# Increasing knowledge on dementia risk reduction in the general population: Results of a public awareness campaign

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## ARTICLE INFO

## ABSTRACT

Strategies to reduce dementia risk are needed to minimize the burden of this growing public health concern. Most individuals are not aware that dementia risk reduction is possible, let alone how this could be achieved. Health education, such as public awareness campaigns on the topic of dementia risk reduction, can meet this need. A public health campaign (including social media and offering an online individual risk assessment tool) was carried out over a 7-month period in Flanders, Belgium. Impact was assessed in two independent online surveys, before (n = 1003) and after the campaign (n = 1008), in representative samples of adults aged 40–75 years. Questions regarding personal needs, wishes and barriers were also included. After the campaign, more individuals (10.3%) were aware that dementia risk reduction is possible than before the campaign, and more individuals correctly identified 10 out of 12 surveyed modifiable dementia risk and protective factors. However, no differences were observed in low-educated individuals. Further, specific differences in potential needs, wishes and barriers for future campaigns or interventions were observed between demographic strata. The majority of the respondents (89%) indicated that they would welcome more information on improving their brain-health. More than half (54%) also believed that they lacked the necessary knowledge to make brain-healthy behavior changes. In conclusion, effective public awareness campaigns on the topic of dementia risk reduction are feasible and timely, given the state of the evidence. Special efforts need to be made to develop effective campaigns, tailored towards low-educated individuals.

## 1. Introduction

Dementia is a syndrome characterized by cognitive dysfunction causing difficulties in daily life functioning. It is an important cause of disability and death among older adults (Robinson et al., 2015). In 2015, about 47 million people had dementia worldwide and this number is expected to almost triple by 2050 (Prince et al., 2015). In Flanders, the Northern part of Belgium, the number of dementia cases is estimated to increase by more than 40% by 2035 compared to 2018 (The Flanders Centre of Expertise on Dementia, 2021). Currently, there is no curative treatment but multiple modifiable risk and protective factors for dementia (e.g. smoking, hypertension) have been identified. Livingston et al. estimated that up to 40% of dementia cases are attributable to 12 common, potentially modifiable lifestyle factors (Livingston et al., 2020). Consequently, dementia risk reduction (DRR) strategies targeting these factors are receiving more attention and risk reduction guidelines have been published (World Health Organization, 2019).

Nonetheless, the general public seems largely unaware that dementia risk is indeed partially modifiable by adopting a healthy lifestyle and proper management of existing health conditions (Steyaert et al., 2020). A systematic review of dementia literacy surveys in the general population showed that almost half of the individuals believed that dementia is a normal, non-preventable part of aging (Cations et al., 2018). In a recent Dutch study, more than half of the respondents were not aware

that DRR is possible, and knowledge of modifiable risk and protective factors for dementia was poor. However, most participants wanted information on improving their brain health (Heger et al., 2019).

Increasing the general public's awareness that DRR is possible, especially at mid-life, is an important first step towards behavioral change (Deckers et al., 2018; World Health Organization, 2017). The World Health Organization (WHO) is stimulating countries to implement campaigns to increase dementia awareness (World Health Organization, 2017). This initiative was the rationale behind a large-scale health education campaign that was executed in Flanders. The aim of the accompanying survey was threefold: firstly, to evaluate differences in knowledge before and after the campaign; secondly, to identify groups in the population with poor awareness; thirdly, to assess needs and wishes for future preventive strategies. We hypothesized that more people would be aware of DRR and its modifiable risk and protective factors after the campaign compared to before but that changes differ by population characteristics.

