologism in Korea that collectively refers to millennials (born between 1980 and 1994) and Generation Z (born between 1995 and 2015) [11, 12].

The metaverse is a network of 3-dimensional (3D) virtual world that emphasizes social interaction and is a combination of virtual

reality (VR) and augmented reality (AR) [13]. The COVID-19 has made it challenging to interact physically; hence, the Generation MZ, which values virtual world immersion, has become the primary metaverse user [14]. Therefore, the 2022 campaign held in the metaverse was more effective as it encouraged participants to explore the event and promote awareness of EOCRC, mainly among the younger generation. This study aimed to assess the impact of the 2022 Gold Ribbon Campaign held on a metaverse platform.

## METHODS

### Ethics statement

This study was conducted in compliance with the principles of the Declaration of Helsinki. The study protocol was approved as exempt by the Institutional Review Board of Seoul National University Bundang Hospital (No. X-2302-809-901). The requirement for informed consent was waived.

### Construction of a metaverse platform

The overall map image was designed based on the shape of the

large intestine. We strongly conveyed the meaning of the campaign by inserting various virtual content inside the colon. The final planned idea was an intuitive colon-shaped arcade with a central plaza (Fig. 1). The metaverse website can be found at <https://zep.us/play/yobmkd>.

In the timeline, welcome speeches were posted at the main entrance, and the event hosts greeted and informed the guests about the campaign's purpose and the event. The hosts at the entrance notified the guests about the location of each piece of information by indicating the direction. In addition, posters were placed at the location where the campaign's main content was posted, to provide information on the incidence of CRC worldwide. All campaign content were presented as video media and constructed by adding the dubbing and animation effects of professional announcers. Other colon-shaped luminal arcades were fully equipped with CRC-related images. Finally, a counseling room and an escape room were allocated allowing the participants to check the information on the content acquired through this campaign and participate in the quiz event.



Fig. 1. Metaverse map of the 2022 Gold Ribbon Campaign.

## Curation of contents

The metaverse map consisted of a colon-shaped arcade on the luminal side and a central plaza on the mesenteric side. Eighteen objects containing videos related to CRC were arranged on the luminal side and 9 objects containing videos related to EOCRC on the mesenteric side; these videos were selected by the Public Relations Committee of the KSCP from the educational videos on YouTube. The content of the videos on the luminal side included 1 epidemiology, 2 risk factors, 2 symptoms, 4 diagnoses, 1 cancer stage, 5 treatments, and 3 prognoses of CRC. The average length was 12 minutes and 42 seconds (range, 15 seconds to 37 minutes and 26 seconds). The content of the videos on the mesenteric side included 2 epidemiology, 2 risk factors, 1 classifications, 2 diagnoses, 1 cancer stage, and 1 prognosis. The average length was 6 minutes and 38 seconds (range, 1 minute and 55 seconds to 18 minutes and 5 seconds). Six questions were prepared in the escape room (5 true or false questions and 1 short-answer question). The questions and corresponding answers are listed in Fig. 2.

## Promotion of the campaign

We created promotional video clips and advertised the campaign 3 times on Facebook and Instagram online stores. The video showed a campaign poster created by the KSCP and a figure of the EOCRC incidence rates by country, emphasizing that Korea has the highest incidence. At the end of the video, a screen with a link and a quick response (QR) code to the metaverse campaign webpage appeared.

We also placed an advertisement banner showing the entire map of the metaverse platform at the top of each screen on the ZEP website (ZEP). ZEP is a metaverse platform co-operated by Naver Z Corp, a global metaverse corporation servicing Zepeto and Supercat, whose specialties include Report Programming Generator development and 2-dimensional pixel graphics. Furthermore, the campaign was promoted through the Naver Blog

(Naver Corp), which examines and shares knowledge about the metaverse edtech, ZEP, Gather Town (Gather Presence Inc), and virtual exhibition metaboxes. Various prizes were promoted during the campaign, and relevant YouTube videos were shared on Facebook and Instagram.

