

Original Article

Non-adherence to diagnostic colonoscopy after positive faecal screening test

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ABSTRACT

INTRODUCTION. The Danish Colorectal Cancer Screening Programme has achieved a high adherence, in the 88-90% range, to diagnostic colonoscopy following a positive immunochemical faecal occult blood test (iFOBT). However, a small subgroup does not proceed to colonoscopy. This study investigated factors associated with non-adherence to diagnostic colonoscopy in the North Denmark Region (NDR).

METHODS. In 2020, 278 had a positive iFOBT in the NDR and did not undergo subsequent colonoscopy. We conducted a two-part study consisting of 1) a journal audit assessing comorbidity, inflammatory bowel disease (IBD), hospitalisations and colonoscopy history, and 2) a questionnaire exploring self-reported reasons for non-adherence. Among 256 eligible individuals, 169 (66%) completed the questionnaire.

RESULTS. The journal audit revealed that 25% of non-adherent individuals had an ASA score ≥ 3 , 65% had a Charlson Comorbidity Index score ≥ 2 and 10% had known IBD. Furthermore, 20% had undergone a colonoscopy within the preceding two years. Questionnaire responses identified recent colonoscopy ($n = 29$) and haemorrhoids ($n = 30$) as frequent reasons for non-adherence. Many respondents reported non-medical reasons, including perceiving themselves as healthy, lacking understanding of the programme or finding colonoscopy unpleasant.

CONCLUSIONS. Non-adherence to diagnostic colonoscopy after positive iFOBT is often not medically justified. The findings indicate a need for improved patient education. Enhanced general practitioner involvement may help address logistical and informational barriers.

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Colorectal cancer (CRC) is the second most frequently diagnosed cancer and the second leading cause of cancer-related mortality in Europe [1]. In Denmark, approximately 4,500 new CRC cases are diagnosed annually [2]. To improve early CRC detection, the Danish National Colorectal Cancer Screening Programme (CRCSP) was implemented in 2014, utilising the immunochemical faecal occult blood test (iFOBT) as the primary screening tool. Screening participation remains stable at approximately 60%, and among individuals with a positive iFOBT, 88-90% undergo a diagnostic colonoscopy [3]. A nationwide, cross-sectional study from 2014 found that adherence to a diagnostic colonoscopy after submitting a positive iFOBT was 88.6% and predictors for non-adherence were increased age and comorbidity [4].

Evidence suggests that CRC detected through screening is associated with less invasive surgery and earlier-stage disease at diagnosis [5]. Since colonoscopy is the confirmatory test following a positive iFOBT, adherence to

diagnostic colonoscopy is crucial for CRCSP effectiveness.

Prior research has identified several factors influencing screening participation, including comorbidity, logistics, awareness and cultural factors [6]. Qualitative research indicates that non-adherence is not always an intentional refusal; rather, inadequate information and logistical challenges may hinder compliance [7]. However, predictors of not proceeding to colonoscopy after a positive iFOBT remain insufficiently characterised, particularly within healthcare systems where screening and diagnostic services are universally accessible.

The aim of the present study was to identify reasons for non-adherence to diagnostic colonoscopy following a positive iFOBT in the North Denmark Region (NDR). By examining both medical records and patient-reported reasons, we sought to identify potential interventions that may improve adherence and enhance the effectiveness of the CRCSP.

Methods

The CRCSP invites all citizens aged 50-74 years to submit an iFOBT sample. Individuals with faecal haemoglobin concentrations $> 100 \mu\text{g/l}$ are classified as having a positive result and are automatically scheduled for a diagnostic colonoscopy within 14 days [8]. If the patient does not attend the planned colonoscopy, the individual is re-contacted electronically via the secure national E-boks system or by letter once for a new appointment. Participation in both the screening test and the diagnostic evaluation is free of charge.

Study population

Using the Danish Colorectal Cancer Screening Database [9], we identified all individuals in the NDR with a positive iFOBT in 2020. Among the 88,919 citizens invited, 54,715 (62%) participated in the screening, yielding 2,770 positive iFOBTs. The study population comprised individuals who did not undergo diagnostic colonoscopy within two months of a positive result ($n = 278$; 10%).

Study design

The study involved two components: 1) a medical record audit and 2) a questionnaire survey.