## 2. Methods

### 2.1. Public health campaign

A public health campaign to promote awareness of DRR in the Flemish adult population was carried out by the Flanders Centre of Expertise on Dementia in cooperation with regional centers of expertise, the Flemish pharmacies network, the Flemish Institute on Healthy Living and the Alzheimer Liga. The initiative was based on a successful awareness campaign previously developed and executed in the Netherlands (Heger et al., 2020). It started on World Alzheimer's Day (Sep 21st 2018) and ended in March 2019. The campaign focused on 12 modifiable risk and protective factors for dementia (e.g. cognitive activity, healthy diet, physical activity, smoking, diabetes, obesity), which make up the well-validated 'LIfestyle for BRAin health' (LIBRA) score (Deckers et al., 2020; Deckers et al., 2019a; Deckers et al., 2018; Deckers et al., 2019b; Pons et al., 2018; Schiepers et al., 2018; Vos et al., 2017). The campaign was named SaniMemorix and consisted of several parts. Press releases were issued to public media, such as newspapers, magazines, radio stations and other outlets. Social media messages were posted by the Flanders Centre of Expertise on Dementia and their partner organizations. Further, 40,000 "vaccine boxes against dementia" were distributed by volunteers (including the Belgian Minister of Health) at train stations, local markets and pharmacies (Appendix A). The boxes contained an empty blister pack that symbolized the 12 LIBRA factors and a leaflet with more detailed information. The leaflet also displayed personal messages from well-known Flemish people, health experts and scientists. The boxes contained a packet of unsalted nuts, symbolizing the importance of a brain-healthy diet because of their vascular and cognitive health benefits (Pistollato et al., 2018; Valls-Pedret et al., 2015). Pharmacies distributed leaflets through a SaniMemorix display on their counter. All campaign materials referred to a campaign website, where more information including an infographic video could be found. People could complete an online screening tool that assessed the 12 LIBRA factors and showed individuals their personal room for improvement.

### 2.2. Study population & measurements

Online surveys before and after the public awareness campaign were set up by the Flanders Centre of Expertise on Dementia, in collaboration with the Alzheimer Centre Limburg (Maastricht University, the Netherlands). The population samples drawn for each of these two surveys consisted of different individuals to avoid a potential learning effect induced by our study. These two survey samples will be referred to as the pre-campaign sample (08/'18) and the post-campaign sample (04/'19). The surveys were carried out by a market survey company (Ipsos, Antwerp, Belgium). The target population were Flemish adults

aged 40–75 years old. Sampling was stratified by sex, age and region (urban versus rural) to ensure representative samples. Respondents originated from an existing sampling frame. People entered the sampling frame by completing an online recruitment survey and accepting the terms and conditions. The respondent was informed at that time and gave consent in writing or electronically. All personal data were confidentially kept by the company and respondents receive suitable incentives for their time.

Survey items originated from an awareness survey employed earlier (Heger et al., 2019; Heger et al., 2020). Briefly, the primary outcome measure was the proportion of participants aware of DRR. Participants were asked about their awareness of the 12 LIBRA factors in the context of dementia risk. The proportion of participants aware of each of these was a secondary outcome measure. To assess these measures, items were set up as statements to which the participant could respond on a 5-point Likert scale, ranging from "Strongly disagree" (5 points) to "Strongly agree" (1 point). All statements about LIBRA factors were set up to be correct (e.g. "Smoking increases your risk for dementia"). The statement on general DRR awareness was set up to be incorrect. An individual was considered to be aware of DRR in general or a specific LIBRA factor when he/she (strongly) (dis)agreed with the given statement. To evaluate a participant's overall knowledge of all 12 LIBRA factors, the points were summed up (range 12–60). This was used as another secondary outcome measure. Participants also completed questions concerning sociodemographic characteristics, self-reported knowledge on dementia and familiarity with dementia. Educational level was categorized according to the International Standard Classification of Education (ISCED 2011) system into low-educated (ISCED 0–2; 0–11 years formal education), intermediate-educated (ISCED 3–4; 12–14 years formal education), and high-educated (ISCED 5–8; ≥15 years formal education) (UNESCO Institute for Statistics, 2012). Participants were asked about their interest in information on improving their brain health, their preferred information sources, subjective barriers to engage in brain-healthy behavior and motivation to use a smartphone application to support a brain-healthy lifestyle. The post-campaign participants answered several additional questions about the campaign reach and initiated health behaviors. An English translation of the survey can be found in Appendix B.