The campaign was also promoted by various Korean online newspapers. We released promotional articles about the Gold Ribbon Campaign, which were published by 11 Korean online newspapers targeting the Generation MZ. Various lifestyle recommendations aimed at preventing CRC and posters created by the KSCP were provided in the newspapers.

## Data collection

We retrospectively collected the server access data that were automatically recorded when the participants visited the metaverse from September 1 to 15, 2022. We also collected the participants' baseline information—with the guarantee of anonymity—such as sex, age group, and satisfaction score for the campaign's content using a Likert scale. The survey questions are listed in Fig. 3.

## Statistical analysis

Categorical variables were compared using the chi-square test, and a 2-proportion Z-test was used to compare continuous variables. Linear-by-linear association test was used to analyze the association between the survey questions. All reported P-values were 2-tailed, with a P-value of 0.05 indicating a significant difference. All analyses were conducted using IBM SPSS ver. 26 (IBM Corp) and R ver. 4.2.2 (R Foundation for Statistical Computing).

## RESULTS

### Analyses of the campaign participation rate

Facebook and Instagram advertisements were presented to 248,000 users, receiving 23,111 likes and gaining 2,564 link ac-

| Question  | Answer |
|---|--------|
| "Early-onset colorectal cancer" refers to the occurrence of colorectal cancer before the age of 60 years.   | X      |
| People whose parents, brothers, and sisters have a history of colorectal cancer are at an increased risk of developing this condition.  | O      |
| The spread of colorectal cancer to other organs such as the lungs and liver is referred to as stage 3.  | X      |
| Generally, overweight, obesity, excessive drinking, smoking, low dietary fiber intake, and a high-fat diet can be risk factors for colorectal cancer development.   | O      |
| Since colorectal cancer is more prevalent among Western individuals, Koreans should not be concerned about developing this malignancy in the future.  | X      |
| Since more than 95% of colorectal cancer cases occur due to the progression of a small lump called (A), (A) is referred to as the seed of colorectal cancer. Colorectal cancer can be prevented if (A) can be detected and removed in advance by colonoscopy. Provide the one word that will best describe (A). | Polyp  |

Fig. 2. Six survey questions and responses.

| Question  | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|-------------------|----------|---------|-------|----------------|
| 1. Are you satisfied with the overall metaverse?  |                   |          |         |       |                |
| 2. Are you satisfied with the structure of the metaverse for the campaign?  |                   |          |         |       |                |
| 3. Are you satisfied with the information about colorectal cancer?  |                   |          |         |       |                |
| 4. Did you recognize the seriousness of early-onset colorectal cancer and the necessity for screening and prevention? |                   |          |         |       |                |
| 5. Do you want to introduce the metaverse campaign to your acquaintances?   |                   |          |         |       |                |
| 6. Are you willing to participate in next year's campaign?  |                   |          |         |       |                |

Fig. 3. Six survey questions formulated after the campaign.

cesses to the metaverse campaign. A total of 2,770 people visited the metaverse campaign from September 1, 2022 to September 15, 2022 (Fig. 4). Among them, 455 (16.4%) responded to the survey after the campaign. The detailed characteristics of the participants are presented in Table 1.

### Assessment of the campaign satisfaction rates

With regard to the 455 results of the survey on the campaign satisfaction scores, 431 participants (94.8%) were satisfied with the metaverse platform used for the campaign, while 428 (94.0%) were satisfied with the structure of this platform. In addition, 444 participants (97.6%) were satisfied with the information on CRC provided by the metaverse campaign, while 446 participants (98.0%) recognized the seriousness and necessity of screening for and prevention of EOCRC. The details of the satisfaction score survey are shown in Fig. 5.

