Decision-making in fecal occult blood test compliance: A quali-quantitative study investigating motivational processes☆

G. Broc[a],[*], B. Denis[b], J.-B. Fassier[a], I. Gendre[b], P. Perrin[b], , & B. Quintard[c]

[a] UMRESTTE (UMR T9405), Univ. Claude Bernard Lyon 1, Lyon, France
[b] Association for Colorectal Cancer Screening in Alsace (ADECA Alsace), Colmar, France
[c] Inserm (UMR 1219), Univ. de Bordeaux, Bordeaux, France

ARTICLE INFO

ABSTRACT

The qualitative-quantitative study investigates the co-existence of barriers and levers to FOBT screening in 5894 individuals reluctant to be screened, identifying operational motivational patterns that may increase screening compliance. Co-occurrence analysis was performed according to three motivational conditions (barriers, levers, or both).Cluster analysis then identified motivational predictors of effective screening. One quarter of the individuals who had refused screening nevertheless expressed at least one motivation towards FOBT. As such, co-existence of barriers and levers within the same individual demonstrates ambivalence tendencies. Intrinsic motivations appear to be the most likely to increase FOBT compliance. This study finds that certain factors well-known to improve CRC screening compliance generally, may not have much impact on reluctant individuals due to ambivalence and contextual nuances. Several practical recommendations to encourage screening participation are offered, such as focusing on levers rather barriers, providing tailored education to improve awareness and readiness, and fostering intrinsic motivation with relevant approaches.

1. Introduction

With 1.2 million new cases per year, colon cancer (CRC) is the third most common cancer and the second leading cause of cancer deaths worldwide (Ferlay et al., 2013; Jemal et al., 2011). Regular screening enables early detection, leading to a cure rate of 90%, thus relieving the particularly high financial burden of digestive cancers (Hewitson et al., 2008).

In France, national guidelines recommend organized screening with biennial fecal occult blood test (FOBT) for people aged 50–74 years with average CRC risk, and an opportunistic screening with colonoscopy for high-risk individuals, at least every 5 years. The program is free, but is cost-effective only with high participation rates (Lejeune et al., 2004), which are currently insufficient in France (Jezewski-Serra and Salines, 2013) as in Europe (OECD, 2012) and the USA (Joseph et al., 2012).

Meta-analyses and meta-syntheses have isolated psychosocial variables predicting CRC screening compliance (Honein-AbouHaidar et al.,

2016; Javanparast et al., 2010; Wools et al., 2016). "Female gender", "low income/education" and "young age" have been demonstrated to have a negative impact on CRC screening uptake, while "past FOBT", "other screening", "personal/familial history of CRC" and "medical recommendation" generally increase FOBT compliance. According to Wardle et al. (2015), determinants of CRC screening also underline individual (e.g., knowledge, attitude, social norms) and thus motivational aspects (e.g., decisional balance of benefit-risk).

In parallel, studies that have used qualitative methodologies with semi-structured interviews or focus groups concur that the problem of screening participation is above all a matter of awareness and mis-understanding (Aubin-Auger et al., 2011; Dharni et al., 2016; Kimura et al., 2014).

