

Dress-p.i.n.k.: an easy-to-use digital tool for Health Promotion and Community-Based Participatory Prevention of Breast Cancer

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Abstract

Breast cancer is the most common malignancy among women worldwide, and early detection and prevention significantly improve outcomes and reduce healthcare costs. Community-based participatory prevention focuses on population health by addressing changes in the social and physical environment, involving intersectoral action, and highlighting community empowerment. Comprehensive community-based prevention efforts provide interventions that predispose, enable, and reinforce behavioral and social changes by individuals and organizations to achieve successful health outcomes. Innovative digital tools are becoming a central strategy for promoting behavioral population-wide change. This study presents the Dress-p.i.n.k., a mobile health tool based on bot technology designed to (a) collect a large amount of data about the lifestyle habits most related to breast cancer onset, directly provided by the population of adult non-pregnant women in Italy, and (b) provide health promotion messages to increase individual awareness of breast cancer risk factors and promote healthy behaviour changes. By integrating a community-based participatory approach, advanced technology and stringent data privacy measures, Dress-p.i.n.k. exemplifies the potential of digital health tools to increase and advance equity in healthy lifestyle knowledge and adoption, as well as in engaging people to provide primary sources of data for scientific purposes in the field of public health research.

Keywords

Breast Cancer, Mobile Health, Personalized Medicine

1. Introduction

Breast cancer (BC) is the most frequently diagnosed cancer and the leading cause of cancer-related death among females in Europe. Research indicates that lifestyle modifications can prevent 30-50 % of cancer cases, making awareness of BC-related risk factors and the promotion of healthy lifestyles essential strategies to mitigate the disease's impact [1, 2, 3]. Community-based participatory prevention aims to empower individuals and groups to control the conditions affecting their health and well-being, promoting behavioral changes at the population level. Recent studies [4, 5] highlight the importance of enhancing cultural assets to reduce disparities in risk factor awareness, thereby promoting good health throughout life also through the use of digital tools like mobile apps [6]. In this context, the mobile health tool Dress-p.i.n.k. ("Doing Risk sElf-assessment and Social health Support") was developed to collect population-based information on BC and its risk factors, promote health literacy by

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disseminating scientific information to enhance knowledge and awareness of these risks, and encourage active participation in health management. This work aims to present the architecture, study design, and initial results of Dress-p.i.n.k..

2. Materials and Methods

The Dress-p.i.n.k. was developed within the Prevention, Imaging, Network, Knowledge (P.I.N.K.) study [7], a multicentric project involving several diagnostic centers across Italy, coordinated by the Italian National Research Council and co-funded by the Umberto Veronesi Foundation. The study aims to identify the most efficient combination of diagnostic imaging techniques for early detection of BC, while also examining the relationship between personal habits and the risk of developing BC. Dress-p.i.n.k. focuses on adult non-pregnant women across Italy. It covers different factors such as sleep quality, anxiety, stress, physical activity, nutrition, and food habits. By offering scheduled questionnaires over a month, Dress-p.i.n.k. ensures continuous user engagement and sustained data monitoring. To comply with the General Data Protection Regulation (GDPR), Dress-p.i.n.k. consists of three components: a Telegram bot (@IFC_PinkBot), a web application, and a NoSQL database. Users can log in with a username and password to answer questions, review past responses, read privacy policies, and view lifestyle suggestions, along with user support features.

The DRESS-p.i.n.k. survey spans approximately 26 days and is divided into daily subgroups of 4-6 questions to ensure user compliance. The questionnaires explore four main areas: (a) dietary habits, (b) personal characteristics and health status, (c) physical activity, and (d) well-being perception [8]. Within the dietary habits section, Dress-p.i.n.k. proposes the Medi-Lite questionnaire [9], which assesses adherence to the Mediterranean Diet. Users receive a score reflecting their adherence to the diet, along with evidence-based suggestions for improving their lifestyle and dietary habits. To enhance communication, responses are illustrated with images [10].