### Tendency of satisfaction by age group and sex

The results of the survey on satisfaction scores according to age group are shown in Fig. 6. As regards the satisfaction scores for the CRC information and recognition of the seriousness and necessity of screening for and prevention of EOCRC, the score tended to decrease as the age increased. When asked about their overall satisfaction level with the metaverse and structural layout of the platform, teenagers scored particularly low compared with other age groups. According to the results of 2 proportional Z-tests, no significant differences were observed in the percentage between male and female participants when asked if they were satisfied with the questionnaire.

### Association between the survey questions

The satisfaction scores for CRC information provided in the metaverse and the scores for the recognition of the seriousness and necessity of screening for preventing EOCRC showed a conspicuous positive tendency in the contingency table. In the linear-by-linear association test, the satisfaction scores of the 2 questions

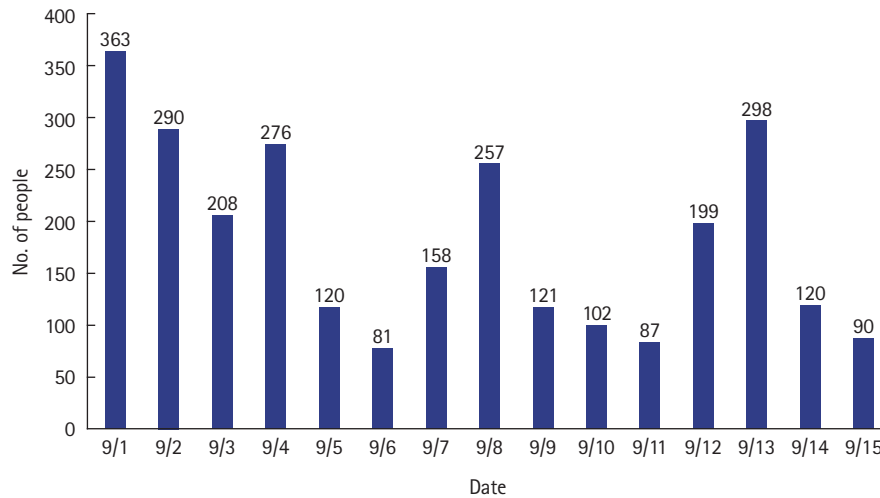
showed a highly positive tendency toward each other (Fig. 7).

## DISCUSSION

This is the first study to analyze the statistical effect of a CRC awareness campaign which was conducted on a novel metaverse platform for the first time. Various studies have been conducted worldwide to promote cancer awareness. However, the 2022 Gold Ribbon Campaign in Korea was conducted using a metaverse platform, a new emerging technology, and participants were surveyed using various questions, including on their level of satisfaction, to measure the campaign's effectiveness.

When designing the Gold Ribbon Campaign using a metaverse platform, the age of the participants should be significantly considered. Users comfortable with 3D games can easily navigate through the metaverse platform. However, if the campaign primarily involves people in their late 40s, individual differences play a significant role in achieving the campaign's purpose. The participants may not be able to deliver content included in the Gold Ribbon Campaign effectively. However, raising awareness on EOCRC was the catchphrase of the 2022 Gold Ribbon Campaign. Therefore, although people of all ages were welcome to participate, a metaverse campaign was conducted to educate the Generation MZ on CRC.

With the development of virtual convergence technology (extended reality, XR), which includes AR and VR, the idea of a metaverse and its applied model is gaining interest [15]. This is an emerging technology in various medical fields [16-18]. Patients with posttraumatic stress disorder can use XR projected on data glasses in order to immerse in the metaverse environment and relieve traumatic events without the risk of physical harm [19]. This approach enables clinicians to assist patients in isolating triggers and building resistance to prevent future attacks. The metaverse can also be a powerful environmental tool for providing education and training [20, 21]. Medical students can learn to perform life-saving surgery in the metaverse at a virtual university before



**Fig. 4.** Number of people who visited the metaverse platform (server visit history) during the campaign from September 1 to 15, 2022. A total of 2,770 people accessed the platform over 15 days.