Medical record audit

The authors reviewed electronic health records from the five years before the iFOBT test for demographics, comorbidities, inflammatory bowel disease (IBD) diagnosis, hospital admissions within the preceding year, colonoscopy history over the previous eight years and any colonoscopies performed beyond the two-month non-adherence window. The Charlson Comorbidity Index (CCI) original version [10] was calculated for each individual. The American Society of Anesthesiologists (ASA) score was also determined by the authors.

Questionnaire

The questionnaire explored reasons for not completing the scheduled colonoscopy ([see Supplementary material](#)). Participants were presented with 15 predefined response options and could select multiple reasons. An open-text field allowed respondents to provide additional explanations. The questionnaire was distributed via the secure Danish National Digital Mailbox (E-boks). Non-responders and participants without E-boks access were contacted once by telephone.

Individuals were excluded if they were deceased, declined participation, could not be reached or could not communicate effectively in Danish, English, or German.

Free-text answers were analysed using a qualitative content analysis with an inductive approach. Answers were read and analysed multiple times by two authors and condensed into 14 meaningful categories. Discrepancies

were resolved by consensus.

Data management

Data were collected and managed using REDCap and analysed using STATA version 17. The study was approved as institutional quality assurance under Danish guidelines (Regional Ethics Committee waiver -000764) and on 22 April 2022 received approval from the hospital administration, in accordance with Danish national guidelines for approval of quality control studies. All patient information was de-identified, and patient consent was not required as per above. Patient data will not be shared with third parties.

Data availability

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Trial registration: not relevant.

Results

Overall, 278 individuals did not undergo a colonoscopy within two months after their positive iFOBT. Among these, 22 had died before the questionnaire was administered. Of the remaining 256 individuals, 169 responded, yielding a 66% response rate. Demographic data are presented in Table 1.

TABLE 1 Demographic and clinical characteristics of the study population (N = 278).

Gender: female/male, n (%)	138/140 (49.6/50.4)
Age, mean (SD), yrs	64 (8)
Crohn's disease or ulcerative colitis: yes/no, n (%)	26/252 (9.4/90.6)
ASA score 1-2/ ≥ 3 , n (%)	199/79 (71.6/28.4)
Hospital admissions in the previous year: 0/1-2/ ≥ 3 , n (%)	200/59/19 (71.9/21.2/6.8)
Colonoscopy within the past 8 yrs: yes/no, n (%)	113/165 (40.6/59.3)
Charlson Comorbidity Index: 0/1-8, n (%)	98/180 (35.3/64.7)
Colonoscopy > 2 mos. later (specific indication): yes/no, n (%)	53/225 (19.1/80.9)

ASA = American Society of Anesthesiologists.

Questionnaire findings

A total of 104 patients were primary responders; the rest answered by phone. Among respondents, 122 selected one or more predefined reasons for non-adherence, whereas 48 provided only open-text explanations (Figure 1 and Figure 2). The most frequently selected reasons (Figure 1) included: recent colonoscopy (29 respondents), haemorrhoids (30 respondents), colonoscopy perceived as unpleasant (ten respondents) and no clear explanation (19 respondents). The open-text responses (Figure 2) most commonly cited were previous colonoscopy, existing IBD or not receiving the colonoscopy invitation.

FIGURE 1 Reasons for non-adherence to colonoscopy after positive immunochemical faecal occult blood test screening (free-text responses).