### 2.3. Statistical analyses

To test the primary outcome, a chi-squared test was used to compare the proportion of participants aware of DDR pre- and post-campaign. The secondary outcome measure of overall knowledge of LIBRA factors was compared pre- and post-campaign using a Mann-Whitney $U$ test. Overall knowledge of LIBRA factors was also compared among demographically diverse groups. When comparing more than two groups, this was done with a Kruskal-Wallis test, followed by Mann-Whitney $U$ tests. Otherwise, only a Mann-Whitney $U$ test was used. Mean age was compared between the two survey samples using an independent samples $t$-test. All other comparisons were carried out using chi-squared tests. All tests were performed two-sided with an alpha level set at 0.05. Analyses were done using SPSS Statistics version 26 (IBM Corp., Armonk, N.Y., USA).

## 3. Results

### 3.1. Population characteristics

The pre-campaign and post-campaign sample consisted of 1003 and 1008 respondents; respectively. The two samples did not differ significantly in terms of demographic characteristics or familiarity with dementia (Table 1).

**Table 1**

Sample demographic characteristics and familiarity with dementia in 40-to-75-year-old adults from Flanders (Belgium), surveyed in 08/'18 (pre-campaign) and 04/'19 (post-campaign).

| | Pre-campaign | Post-campaign | p-value |
|---|---|---|---|
| | n = 1003 | n = 1008 | |
| Female sex, n (%) | 502 (50.0) | 507 (50.3) | 0.912 |
| Urban residence, n (%) | 498 (49.7) | 487 (48.3) | 0.549 |
| Age (years), mean (SD[1]) | 56.3 (9.3) | 56.7 (9.7) | 0.343 |
| **Age group (years), n (%)** | | | |
| 40–50 | 321 (32.0) | 315 (31.3) | 0.934 |
| 51–60 | 323 (32.2) | 327 (32.4) | |
| 61–75 | 359 (35.8) | 366 (36.3) | |
| **Educational level, n (%)** | | | |
| Low | 179 (17.8) | 178 (17.7) | 0.144 |
| Intermediate | 432 (43.1) | 395 (39.2) | |
| High | 392 (39.1) | 435 (43.2) | |
| **Marital status, n (%)** | | | |
| Married/living together | 645 (64.3) | 660 (65.5) | 0.452 |
| Not married, never been married | 136 (13.6) | 111 (11.0) | |
| Divorced | 162 (16.2) | 179 (17.8) | |
| Widowed | 49 (4.9) | 46 (4.6) | |
| Other | 11 (1.1) | 12 (1.2) | |
| **Familiarity with dementia** | | | |
| Excellent, good or considerable self-reported dementia knowledge, n (%) | 767 (76.5) | 741 (73.5) | 0.126 |
| Knows someone with dementia, n (%) | 737 (73.5) | 723 (71.7) | 0.378 |

[1] Standard deviation (SD).

### 3.2. Pre-campaign awareness

Before the campaign, 65.5% of respondents did not know that DRR is possible, and 21.6% could not identify a single LIBRA factor. People with a high level of education (a), people with considerable, good or excellent self-reported knowledge on dementia (b) and people who knew someone with dementia personally (c) were more likely to be aware of DRR ((a) p ≤ 0.010, compared to low- and intermediate educated people; (b) p < 0.001, compared to people with poor self-reported dementia knowledge; (c) p = 0.026, compared to people who did not know someone with dementia). These groups of people also identified more LIBRA factors correctly ((a) p < 0.001, (b) p = 0.001, (c) p = 0.005; same reference groups as above). Men identified more LIBRA factors than women did (p = 0.005).