**Table 1.** Characteristics of the participants who responded to the survey after the metaverse campaign

| Characteristic                       | Total (n = 455) | Age (%)           |                  | P-value |
|--------------------------------------|-----------------|-------------------|------------------|---------|
|                                      |                 | < 50 yr (n = 397) | ≥ 50 yr (n = 58) |         |
| Sex                                  |                 |                   |                  | 0.110   |
| Female                               | 256             | 229 (89.5)        | 27 (10.5)        |         |
| Male                                 | 199             | 168 (84.4)        | 31 (15.6)        |         |
| Previous campaign participation      |                 |                   |                  | 0.005   |
| No                                   | 361             | 323 (89.5)        | 38 (10.5)        |         |
| Yes                                  | 94              | 74 (78.7)         | 20 (21.3)        |         |
| Route of campaign participation      |                 |                   |                  |         |
| Friend or acquaintance ecommendation | 98              | 86 (87.8)         | 12 (12.2)        |         |
| Facebook                             | 98              | 89 (90.8)         | 9 (9.2)          |         |
| Instagram                            | 77              | 67 (87.0)         | 10 (13.0)        |         |
| Online newspaper                     | 71              | 59 (83.1)         | 12 (16.9)        |         |
| ZEP banner                           | 40              | 37 (92.5)         | 3 (7.5)          |         |
| Poster in hospital                   | 30              | 27 (90.0)         | 3 (10.0)         |         |
| YouTube                              | 14              | 9 (64.3)          | 5 (35.7)         |         |
| Conference poster                    | 13              | 11 (84.6)         | 2 (15.4)         |         |
| Naver Blog                           | 8               | 8 (100)           | 0 (0)            |         |
| Others                               | 6               | 4 (66.7)          | 2 (33.3)         |         |

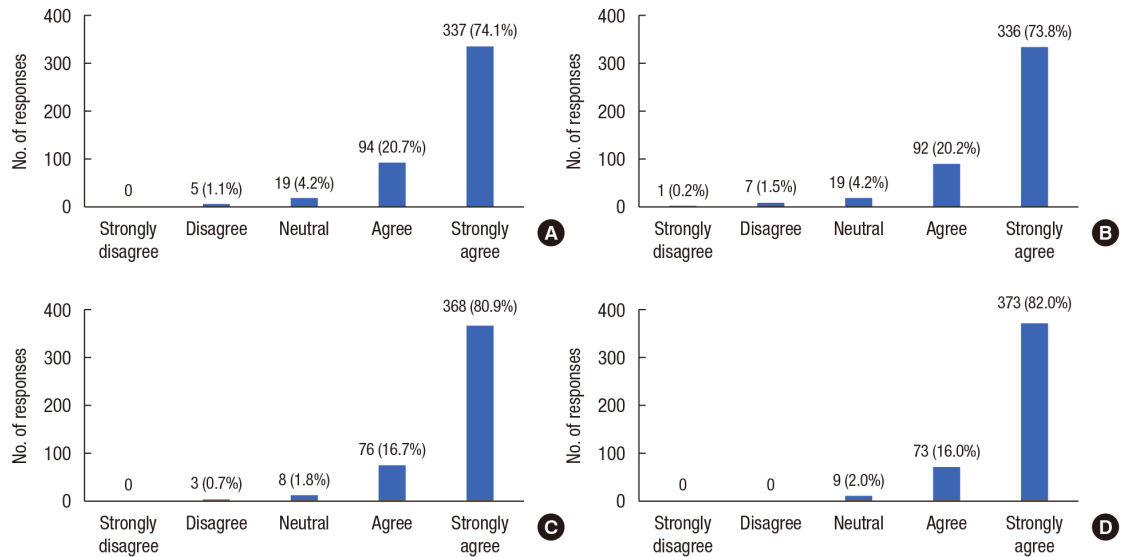
The rate of participation through social network sites, including Facebook, Instagram, and YouTube, reached 41.5%.

attempting it on actual patients [22]. Students can also participate in metaverse activities after setting up their avatars and entering a virtual classroom where they can attend lectures about surgery techniques [23].