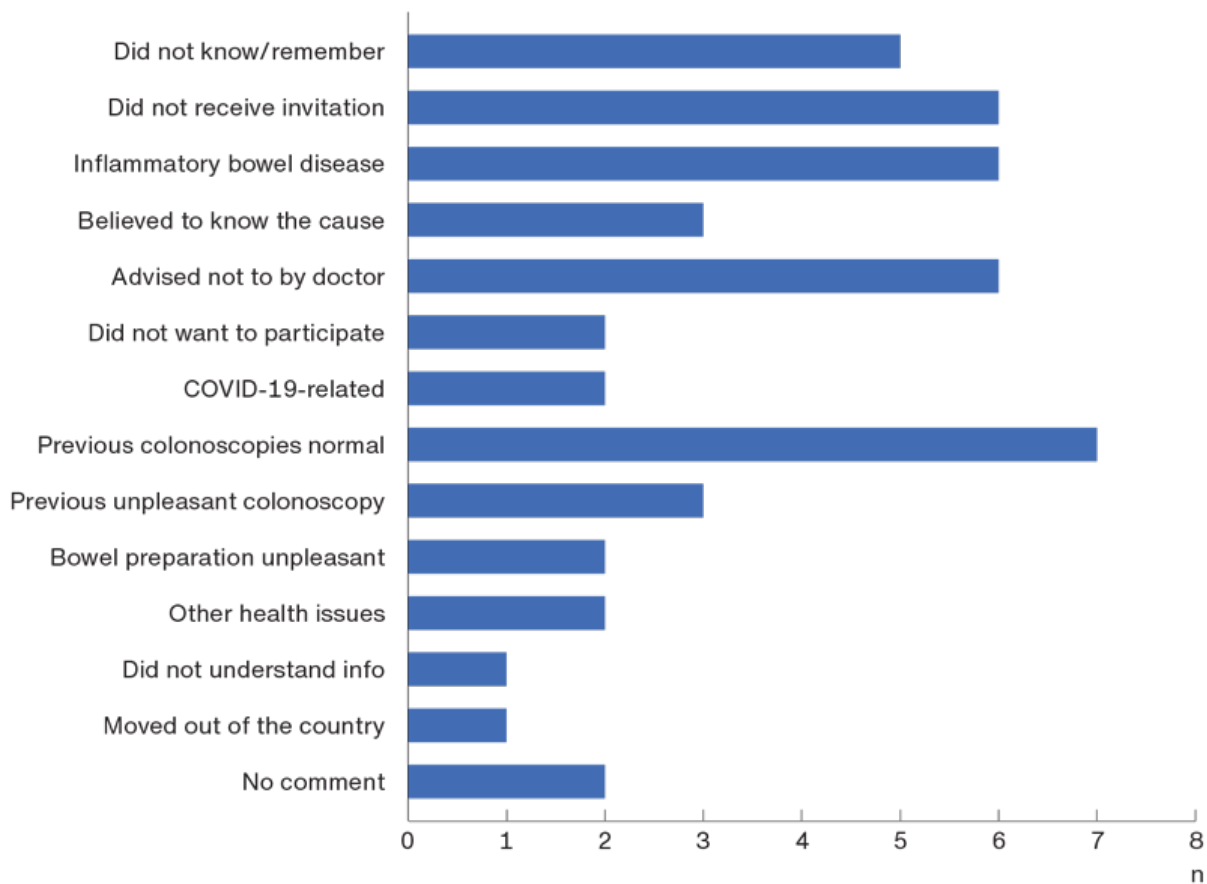
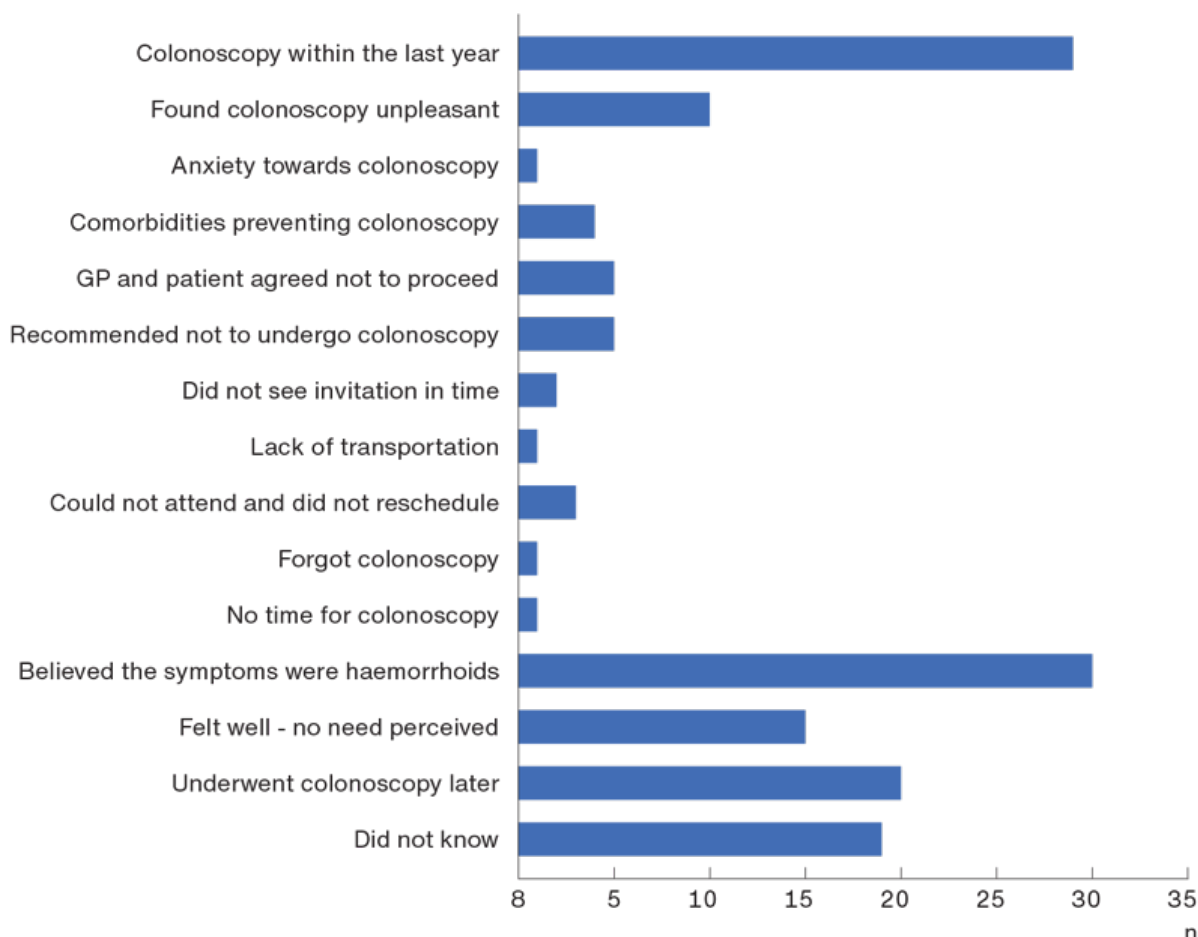