### 3.3. Campaign reach

Two percent of the post-campaign sample recognized examples of the campaign material and 37.5% expressed they heard something new about DRR during the last year. The most common information sources were television (21.5%), newspaper (15.2%) or radio (7.6%). Seventy-four percent of the 40–50-year-old respondents indicated they did not hear about the topic anywhere compared to 52.7% of the 61–75-year-old respondents (p < 0.001). The 40–50-year-old respondents also heard about the topic significantly less on television (p = 0.005) or in the newspaper (p < 0.001) compared to older respondents. Thirty-four percent of respondents indicated they got more aware of their brain health and the relationship between lifestyle and brain health in the past year. The online screening-tool website was visited 24,700 times by
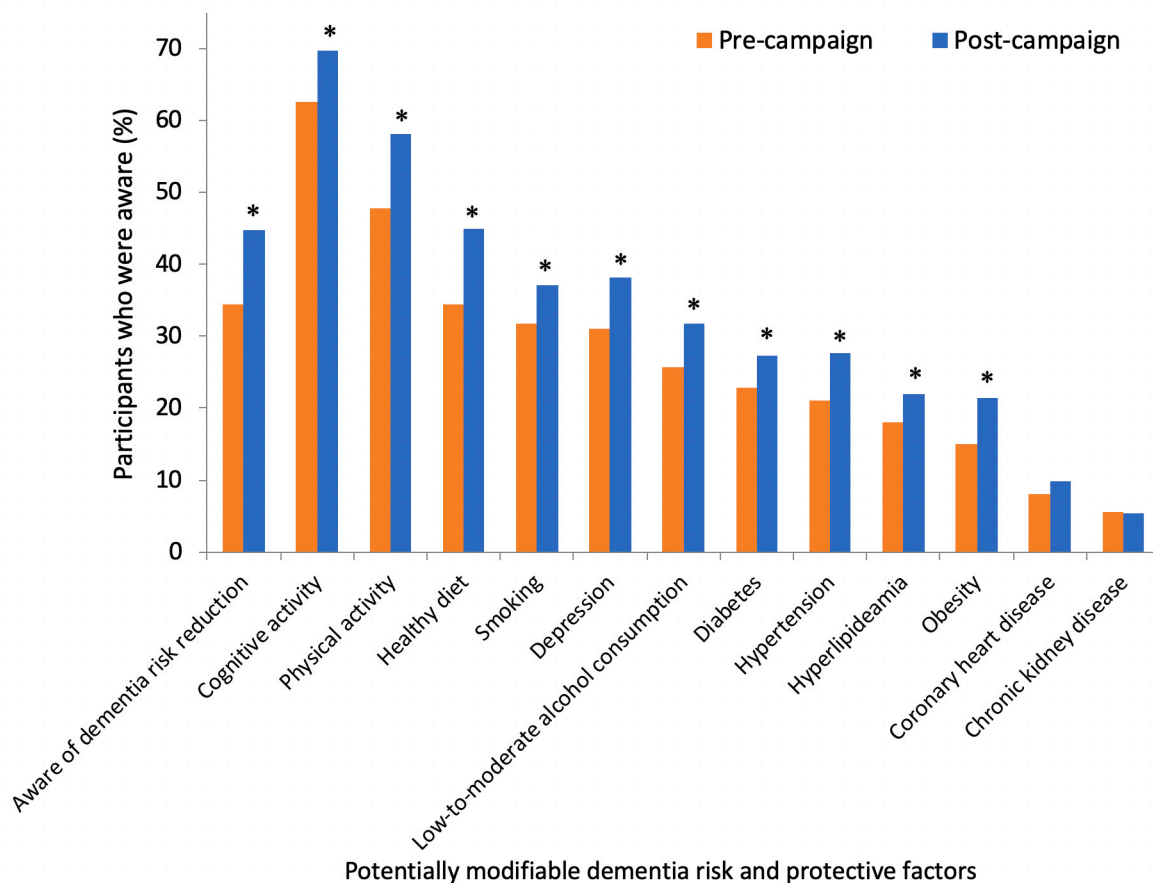


**Fig. 1.** Knowledge of dementia risk reduction was higher after the campaign.
Differences tested using chi-squared tests. *: significant difference compared to pre-campaign sample (p < 0.05).