According to psychosocial models of motivation (Hagger et al., 2002; Munro et al., 2007; Witte and Allen, 2000), perception of threat severity and vulnerability should increase awareness and, thus, motivation to adapt. Several conflicting motivations can, however, co-exist within a person (e.g., smoking and quit smoking, participate in FOBT or
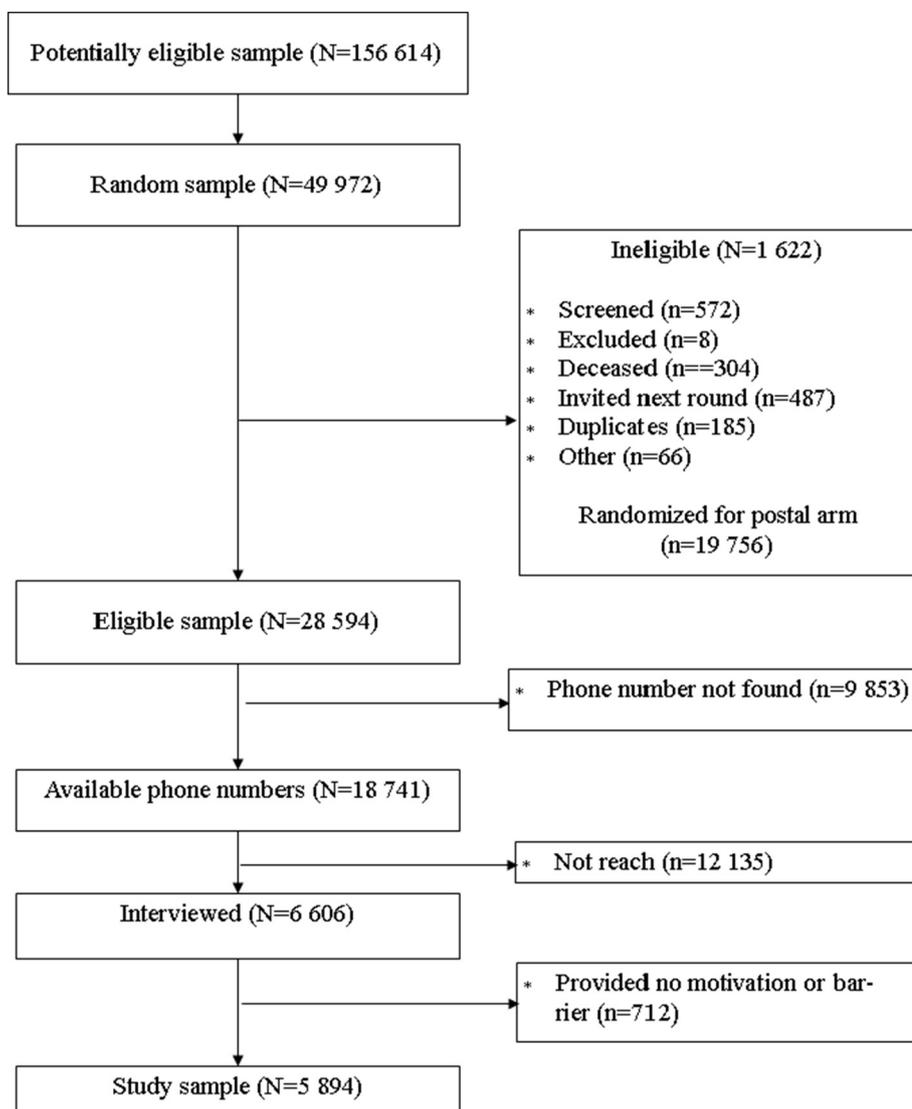
not, etc.) and, as such, motivation is considered to be ambivalent rather than dichotomous (Miller and Rollnick, 2013). At the same time, volitional processes intervene in transitioning from intention to acts. Self-efficacy for change and cues to act have both been demonstrated to increase volition and thus, probability to act, while perceived inefficiency, constraints or danger of change strongly reduce the likelihood, as shown in CRC screening with FOBT (Cole et al., 2007; Senore et al., 2010).

In addition, Ryan and Deci (2000) argue that motivation determination falls within a continuum of extrinsic (i.e., determined by conditions) to intrinsic (i.e., spontaneous interest) motivations. The more motivation is self-determined, the more the person is in line with his or her principles, with the effect of increasing behavior maintenance. In the context of CRC screening, intrinsic motivation is desired because of ethical considerations to ensure autonomous decision-making (Smith et al., 2010), informed choice (Wardle et al., 2015) and the need to maintain screening program profitability by improving participants' loyalty and limiting ineffective and costly reminders.

While it is useful to identify populations with lower or higher probabilities of screening, this purely descriptive distinction between facilitators and barriers seems insufficient to capture the underlying motivations leading individuals to participate in screening. To provide support to individuals reluctant to screen, it is essential to better understand the decision-making processes that an individual goes through

when faced with a screening decision and how s/he adapts to his/her contradictions.

The main objective of this mixed-study is to further investigate the issue of motivation, in particular, ambivalence and self-determination aspects overlooked in current FOBT literature, by using a robust and validated qualitativemethod. The secondary objective is to propose a quantitative description of factor patterns related to FOBT participation.

2. Materials and methods

The present analyses are a secondary analysis based on qualitative data collected during a large-scale telephone survey of people reluctant to be screened. The primary analysis evaluated the cost-effectiveness of tailored telephone counseling to increase FOBT participation in comparison with a standard postal mail-out. A randomized controlled protocol was used, as briefly described below, and has been described at length in a previous publication (Denis et al., 2017).

2.1. Procedure

The protocol adhered to the national requirements for inviting eligible subjects to the first round of any biennial campaign. If no response was obtained (neither refusal nor medical exclusion), the recipients

were usually sent three reminders at T6, T10 and T12 months respectively. FOBT was sent directly to their home with the second reminder (R2). Telephone interviews were conducted just before sending R2 so that only individuals actually willing to perform the test received it.

Four health professionals (3 nurses and one psychologist) conducted the semi-structured interviews. They were assisted by a computer program that prompted the key ideas from the interview guide and allowed them to transcribe patients' speech automatically. Among the questions, participants were asked to explain and develop the reasons why they had not participated in screening, as well as the reasons that would motivate them to perform FOBT screening.