FIGURE 2 Reasons for non-adherence to colonoscopy after positive immunochemical faecal occult blood test screening (checkbox responses).



GP = general practitioner.

Medical record findings

Medical record review revealed that 25% had an ASA score ≥ 3 , 65% had a CCI score ≥ 2 , 10% had diagnosed IBD and 20% had undergone a colonoscopy within the preceding two years for clinical indications. We also conducted a subgroup analysis of 29 patients defined as severely comorbid (malignant tumour with or without metastases, leukaemia, lymphoma or AIDS). Nine responded, and the most frequently cited reasons for non-adherence were not knowing (three respondents) and having too many comorbidities to undergo colonoscopy (two respondents).

Discussion

This study provides insight into the medical and non-medical factors associated with non-adherence to diagnostic colonoscopy following a positive iFOBT in the NDR. Although the study design does not include a control group, the high burden of comorbidity observed – 65% with a CCI score ≥ 2 and 25% with an ASA score ≥ 3 – suggests that clinical vulnerability may influence willingness or ability to attend a CRCSP follow-up. Previous studies have similarly linked comorbidity with reduced screening participation [6]. However, predictors for adhering to a subsequent colonoscopy after a positive iFOBT are less evaluated. A US study

identified lack of healthcare insurance and social barriers as important factors; however, their results are hardly applicable in Denmark, where healthcare and screening programmes are free of charge and available to all Danish citizens [11]. A Danish nationwide, cross-sectional study from 2014 found that adherence to diagnostic colonoscopy after submitting a positive iFOBT was 88.6% and predictors of non-adherence were increased age and comorbidity [4].