19,910 individuals.

### 3.4. Comparison of pre- and post-campaign knowledge

After the campaign, the proportion of respondents aware of DRR was higher than before the campaign (34.5% versus 44.8%; p < 0.001; Fig. 1). Particularly, respondents who indicated they heard about DRR in the past year were more aware (56.9%) than the pre-campaign sample (p < 0.001). Awareness was not significantly different (37.6%) for those post-campaign respondents who had not heard about DRR.

The pre-post campaign difference in awareness was observed in both sexes, all age categories, rural and urban living individuals and people with high and intermediate education. The increase in awareness was not significant in low-educated respondents (Fig. 2).

The number of correctly identified LIBRA factors was higher post-campaign (median (interquartile range): pre-campaign: 3 (4), post-campaign: 4 (5), p < 0.001). Except for the risk factors coronary heart disease and chronic kidney disease, the proportion of respondents aware of all other LIBRA factors was higher after the campaign (Fig. 1). Knowledge of LIBRA factors was higher only in individuals who actually heard about DRR during the last year (p < 0.001) and not in those who had not. The youngest age category (40–50 years old) did not show a difference in overall knowledge of LIBRA factors over the course of the campaign, contrary to older individuals (51–60 and 61–75 years old: p ≤ 0.001). Knowledge of LIBRA factors also did not differ significantly between the pre- and post-campaign sample in low-educated individuals, in contrast to intermediate- and high-educated respondents (intermediate: p = 0.002; high: p = 0.019).

### 3.5. Interest in information on dementia risk reduction

In the post-campaign survey, 59.4% of the participants stated they would like to receive more information on how to improve their brain health. 30.8% was maybe interested in this information and 9.8% was uninterested, which was similar to the pre-campaign survey. The general practitioner (GP) was preferred most often as the primary source of information (Fig. 3).

Specific preferences for certain information sources were observed. Individuals of 61–75 years favored the GP more than their youngest counterparts (40–50 years old, p = 0.007). The preference for an internet search showed the opposite pattern (p = 0.010). The government-supported, non-profit organization's website, providing information about dementia (prevention), www.dementie.be, was popular among high-educated individuals (57.9%) but less among intermediate- (51.1%) and low-educated individuals (43.8%; p = 0.005).
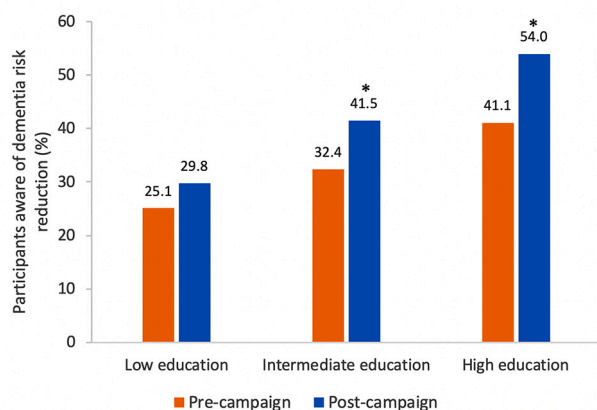
Most respondents indicated they would definitely (41.7%) or maybe (40.1%) use a smartphone app to improve their brain health. Individuals who were aware of DRR were more interested in using an app than unaware individuals (p = 0.002). The appeal of using an app did decrease with increasing age (p = 0.006).

### 3.6. Health behaviors and subjective barriers for brain-healthy living post campaign

Within the post-campaign sample, 80.5% expressed they acted to live healthier during the past year. Most commonly mentioned was engaging in more physical activity (45.5%), followed by eating healthier (39.5%). Watching your body weight and drinking less alcohol were said to be implemented by 35.1% and 21.5% of respondents, respectively. In the post-campaign sample, 25.7% also indicated they had started living healthier, specifically to improve their brain health.