For the purposes of the study, a non-exhaustive list of potential barriers and motivations was established during a pre-interview survey among experts (gastroenterologist, epidemiologist, and desk officers communicating with screening participants). During the data collection, the interviewers had to check the elements registered in the grid and to complete any new or imprecise ideas using a writing zone. This method allowed direct transcription of the contents. In addition, data were automatically saved and collected in a spreadsheet exportable to specialized software for qualitative data processing. We point out that no health education was carried out before the data collection. No encouragement to screen was given until after the data collection.

2.2. Study population

According to French guidelines for organized colorectal cancer screening, eligible subjects were 50–74 years old, with no recent test (< 2 years) or opportunistic colonoscopy (< 5 years), having neither a familial nor personal history of colorectal cancer, Crohn's disease, ulcero hemorrhagic rectocolitis, nor any recent digestive symptoms. Study participants had to be eligible for the R2 reminder, meaning that they hadn't yet performed the FOBT despite two previous communications. Exclusion criteria were as follows: recent colorectal cancer screening (within the time limits mentioned above), medical exclusion before contact, death, guardianship or database irregularities (re-invited subjects, duplicates, updating failures).

As shown in the flow chart (Fig. 1), 49,972 of 156,614 available persons were included in the study after randomization, of whom 1622 were ineligible. In the present qualitative analysis, only data collected by phone were analyzed. As such, 19,756 individuals with only the postal reminder and 21,988 more randomized individuals for whom the interview was not achieved (9853 unknown numbers and 12,135 not reached) were also excluded. Finally,6606 eligible study participants completed the entire interview, of which, 5894 mentioned at least one facilitator or barrier. The sample was 57.7% female with a mean age of 60 years (SD = 6.9) (Table 1). Regarding access to care, there were as many least deprived people as there were most deprived people. Participants were covered by the national social insurance program (74.4%), but had never done the test despite the reminders (68.8%). Finally, one quarter of participants (24.5%) performed a FOBT within 9 months following the call.

2.3. Data analysis

The present study aimed, not only to highlight the specific motivations for CRC screening compliance which were the most representative (i.e., occurrence[1] analysis), but also to clarify the articulation of these motivations (i.e., co-occurrence[2] analysis). To achieve this, we conducted a qualitative analysis to offer a deep explanation (i.e., exploration) of motivational processes involved in CRC screening,

Table 1
Description of study participants.

Sample size	5894	
Female	3401	(57.7)
Age (years)		
50–54	1591	(27.0)
55–59	1332	(22.6)
60–64	1291	(21.9)
65–69	908	(15.4)
70–74	766	(13.0)
Screening history		
First invitation	996	(16.9)
Never user	4055	(68.8)
Former user	843	(14.3)
Urban areas		
Large	3442	(58.4)
Medium	407	(6.9)
Small	2004	(34.0)
Missing	41	(0.7)
Deprivation Index[a]		
Quintile 1 (least deprived)	1456	(24.7)
Quintile 2	1285	(21.8)
Quintile 3	796	(13.5)
Quintile 4	955	(16.2)
Quintile 5 (most deprived)	1350	(22.9)
Missing	53	(0.9)
Health insurance program[b]		
General program	4385	(74.4)
Special program	177	(3.0)
Self-employed program	436	(7.4)
Civil service program	678	(11.5)
Agricultural program	206	(3.5)
Missing	18	(0.3)

[a] The French version of the European Deprivation Index (EDI) is an aggregated deprivation index created by Pornet et al. (2012) ranged from the least deprived (i.e., with higher likelihood to access to care) to the most deprived (i.e., with a more compromised access to care due in particular to a combination of several limiting factors such as low education, low skill level and precarious living conditions). The advantage of this index is that it relies on the concept of perceived fundamental needs and necessities of life.

[b] In France, health insurance status is provided by several different programs, the most common being the general program. The variety of programs depends on the level of contributions levied on wages or public aid depending on the wage status of the person (unemployed, self-employed, special agent, etc.). In all cases, the test is 100% supported by health insurance and regional councils for medium risks. For high risks, the rest of the charge is a minimum of 2.5 € for consultation. The advantage of the organized screening program is that it avoids the systematic use of colonoscopy which costs at the most 70 € for people lacking complementary healthcare insurance.