One UK study explored why individuals often decline follow-up colonoscopy after abnormal CRCS, using interviews with Specialist Screening Practitioners. Key barriers included psychological fears, sociocultural influences, practical issues, health priorities and COVID-related concerns [12]. However, participation in the Danish CRC screening programme and subsequent compliance with colonoscopy were only slightly affected by the COVID-19 pandemic [13]. A noteworthy finding in our dataset is that one in five non-adherent individuals had already undergone a colonoscopy within the previous two years. The Danish screening invitation material encourages citizens to consider whether they are already enrolled in regular colonoscopic surveillance programmes and informs participants that a positive iFOBT will be followed by an offer of diagnostic colonoscopy. Nevertheless, this finding may suggest limited awareness of the intended role of screening or insufficient communication with general practitioners or gastroenterologists. For these individuals, immediate re-screening may offer limited clinical value.

Non-medical reasons were also prominent, including lack of perceived need, uncertainty about the purpose of the colonoscopy, and discomfort with the procedure. These themes mirror previous qualitative research demonstrating the importance of information clarity and logistical support [7]. Despite the universal accessibility of Danish healthcare, informational and practical challenges remain significant barriers.

Interviews with people from ethnic minority backgrounds in the UK revealed themes such as external locus of control, cultural taboos, reliance on family and health concerns in the decision to attend colonoscopy after CRC screening – highlighting the need for culturally tailored interventions [14]. Furthermore, interviews with patients and Specialist Screening Practitioners in England showed that anxiety – especially about pain, invasiveness and receiving the invitation letter – is a major barrier to attending colonoscopy after a positive stool test. Support from family, friends and professionals, along with clearer information, sedation options and reduced cancer-focused language, were identified as key facilitators [15]. However, a modified invitation letter did not increase adherence to follow-up colonoscopy [16].

An important methodological consideration in the present study is how comorbidity measures are interpreted. The CCI and the ASA classification capture different dimensions of patient health status and are therefore not directly comparable. While the CCI is based on registry-derived diagnostic history and reflects the cumulative disease burden, the ASA is a clinician-assessed measure of functional status and perioperative risk. In Danish CRC cohorts, including data reported in the Danish Colorectal Cancer Group (DCCG) database, ASA distributions are typically skewed towards ASA I-II (approximately 60-75%), whereas CCI distributions generally show that the majority of patients have a score of 0, whereas approximately 10-20% have CCI score ≥ 2 , depending on cohort definition and look-back period.

The relatively high proportion of individuals with an CCI score ≥ 2 in the present study compared with these benchmarks may therefore reflect methodological rather than true differences in underlying health status. First, the CCI in the present study was calculated using the original Charlson algorithm with a fixed look-back period of five years, which may capture a broader range of chronic conditions than modified or weighted versions used in more recent Danish registry studies and DCCG publications. Second, differences in population composition (screening-positive individuals without established cancer versus clinically diagnosed CRC cohorts) may also contribute to differences in comorbidity distribution.

Taken together, the observed discrepancy between ASA and CCI distributions is most likely explained by these conceptual and methodological differences rather than by inconsistencies in data validity. These considerations should be considered when interpreting comorbidity as a determinant of non-adherence.

To improve adherence, targeted patient education should clarify when screening is beneficial, emphasise the need for follow-up after a positive iFOBT and address misconceptions about symptoms or perceived wellness. Enhanced general practitioner involvement may assist in the efforts to contextualise test results, address concerns and support informed decision-making, particularly among patients with multiple comorbidities.

Recall bias is a potential limitation of this study, as participants were asked to report reasons for non-participation to colonoscopy approximately 2-3 years after their initial positive iFOBT in 2020. This delay may have affected the accuracy of the self-reported reasons for non-adherence. In particular, responses regarding “later colonoscopy” may potentially lead to misclassification bias as they may potentially reflect planned surveillance or routine re-invitation rather than intentional non-attendance.

Conclusions

Non-adherence to diagnostic colonoscopy after a positive iFOBT is frequently influenced by lack of understanding, recent colonoscopy or discomfort with the procedure. Improved patient education and strengthened communication between patients, general practitioners and the CRC screening programme might reduce non-adherence. Moreover, individuals with substantial comorbidity or recent colonoscopy may benefit from individualised counselling regarding the risks and benefits of further screening.