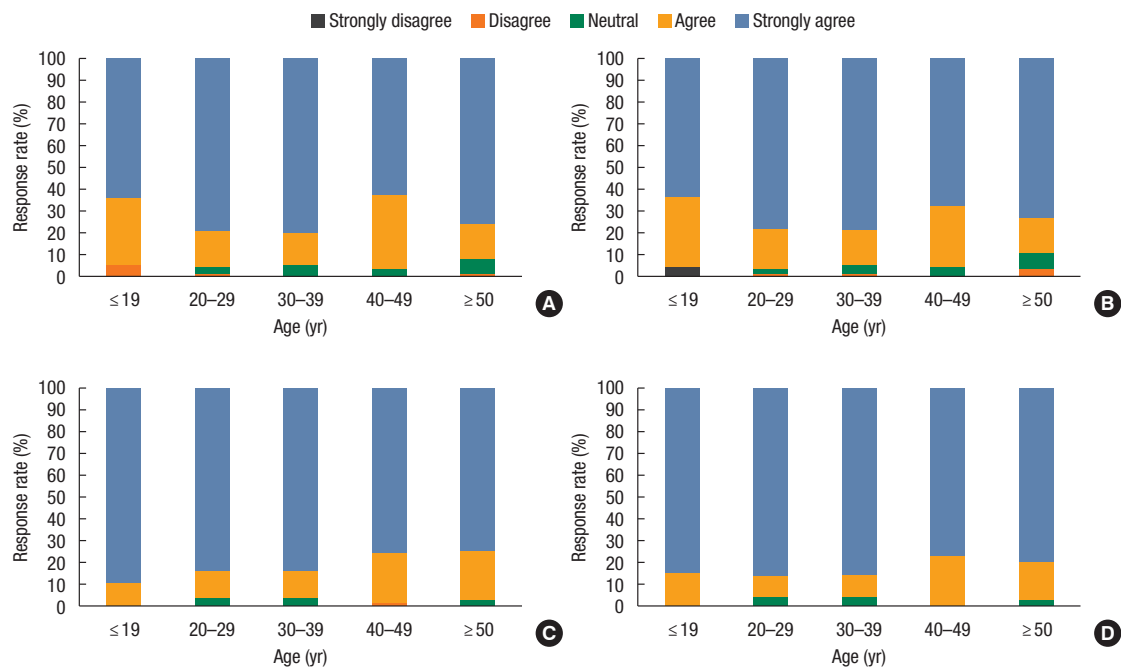
Awareness campaigns have been conducted worldwide, and their effectiveness has been analyzed [24–26]. The World Gynecologic Oncology Day was promoted and analyzed on Twitter [27]. In addition, our previous study conducted in 2014 indicated how often the Gold Ribbon Campaign was mentioned on Twitter to assess the improvements in CRC awareness after the campaign

[28].

The 2022 Gold Ribbon Campaign has achieved a significant effect that has met the expectations. The satisfaction score for the information provided through the campaign was higher in the younger age groups. This score distribution was particularly noticeable when asked if they recognized the severity of EOCRC and the necessity for screening and prevention, with variations in the distributions of answers corresponding to EOCRC among participants aged < 50 and > 50 years. The satisfaction score for the metaverse platform and the structural arrangement of the



**Fig. 5.** Satisfaction scores according to the survey questions: (A) Are you satisfied with the overall metaverse? (B) Are you satisfied with the structure of the metaverse for the campaign? (C) Are you satisfied with the information about colorectal cancer? (D) Did you recognize the seriousness of early-onset colorectal cancer and the necessity for screening and prevention? More than 90% of the participants answered that they were satisfied with all the questions.