Lack of knowledge regarding DRR was the most commonly mentioned barrier to live brain-healthy (endorsed by 54.4% of the post-campaign respondents), followed by lack of motivation (23.6%), financial barriers (20.1%) and lack of time (18.8%). A number of specific differences in subjective barriers were noted. Men more often endorsed lack of knowledge (men: 60.1%; women: 48.7%; p < 0.001) and lack of motivation than women did (men: 27.9%; women: 19.3%; p = 0.001). Further, the oldest respondents (61–75 years old) expressed they lacked knowledge more often than their youngest counterparts (40–50 years old; 59.3% versus 49.2%, p = 0.030). The younger the individuals, the more often they mentioned lack of time as a barrier (p < 0.001): 7.9% of the 61–75 years old respondents considered it a barrier, while this proportion was 18.0% in the 51–60 years old respondents and even 32.4% in the 40–50 years old category. On the other hand, financial barriers were mentioned less often by the oldest (p = 0.022) and high-educated individuals (p < 0.001). Lastly, the higher the educational level, the more often lack of time was considered a barrier (p < 0.001).

## 4. Discussion

A public health education campaign was conducted to increase the population's knowledge on DRR in Flanders, Belgium. After the campaign, a significantly larger proportion of individuals was aware that DRR is possible. Additionally, on 10 out of 12 surveyed potentially modifiable dementia risk and protective factors, the proportion of individuals who correctly identified them was higher post campaign. Similar increases in awareness were observed across age, sex and urban versus rural dwelling, but were more modest in low-educated individuals. The most common barrier for behavior change was lack of knowledge, and most people expressed they would like to obtain more information on improving their brain health.

### 4.1. Campaign reach and pre-post campaign knowledge differences

While few people recognized examples of the campaign material, many more indicated they heard about DRR in the media during the past year. Indeed, the campaign generated considerable media attention in Flanders, which might have translated in significantly more knowledge on the topic in the population. Additional media messaging, not directly related to the initial campaign strategy, probably supported this positive trend. For example, television was indicated by many respondents as an information source, even though television broadcasting was not part of the initial campaign strategy.

Younger individuals seem to have been reached less by the campaign message. Currently, the reason for this is unclear. This may however explain their stable level of knowledge on LIBRA factors between pre- and post-campaign measurement. Reaching younger individuals on the topic of DRR seems challenging, even when using positive framing like "promoting brain health" (Heger et al., 2020). Our group recently published the results of an earlier public health campaign, that was
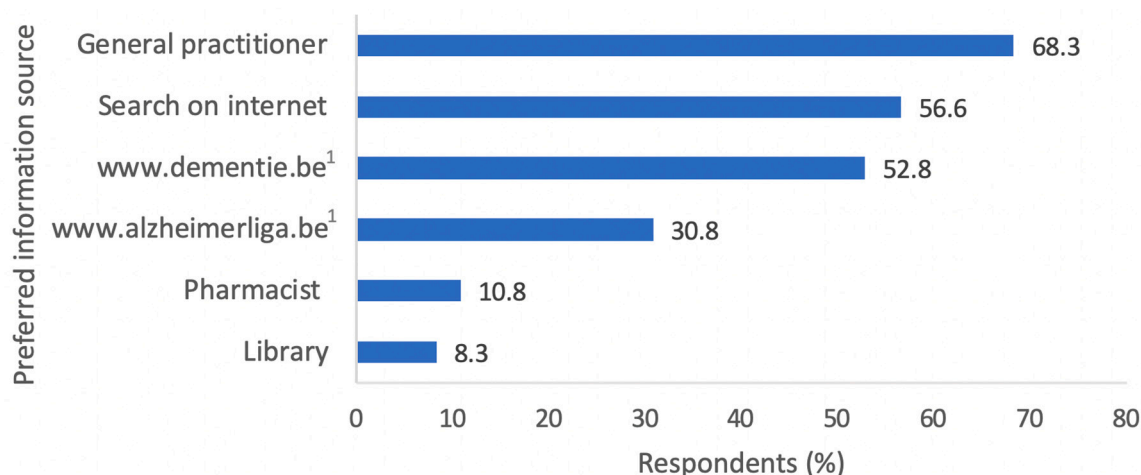


**Fig. 2.** Differences in pre-post campaign awareness across educational groups. Differences tested using chi-squared tests. *: significant difference compared to pre-campaign sample (p < 0.05).