rather than using only quantitative methods which would have been purely descriptive. From this point of view, the use of a similarity tree (a schematic representation of occurring and co-occurring semantic networks) is appropriate (Drieger, 2013; Osgood, 1959; Vergès and Bouriche, 2001) because it facilitates the capture of the central (vs. peripheral) core[3] of a social or attitudinal construct (i.e., barriers and motivations here) (Abric, 2003; Guimelli, 1993). The analysis is based on the use of a co-occurrence matrix constructed as a bivariate correlations matrix where the variables are substituted by specific words or ideas (e.g., motivations or barriers). As a correlation coefficient, each cell reports the number of times that two ideas have been reported together by the subjects and thus gives an idea of the link (i.e.,

---

[1] This refers here to the number of time a word is quoted in statements (one counted per individual)

[2] This refers to the number of time two words appear together in statements (one counted per individual)

---

[3] According to the author, items of information are basically structured around a socially shared, rigid and stable hub of knowledge (i.e., the central core of representation), and certain contextual varying data (i.e., the peripheral elements of representation). The central core is the part of the network that is shared by the vast majority of participants. It's consensual and stable over time and is very useful to highlight to define the active principles of the health program. The peripheral elements are more transient and relatively respondents—dependent. They provide an interesting nuance that allows us to refine our understanding of the content of the representation and build more targeted interventions.

connectivity) between these two ideas. The frequency of each idea is also considered. The matrix is then translated into the similarity tree. On this diagram, (1) the size of each label is proportional to term occurrence; (2) the size of each line linking two terms is proportional to their co-occurrence (i.e., to the strength of their link); and (3) word location (distance or overlap) not only takes into account connectedness between elements, but also readability of the picture thanks to the use of consensual drawing methods (Fruchterman and Reingold, 1991; Kamada and Kawai, 1989) (cf. example in Supplementary materials). For this reason, we cannot depend entirely upon distance between constructs as a meaningful metric inversely related to co-occurrence (i.e., that two spatially distant ideas are not necessarily negatively related; they can be the opposite, and may even be linked albeit less obviously and significantly than other ideas). Furthermore, and contrary to the bivariate correlation estimate, the co-occurrence index does not either account for the direction (positive or negative) of the link between two terms or ideas. In our study, three similarity trees were drawn using the IRaMuTeQ[4] [Interface of R for the Multidimensional Analyses of Texts and Questionnaire] software to analyze the negative (i.e., barriers), positive (i.e., facilitators) and both simultaneous negative and positive attitudes towards FOBT achievement (i.e., ambivalence). In the latter case, the main interest of such a combination was to determine which facilitators and barriers were inextricably bound up with each other and, thus, to provide potential explanations in accordance with our objectives. In any case, the most apparent and most connected ideas give a reliable overview of the manner the central core is constituted. The other elements that are weakly linked or rarely cited, constitute the peripheral nucleus.

To test the secondary objective, each barrier or facilitator was first converted into dummy variables (i.e., binary variables reflecting whether or not the person mentioned this reason). Then, using the R software, we conducted an Ascending Hierarchical Classification [AHC] to aggregate these motivations into a reduced number of motivational profiles (clusters) by emphasizing similarities and dissimilarities in the way participants responded. Finally, we used logistic regression with odds ratio (OR) and treatment contrasts to compare the predictive weight of each profile on the 9-month FOBT screening compliance.

2.4. Validity procedures

In accordance with validation procedures for qualitative analysis (Rohleder and Lyons, 2015) credibility (i.e., internal validity) was ensured by a prolonged phase of data-gathering (14 months), short verbal summaries and triangulation with other methods (e.g., interviews with general practitioners(GP) and screening program organizers, colorectal screening program immersion, and literature review). Regarding authenticity, the very large effect size not only achieved saturation (i.e., other interviews did not provide substantial additional knowledge), but also increased diversity of vantage points, as suggested by Table 1.

Concerning transferability (i.e., external validity, generalization), the context of the study is sufficiently well described allowing other researchers to transpose the findings to other similar contexts (e.g., gaïac or immunochemical FOBT compliance, motivations implied in colonoscopy adherence or, more broadly, decision-making in cancer screening, etc.).

Finally, we endeavored to support dependability and confirmability by 1/providing researchers with sufficient information to replicate our results (e.g., inclusion and exclusion criteria); 2/using four different interviewers to collect and code the information during counseling sessions; 3/using judge selection methods[5] to merge proximal semantic

terms or constitute categories; 4/debriefing with colleagues; and 5/ carrying out split half analysis in order to ensure that the semantic network was stable and robust.

2.5. Ethical considerations

This study was considered a non-interventional study by the Regional Ethics Committee (*Est IV*)[6] which approved the study protocol. As per requirements, an informed verbal agreement covering participation in the study and the use of medical records was obtained.