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Supplementary files https://content.ugeskriftet.dk/sites/default/files/2026-08/a12251040_supplementary.pdf

REFERENCES

1. Dyba T, Randi G, Bray F, et al. The European cancer burden in 2020: incidence and mortality estimates for 40 countries and 25 major cancers. *Eur J Cancer*. 2021;157:308-347. <https://doi.org/10.1016/j.ejca.2021.07.039>
2. Johannsen IR, Boysen AK, Mortensen FV, Kirkegård J. Temporal trends in incidence and mortality of colorectal cancer in Denmark from 2007 to 2022. *Int J Cancer*. 2025;157(4):634-643. <https://doi.org/10.1002/ijc.35400>
3. Njor SH, Friis-Hansen L, Andersen B, et al. Three years of colorectal cancer screening in Denmark. *Cancer Epidemiol*. 2018;57:39-44. <https://doi.org/10.1016/j.canep.2018.09.003>
4. Thomsen MK, Rasmussen M, Njor SH, Mikkelsen EM. Demographic and comorbidity predictors of adherence to diagnostic colonoscopy in the Danish Colorectal Cancer Screening Program: a nationwide cross-sectional study. *Clin Epidemiol*.

- 2018;10:1733-1742. <https://doi.org/10.2147/CLEP.S176923>
5. Dressler J, Njor SH, Jørgensen LN, Rasmussen M. Less invasive primary treatment for colorectal cancer after implementation of national screening: a nationwide cohort study. *World J Surg.* 2023;47(11):2877-2887. <https://doi.org/10.1007/s00268-023-07142-x>
 6. Dressler J, Johnsen AT, Madsen LJ, et al. Factors affecting patient adherence to publicly funded colorectal cancer screening programmes: a systematic review. *Public Health.* 2021;190:67-74. <https://doi.org/10.1016/j.puhe.2020.10.025>
 7. Phillipsen S, Weltz LK, Dressler J, et al. Barriers for participation in the Danish colorectal cancer screening program: a qualitative study. *J Gastrointest Cancer.* 2023;54(3):873-881. <https://doi.org/10.1007/s12029-022-00876-2>
 8. Kaalby L, Rasmussen M, Zimmermann-Nielsen E, et al. Time to colonoscopy, cancer probability, and precursor lesions in the Danish colorectal cancer screening program. *Clin Epidemiol.* 2019;11:659-667. <https://doi.org/10.2147/CLEP.S206873>
 9. Thomsen MK, Njor SH, Rasmussen M, et al. Validity of data in the Danish Colorectal Cancer Screening Database. *Clin Epidemiol.* 2017;9:105-111. <https://doi.org/10.2147/CLEP.S124454>
 10. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis.* 1987;40(5):373-383. [https://doi.org/10.1016/0021-9681\(87\)90171-8](https://doi.org/10.1016/0021-9681(87)90171-8)
 11. Jetelina KK, Yudkin JS, Miller S, et al. Patient-reported barriers to completing a diagnostic colonoscopy following abnormal fecal immunochemical test among uninsured patients. *J Gen Intern Med.* 2019;34(9):1730-1736. <https://doi.org/10.1007/s11606-019-05117-0>
 12. Kerrison RS, Travis E, Dobson C, et al. Barriers and facilitators to colonoscopy following fecal immunochemical test screening for colorectal cancer: a key informant interview study. *Patient Educ Couns.* 2022;105(6):1652-1662. <https://doi.org/10.1016/j.pec.2021.09.022>
 13. Olesen TB, Jensen H, Møller H, et al. Nationwide participation in FIT-based colorectal cancer screening in Denmark during the COVID-19 pandemic: an observational study. *eLife.* 2023;12:e81808. <https://doi.org/10.7554/eLife.81808>
 14. Kerrison RS, Gil N, Travis E, et al. Barriers to colonoscopy in UK colorectal cancer screening programmes: qualitative interviews with ethnic minority groups. *Psychooncology.* 2023;32(5):779-792. <https://doi.org/10.1002/pon.6123>
 15. Travis E, Kerrison RS, O'Connor DB, Ashley L. Barriers and facilitators to colonoscopy for cancer detection: patient and practitioner perspectives. *Psychol Health.* 2024;39(9):1263-1283. <https://doi.org/10.1080/08870446.2022.2141241>
 16. Travis E, Ashley L, O'Connor DB. Effects of a modified invitation letter to follow-up colonoscopy for bowel cancer detection. *Br J Health Psychol.* 2024;29(2):379-394. <https://doi.org/10.1111/bjhp.12704>