**Fig. 6.** Satisfaction score by age group according to the survey questions: (A) Are you satisfied with the overall metaverse? (B) Are you satisfied with the structure of the metaverse for the campaign? (C) Are you satisfied with the information about colorectal cancer? (D) Did you recognize the seriousness of early-onset colorectal cancer and the necessity for screening and prevention? The scores of the teenagers were particularly low in (A) and (B). As the age increased, the scores tended to decrease in (C) and (D).

metaverse showed a decreasing tendency among teenagers; this finding suggests that the graphics on the metaverse map did not meet the expectations of young individuals who enjoy playing 3D games with high-level graphics. In addition, the higher the satis-

faction with the CRC information provided through the campaign, the higher the cognitive score for the severity of EOCRC. The high-quality image content of CRC significantly conveyed the severity of EOCRC, which was the primary purpose of the cam-

|   |                   |                   |          |          |          |                |          |
|---|-------------------|-------------------|----------|----------|----------|----------------|----------|
| Recognition of the seriousness of early-onset CRC | Strongly agree    | 1                 | 7        | 19       | 92       | 363            | <0.001   |
|   | Agree             | 1                 | 3        | 5        | 51       | 313            |          |
|   | Neutral           | 0                 | 3        | 11       | 38       | 21             |          |
|   | Disagree          | 0                 | 1        | 3        | 3        | 2              |          |
|   | Strongly disagree | 0                 | 0        | 0        | 0        | 0              |          |
|   |                   | Strongly disagree | Disagree | Disagree | Disagree | Strongly agree | *P-value |
| Satisfaction with the information about CRC       |                   |                   |          |          |          |                |          |

**Fig. 7.** Contingency table showing the 2 survey questions rated using a Likert scale. The more intense the shade of red, the stronger the correlation between the 2 survey questions. The satisfaction scores of the 2 questions showed an increasing tendency. CRC, colorectal cancer. \*Calculated using the linear-by-linear association test.

paign. Thus, the high-quality video content has played a significant role in conveying the subject, apart from the metaverse’s overall content layout.

This study has some limitations. First, it has a small sample size. Many people visited the metaverse campaign website, although the number of people who responded to the survey after the campaign was lower than the rate expected. As this study assessed the first campaign conducted on a metaverse platform, it was difficult to predict the campaign’s promotional effect and the survey’s response rate. Compared with the number of advertisement exposures through social network sites, such as Facebook and Instagram, the number of metaverse link clicks exceeded 1%, which was lower than the expected rate. Second, a more satisfactory tool should be used for measuring people’s level of satisfaction with the campaigns. The Likert scale is a widely used and excellent indicator for evaluating human satisfaction. However, only 6 questions were asked regarding satisfaction; the scope of the questions could have been more extensive.

In conclusion, most of the 2022 Gold Ribbon Campaign participants seemed to be satisfied with the metaverse campaign according to the post-campaign survey. The goal of raising awareness and conveying accurate knowledge of EOCRC to the younger group, with a focus on the Generation MZ, was successful. Similar to this campaign using a novel metaverse platform, the medical society should pay attention to increasing participation in and satisfaction with future public campaigns.

## ARTICLE INFORMATION

### Conflict of interest

No potential conflict of interest relevant to this article was reported.

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### Author contributions

Conceptualization: HKO, YBC, Chang Woo K, Chan Wook K; Data curation: TGL, GHS, HA, ECH, SH, KHS; Formal analysis: TGL, GHS, SH, KHS; Funding acquisition: HKO, YBC, ECH, Chang Woo K, Chan Wook K; Investigation: TGL, GHS, HA, SK, HJK, SH, KHS; Methodology: HKO, YBC, MB, ECH, SK; Project administration: HKO, YBC, HJK, SK; Resources: MB, ECH, KHS Software: MB, SH, KHS; Supervision: HKO, YBC, Chang Woo K, Chan Wook K; Validation: ECH, SK, HJK, SH; Visualization: MB, ECH, SK, Chang Woo K, HJK, SH, KHS, Chan Wook K; Writing—original draft: TGL, GHS, HA; Writing—review & editing: HKO, MB, ECH, SK, Chang Woo K, HJK, SH, KHS, Chan Wook K, YBC. All authors read and approved the final manuscript.

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