3. Results

Study participants reported barriers (*N* = 5887) and/or facilitators (*N* = 1540, 26.13%). Among them, 1533 were considered as ambivalent because they reported motivations both to perform and not to perform FOBT.

3.1. Independent analysis of barriers and facilitators to FOBT

Our primary emphasis is on ambivalence rather than on facilitators and barriers studied independently. However, we provide detailed analyses and figures of an independent analysis in Supplementary materials.

To sum up, a total of 94 barriers and 50 facilitators were broadly identified (e.g., physician endorsement, knowledge, risk perception), echoing those identified in the literature (Wardle et al., 2015; Wools et al., 2016) and confirming the internal validity of our findings. Two dimensions of barriers were found depending on whether motivation ("*Not concerned*", "*No symptoms*") or volition ("*Fears positive[result]*", "*Procrastination*", "*Complicated*") was affected. Facilitators, for their part, are organized in word clouds underlying extrinsic motivations (vicarious experience, contextual cues as "Convenience" or "Support"), intrinsic motivations ("Preserve health", "Important"), and even a motivation (or lack of motivation) to FOBT (the 4 items detached from the motivational tree).

3.2. Ambivalence in FOBT screening motivation

Fig. 2 presents the overall semantic network highlighting the simultaneous reporting of motivations and barriers (i.e., ambivalence).

The most dominant theme of the word cloud is the "*Procrastination*" barrier that, indeed, refers to torn feelings and indecision. More surprising, only motivations gravitate around the term and should paradoxically explain a delay in FOBTs ("*Early diagnosis*", "*Partner/Family did it*", "*Past FOBT*", "*Familial/Personal ATCD [Antecedents]*", and "*Social support*").Looking at it more closely, and based on the assumption that change is hard or threatening[7](Alvaro et al., 2010), as well as choosing not to prevent cancer (Weinberg et al., 2009),each thought would allow the individual to temporize the cancer threat while maintaining status quo[8](see for example Girandola, 2000, for a detailed review of auto-regulative defense strategies in fear appeals). Moreover, "*Procrastination*" is especially strongly associated with "*Preserve health*", "*Past screening*" and "*Advice*" motivations that were demonstrated here to be ambiguous and negatively connoted.

---

[4] The software is available on the official website http://www.iramuteq.org/ and requires downloading the free R software at the link https://www.r-project.org/

[5] The judge selection method allows the researcher to make choices or to lend weight to his/her own subjective decisions by obtaining an inter-coder rate of agreement

[6] Name of the committee for the protection of persons (i.e., ethical research committees) in the East of France ensuring that any human biomedical research project conducted in France respects various measures (medical, ethical and legal) aimed at guaranteeing the protection of the participants.

[7] Change underlies risk taking, a worrying leap in the unknown and, thus, loss of both bearings and control. In the CRC context, FOBT achievement implies a change from habits, with the risk to be diagnosed or suffer from side effects of medical examinations.

[8] Indeed, current persons eligible for CRC screening claim to be under protection due to an old FOBT, still having time owing to CRCs earliness or entrusting relatives with responsibility to force decision in due time (reverse effect of social/spousal support).

Fig. 2. Similarity tree highlighting simultaneous barriers and motivations to fecal occult blood test colorectal cancer screening (*N* = 1533).

Thus, even if an individual is driven by the desire of maintaining his or her health, there is no guarantee that he or she considers FOBT as a means to this end, especially when this in itself represents a potential danger ("*Dangerous*", "*False positive*"). In this sense, we should note that for many people, "*Colonoscopy*" already largely filled the need to test for potential CRC, at least if there was a need to meet("*Not sick*"). More broadly, the structure in charge of CRC screening is sometimes perceived as less legitimate than the individual's GP ensuring prevention and protection of the health ("*Expect consult*"). Several interviewees revealed that they did "*not pay attention*" to the postal invitation and/or thought it was an advertisement ("*Thrown away*"). At last, motivation to preserve health incidentally leads individuals to center around what is presently affecting their health ("*Mild disease*"). This is to the detriment of the CRC issue that is just one of many concerns ("*Other concerns*", "*Family obligations*") that may be considered much more pressing ("*No time [for that]*"). This is in accordance with previous findings (Whitaker et al., 2011).

Concerning "*Past screening*", previous experience may have "*discouraged*" subjects who got the impression that it was not useful ("*False*

positive", "*Impotence to cancer*"), or for participants who did not have symptoms ("*No symptoms*"), or had already received proof that they have "*no cancer*". In this case, subjects infer that their doctor also believes the screening is not necessary ("*Not recommended*"), which is why the GP is not recommending the test ("*No test*").In parallel, previous examinations or tests are used as benchmarks for screening. In comparison, FOBT seems to them more complicated ("*Disgust*", "*Ashamed*", "*Use problems*", etc.).