**Fig. 3.** Preferred information sources regarding dementia risk reduction in post-campaign sample.[11]

conducted in Limburg, the Netherlands targeting the same population (Heger et al., 2020). This campaign employed community participation next to mass media materials and eHealth. The Dutch campaign succeeded in producing memorable campaign material (20% recognized the material during the post-campaign survey), but a population-level difference in knowledge was not observed. However, people who indicated having heard about the campaign through the media were more aware of DRR. The respondents in that study were older and the proportion aware of DRR (44%) was higher before the campaign. The Dutch campaign also had to rely mainly on regional and local media channels while the Flemish campaign reached a number of large, national media outlets. These differences may partially explain the contradictory findings.

Other studies evaluating awareness campaigns on DRR are scarce (Farrow, 2013; Hickey et al., 2019). One study assessed the usefulness of a website containing information about DRR, as rated by the website's visitors. While found useful by its visitors, there was no pre-post population-level evaluation (Farrow, 2013). Another public awareness campaign on dementia in Ireland, did find a population-level increase in DRR awareness after 2 years. Like our campaign, it employed national mass media outlets and social media but also community activation (Hickey et al., 2019). When further extending the scope to campaigns directed at other health awareness themes, such as increasing awareness of alcohol as a carcinogen (Christensen et al., 2019; Martin et al., 2018) or increasing parents' awareness surrounding healthy behaviors of children (Bell et al., 2013; Orr et al., 2010), similar findings are frequently observed. These mass media campaigns were successful in delivering the campaign message and increasing awareness on the respective topic (Bell et al., 2013; Christensen et al., 2019; Martin et al., 2018; Orr et al., 2010). These findings align with the notion that using large mass media outlets are often appropriate to increase population-level awareness on health topics (World Health Organization, 2021). However, there is no one-size-fits all strategy when it comes to realizing a successful health promotion campaign. Many factors can – and have been shown to – influence its impact and should be considered when developing a communication strategy (Snyder, 2007).

### 4.2. Lower uptake of health messages in low-educated individuals

While there was an increase in awareness on average, knowledge of DRR pre- and post-campaign did not differ significantly in low-educated individuals (Fig. 2). It seems that messages about DRR did reach them, since respondents of all educational levels indicated to have heard about the topic to a similar extent. Low-educated respondents were the smallest group in this survey (n = 357, 18% of all respondents), which

could have reduced the power to detect a significant difference in awareness. Further, the low-educated respondents were older and less interested in receiving information on DRR. This lack of improvement in low-educated individuals is commonly seen with health education campaigns. Health education strategies and especially mass media campaigns tend to be less effective in people with a low socioeconomic status (Lorenc et al., 2013; Thomson et al., 2006). Ways to improve this may include choosing another information channel (e.g. social media or television instead of newspaper), community engagement (especially when community members partake in the delivery of the intervention) and in-person education (Mabweazara et al., 2019; Niederdeppe et al., 2008; O'Mara-Eves et al., 2015; Thomson et al., 2006; Weinmann et al., 2018).

### 4.3. Knowledge of dementia risk reduction

Before the campaign, knowledge of DRR in Flanders was poor, but comparable to other European and Australian survey studies (Heger et al., 2019; Leon et al., 2015; Luck et al., 2012; Marcinkiewicz and Reid, 2015; Smith et al., 2014; Stevens et al., 2018). Often, the protective factors cognitive activity and physical activity are among the ones most commonly recognized (Cations et al., 2018; Heger et al., 2019; Luck et al., 2012; Marcinkiewicz and Reid, 2015; Smith et al., 2014; Stevens et al., 2018). On the other hand, recognition of cardiovascular risk factors for dementia is generally very limited (Cations et al., 2018; Heger et al., 2019; Marcinkiewicz and Reid, 2015; Parial et al., 2020). Therefore, health education strategies to increase the population's awareness on the link between cardiovascular and brain health are recommended (Parial et al., 2020). One effective way of health education would be through primary care by implementing it next to the existing cardiovascular risk management (Collins et al., 2019; Godbee et al., 2019; O'Donnell et al., 2015; Steyaert et al., 2020). This is supported by the 68% of respondents who prefer receiving information on improving their brain health from their GP.