3. Results

The Dress-p.i.n.k. has been accessible since April 2024. At the time of writing, the tool has been used by over 210 women, with more than 64% being below the expected age of 50 for the first mammographic screening. Approximately 94% of users found the Dress-p.i.n.k. easy to use, with older women encountering slightly more difficulties. All women over 29 correctly identified the true purpose of the survey (BC lifestyle-risk relationship). In terms of enhancing health knowledge, the tool significantly increased awareness among nearly 80% of women, particularly among older participants, by providing information on personal features and nutritional habits as risk factors for BC. About 94% of women reported a medium-high level of increased awareness due to the information provided (Figure 1(a)). The effectiveness of the information in modifying personal characteristics or nutritional habits was positively assessed across all age groups. Regarding personal characteristics as BC risk factors, women above 60 reported greater effectiveness of the provided information in increasing knowledge and awareness rather than in promoting change (high usefulness 83.3% vs 75.0%, respectively). Conversely, the youngest women found the provided information more effective. The information provided was highly effective in promoting behavior modification for nutritional habits across all ages (Figure 1(b)). Additionally, as adherence to the Mediterranean Diet increases, so does the perceived usefulness of the information for enhancing knowledge, especially among women with high adherence. Women aged between 50 and 59 (23.4% of users) reported the highest levels of information usefulness, both in terms of increased knowledge and awareness and behavior change. They also reported a very high adherence to the Mediterranean Diet and quite 75% of them are in menopause.

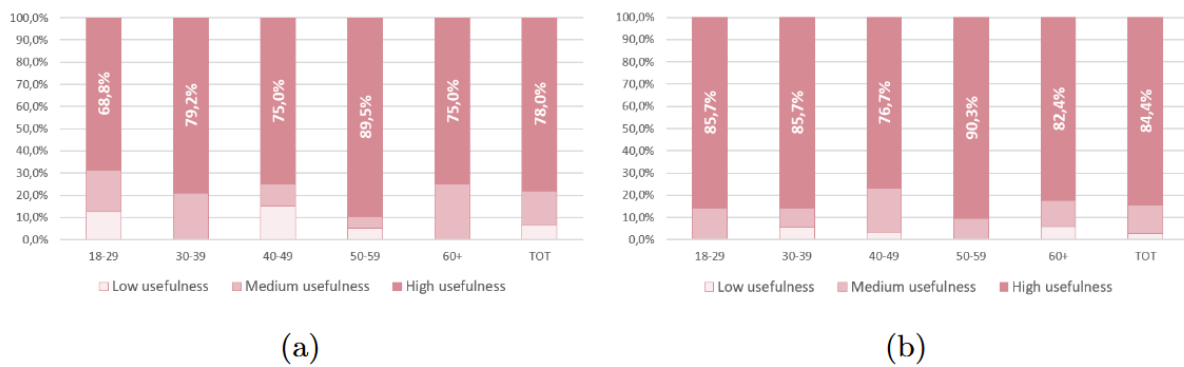


Figure 1: Usefulness of information in (a) modifying personal features and (b) changing nutritional behaviors by age.

4. Discussion and Conclusions

Community-based participatory prevention emphasizes the empowerment of individuals to take responsibility for their health through collaborative efforts. Effective engagement in behavior change requires targeted health promotion strategies and scientifically validated digital health tools. The Dress-p.i.n.k. initiative demonstrates how integrating a community-based approach can enhance equity in adopting healthy lifestyles and involve individuals as primary data sources for public health research. The tool successfully disseminates health information among female populations, encouraging behavioral changes. Users across all age groups find the provided information valuable. It also facilitates targeted health promotion messages based on age, menopausal status, and nutritional habits. In conclusion, although the user base is currently limited, ongoing data collection shows a commitment to evaluating effectiveness. Future researches should assess the efficacy of mobile apps in health promotion in developing countries to expand the reach of tools like Dress-p.i.n.k.

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