Finally, "*Advice*" is not necessarily encouraging. Even well-meaning, encouragers involuntarily convey anxious ("*Looking for trouble*", "*Fears positive/cancer/treatment*") and resignation ("*We will all eventually die*", "*Destiny*") feelings. The combination of high threat and low control perceptions leads to the use of defensive (e.g., rationalization, deny, denegation) rather than protective strategies (Shelton et al., 2011; Witte and Allen, 2000).

3.3. Effective incidence on colorectal cancer screening participation

Ascending Hierarchical Classification [AHC] identified 6 facilitators

Table 2
Facilitators and barriers clusters (i.e., grouping).

Facilitators clusters		Barriers clusters	
Name of cluster	Grouped facilitators	Cluster name	Grouped barriers
#1 costs nothing	"Convenient"; "Free"; "Quick"; "At home"	#1 suspicious	"Previous screening"; "Previous FOBT"; "Lobbying"; "No cancer"; "Consultation price"
#2 recommended	"50 years"; "Important"; "Check-up"	#2 no time	"No time/to consult"; "Other concerns"; "Procrastination"
#3 past experience	"Past screening"; "Past FOBT"; "Acquaintance with CRC"; "Advices"	#3 healthy life	"Healthy life"; "No ATCD"; "No symptoms"; "Immunization"; "Alternative medicine"; "Dangerous"
#4 perceived support	"Support"; "Structure support"; "GP's support"; "Spousal support"; "Test has arrived"	#4 afraid	"Head in the sand"; "Fears cancer/positive/treatment/ colonoscopy"; "Looking for trouble"; "Anxiety of waiting"
#5 health benefits modeling	"Partner did it"; "FOBT modeling"; "Early diagnosis"; "Recovery chances"; "Less heavy treatment"	#5 discouraged	"Discouraged/by GP"; "No test"; "Destiny"; "Every 2 years"; "We will all eventually die"
#6 family pressure	"Family did it"; "Family ATCD"; "Satisfy friends/family"	#6 not concerned	"Too old/young"; "Retirement"; "Age"

List of abbreviation: GP = General Practitioner; FOBT = Fecal Occult Blood Test; CRC = Colorectal Cancer; ATCD = Antecedents.

Table 3
Pairwise simple logistic regressions testing the predictive weight of cluster profiles on fecal occult blood test screening.

Motivational clusters[a] (N = 1540)	Odds ratio (95% CI)	Barrier clusters[b] (N = 5887)	Odds ratio (95% CI)
#1 costs nothing	1.0	#1 suspicious	1.0
#2 recommended	1.1 (0.2–4.8)	#2 no time	0.3 (0.1–0.9)
#3 past experience	0.7 (0.3–1.7)	#3 healthy life	0.3 (0.0–1.3)
#4 perceived support	0.5 (0.1–1.8)	#4 afraid	0.3 (0.1–1.2)
#5 health benefits modeling	1.9 (0.8–5.0)	#5 discouraged	0.4 (0.1–2.1)
#6 family pressure	1.5 (0.3–6.8)	#6 not concerned	0.2 (0.0–2.1)
#2 recommended	1.0	**#2 no time**	1.0
#3 past experience	0.6 (0.2–2.3)	#3 healthy life	1.1 (0.4–2.5)
#4 perceived support	0.4 (0.1–2.2)	#4 afraid	1.2 (0.7–1.7)
#5 health benefits modeling	1.1 (0.2–4.8)	#5 discouraged	1.7 (0.6–4.1)
#6 family pressure	1.3 (0.2–8.1)	#6 not concerned	0.8 (0.0–5.3)
#3 past experience	1.0	**#3 healthy life**	1.0
#4 perceived support	0.7 (0.2–1.8)	#4 afraid	1.1 (0.4–2.9)
#5 health benefits modeling	2.8 (2.0–3.9)	#5 discouraged	1.5 (0.4–5.5)
#6 family pressure	2.1 (0.5–7.5)	#6 not concerned	0.7 (0.0–5.9)
#4 perceived support	1.0	**#4 afraid**	1.0
#5 health benefits modeling	4.1 (1.5–14.8)	#5 discouraged	1.4 (0.5–3.9)
#6 family pressure	3.2 (0.6–17.7)	#6 not concerned	0.7 (0.0–4.7)
#5 health benefits modeling	1.0	**#5 discouraged**	1.0
#6 family pressure	0.8 (0.2–2.8)	#6 not concerned	0.5 (0.0–4.0)

[a] The left part of the table is dedicated to pairwise analysis carried out for the 6 motivational clusters. In accordance with the n(n − 1) / 2 formula, there is 15 possible combinations of pairs of motivation to be tested each time with one predictor logistic regressions (e.g., {1 vs 2}, {1 vs 3}, {1 vs 4}, …, {5 vs 6}).
[b] The same holds true for barrier clusters.

and barriers clusters that bring together similar motivations (cf. Table 2).