### 4.4. Implications for future public health strategies

This study showed that DRR awareness can be increased in the target population of middle-aged individuals. Most respondents found they lacked the necessary knowledge to make beneficial changes to their lifestyle and wanted more information on DRR. Obtaining this information from a primary care physician was preferred most often, even more so with increasing age. This could for example be implemented with a program such as the National Health Service (NHS; UK) Health Check, where 40-to-74 year old individuals are invited to discuss their

risk for conditions such as heart disease and dementia and are informed about ways to prevent them by a (primary) healthcare professional (National Health Service, 2019). Accessing information through the internet was another popular information source, in particular for younger individuals. The government-supported website (www.dementie.be) was less popular among low- and intermediate-educated individuals. The reason for this is currently unclear. Some studies have suggested that low educational attainment or low health literacy could be associated with a lower ability to evaluate online health information and a lower quality rating of high-quality websites (Diviani et al., 2015). These government-supported websites should be appealing and comprehensible for everyone, ideally making them the preferred information source when looking for information online. Furthermore, most participants expressed they would be interested in using a smartphone app to support them in living brain-healthier. Hence, offering a mobile app to promote brain-healthy behavior, next to advice from the GP, could be a useful supportive strategy. This is particularly the case for younger individuals since older individuals are still less likely to own a smartphone, less likely to be interested in health-related apps and less likely to use health apps (Bertholet et al., 2019; Ernsting et al., 2017; Raghunathan et al., 2018). When developing interventions to promote (brain-)healthy living, time-efficient solutions to do this should be sought, especially when targeting younger and higher educated people. Potential financial limitations to engage in brain-healthy behavior should be kept in mind as well, in particular for low-educated individuals or more generally individuals with a low socioeconomic status.

### 4.5. Study strengths and limitations

Strengths of this study include the sizeable and independent samples. The survey samples were slightly higher educated (high-educated: 41%) than the general population (high-educated: 37%) but overall representative (StatBel, 2020). The utilized surveys are comprehensive and allow for cross-country comparisons since they were employed elsewhere (Heger et al., 2019; Marcinkiewicz and Reid, 2015). This study is one of the first to report on differences in knowledge before and after a public health education campaign directed at improving awareness on DRR. Knowledge was specifically assessed in adults in mid-life and early late-life who ideally are targeted with a risk reduction strategy (Deckers et al., 2018; World Health Organization, 2017). The campaign focused on multiple risk factors (based on the well-validated LIBRA index; Deckers et al., 2015), as recommended by the WHO (World Health Organization, 2019).

This study also has some limitations. Non-Dutch speaking individuals were not included since the campaign and survey were in Dutch. This could have resulted in exclusion of certain minority groups. Additionally, an online survey was used. Therefore, the participants are people who are at least somewhat familiar with technology. This may have introduced a sampling bias regarding the observed interest in using a smartphone app to improve your brain health and could have led to an overestimation. Finally, we observed a secular trend in DRR awareness in the population before and after the campaign and therefore cannot claim that changes were attributable to the effect of this specific campaign alone.

### 5. Conclusion

There are large gaps in the public's knowledge on DRR. Raising awareness through campaigns including mass media is one potential strategy to close them. Especially on the topic of cardiovascular risk factors for dementia, efforts need to be made to increase knowledge. Special attention should be given to reaching low-educated individuals

as they form a highly vulnerable group that seems to benefit less from a traditional public health approach used here.

### Declaration of Competing Interest

None.

### Appendix. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ypmed.2021.106522.

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