Then, we examined whether the six profiles had differential impact on screening behavior (coded 0 = not screened; 1 = screened). To this end, the left half of Table 3 is dedicated to pairwise analysis carried out for the 6 motivational clusters. In accordance with the n(n − 1) / 2 formula, there are 15 possible combinations of pairs of motivation to be tested each time with one predictor logistic regression (e.g., {1 vs. 2}, {1 vs. 3}, {1 vs. 4}, …, {5 vs. 6}). For every pair represented in the table, an odds ratio is reported and indicates whether the motivation tested decreases (OR < 1) or increases (OR > 1) the screening rate relative to the reference motivation (in bold). The same holds true for barrier clusters in the right half.

Thus, participation increases by OR = 2.8 [95%CI, 2.0–3.9] when individuals are motivated by health benefits rather than previous experience of CRC and screening, and by OR = 4.1[95%CI, 1.5–14.8] in comparison with support perception facilitators. These findings confirm that intrinsic motivations are more robust to predict behavior rather than extrinsic reasons (Markland et al., 2005). Moreover, the "support" item refers to the volitional process which does not so much underlie motivation, but more so the cues to act. In fact, our findings indicate that individuals undertake FOBT because they want to, rather than because they can.

In contrast, a lack of time strongly reduces FOBT compliance compared to distrustful attitude (OR = 0.3; 95%CI, 0.1–0.9). Contrary to other barriers which are undifferentiated pretexts not to do the test, the concern of not having enough time can also be discussed by motivated persons momentarily prevented. Moreover, we have shown previously that suspicious persons were also the ones that had past experience of CRC screening and probably did routine tests. This would imply that "Suspicious" would be motivated to undertake FOBT, while "No time" would be motivated not to undertake.

4. Discussion

This mixed-method study aimed to better understand motivational processes underlying decision-making in FOBT participation. First, we showed that 26.13% (1540/5894) of persons refusing to undertake FOBT for CRC screening still evoke at least one motivation to undertake FOBT. The point appears essential, as focusing on these levers rather than on barriers would increase participation, enabling programs to reach the financial "breakeven" point of 45% (Segnan et al., 2010).

The CRC screening barriers and facilitators identified in our study are similar to previous findings (Honein-AbouHaidar et al., 2016; Javanparast et al., 2010; Senore et al., 2010; Wools et al., 2016), particularly regarding lack of knowledge, awareness, cancer worry, benefit-risk assessment and medical recommendations. Adding to this, the originality of our study is to show that pairing barriers and facilitators together throws another light on the topic (reverse side of facilitators, positive function of barriers, ambivalence tendencies, etc.). For example, we show that there's a powerful expression of defense mechanisms underlying CRC screening decision-making. Indeed, several strategies have been mobilized, such as displacing (fearing treatments rather than cancer), distortion (minimization of threat/FOBT perceived effectiveness), and denial (illusion of security). All of these defense mechanisms seem to constitute retrospective justifications and rationalizations to resolve ambivalence and status quo ambiguity (Miller and Rollnick, 2013).

Our study also highlighted that even intrinsic motivations are not black or white, but must be qualified under context. Thus, a person's motivation to preserve his/her health could paradoxically represent a barrier, because the person believes s/he has already done enough, or because s/he doesn't consider FOBTs as a means to reach this goal. The same applies to the extrinsic "*Past-FOBT/Past-Screening*" lever, that is

documented as a strong predictor of CRC screening compliance (Senore et al., 2010), but that we observe to be connected with progressive withdrawal, anger and suspicion (e.g., lobbying, i.e., they suspect that bodies are doing business on their health or on their fears) when after repeated screenings, there is still no manifestation of the spectrum (threat) raised by healthcare professionals. More than ever, there's still a need to raise CRC screening knowledge even for individuals that may appear to be already convinced of the benefits. This recommendation had already been made elsewhere (Aubin-Auger et al., 2011; Kimura et al., 2014).

Tailored education, as suggested by Dharni et al. (2016), may also be used in this light by improving eligible participants' awareness or preparing them for FOBT, respectively depending on whether motivation or volition needs to be enhanced among them (Gollwitzer, 1993; Prochaska and DiClemente, 1982). Based on our logistic regression findings the goal remains to foster self-determination of motivation. For this purpose, motivational interviewing (Miller and Rollnick, 2013) and binding communication (Fabien Girandola and Joule, 2012) prove to be useful for increasing intrinsic motivation and putting it into context, and may be beneficial to teach to GPs.

Our study has some limitations. Firstly, the sample consisted of individuals who refused to be screened even after at least two reminders, which increased the discrepancy between the number of barriers and the number of levers quoted. However, the study's aim was to highlight motivations among reluctant persons in order to identify potential action to encourage them to participate. Then, even cross-validated, our findings must rely on declarative content. Several motivations or barriers also might be the expression of defensive strategies (rationalization, trivialization, etc.), nonetheless significant.

Motivations aren't that clear or rigid. This study contributes to increase the understanding of CRC screening determinants, not only in a descriptive, but also in a processual manner (i.e., co-functioning). Among other things, our study shows that motivations must be understood through their positive function for an individual, rather than through their restrictive positive or negative value, in order to improve health promotion strategies.

Transparency document

The http://dx.doi.org/10.1016/j.ypmed.2017.08.023 associated with this article can be found in the online version.

Acknowledgments

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.ypmed.2017.08.023.

References

Abric, J.C., 2003. Méthodesd'étude des représentationssociales (Methods to investigate social representations). Eres, Ramonville Saint-Agne.

Alvaro, C., Lyons, R.F., Warner, G., Hobfoll, S.E., Martens, P.J., Labonté, R., Brown, R.E., 2010. Conservation of resources theory and research use in health systems. Implementation Science: IS 5, 79. http://dx.doi.org/10.1186/1748-5908-5-79.

Aubin-Auger, I., Mercier, A., Lebeau, J.-P., Baumann, L., Peremans, L., Van Royen, P., 2011. Obstacles to colorectal screening in general practice: a qualitative study of GPs and patients. Fam. Pract. 28 (6), 670–676. http://dx.doi.org/10.1093/fampra/cmr020.

Cole, S.R., Smith, A., Wilson, C., Turnbull, D., Esterman, A., Young, G.P., 2007. An advance notification letter increases participation in colorectal cancer screening. J. Med. Screen. 14 (2), 73–75. http://dx.doi.org/10.1258/096914107781261927.

Denis, B., Broc, G., Sauleau, E.A., Gendre, I., Gana, K., Perrin, P., 2017. Tailored telephone counselling to increase participation of underusers in a population-based

colorectal cancer-screening programme with faecal occult blood test: a randomized controlled trial. Revue D'epidemiologie Et De Sante Publique 65 (1), 17–28. http://dx.doi.org/10.1016/j.respe.2016.06.336.

Dharni, N., Armstrong, D., Chung-Faye, G., & Wright, A. J. (2016). Factors influencing participation in colorectal cancer screening-a qualitative study in an ethnic and socio-economically diverse inner city population. Health Expect. http://dx.doi.org/10.1111/hex.12489.

Drieger, P., 2013. Semantic network analysis as a method for visual text analytics. Procedia - Social and Behavioral Sciences 79, 4–17. http://dx.doi.org/10.1016/j.sbspro.2013.05.053.

Ferlay, J., Steliarova-Foucher, E., Lortet-Tieulent, J., Rosso, S., Coebergh, J.W.W., Comber, H., Bray, F., 2013. Cancer incidence and mortality patterns in Europe: estimates for 40 countries in 2012. European Journal of Cancer (Oxford) 1990 49 (6), 1374–1403. http://dx.doi.org/10.1016/j.ejca.2012.12.027.

Fruchterman, T.M.J., Reingold, E.M., 1991. Graph drawing by force-directed placement. Software: Practice and Experience 21 (11), 1129–1164. http://dx.doi.org/10.1002/spe.4380211102.

Girandola, F., 2000. Peur et persuasion: présentations des recherches(1953–1998) et d'une nouvelle lecture. L'année psychologique 100 (2), 333–376. http://dx.doi.org/10.3406/psy.2000.28644.

Girandola, F., Joule, R.-V., 2012. La communication engageante: aspects théoriques, résultats et perspectives. L'Année Psychologique 112 (01), 115–143. http://dx.doi.org/10.4074/S0003503312001054.

Gollwitzer, P.M., 1993. Goal achievement: the role of intentions. Eur. Rev. Soc. Psychol. 4 (1), 141–185. http://dx.doi.org/10.1080/14792779343000059.

Guimelli, C., 1993. Locating the central core of social representations: towards a method. Eur. J. Soc. Psychol. 23 (5), 555–559. http://dx.doi.org/10.1002/ejsp.2420230511.

Hagger, M.S., Chatzisarantis, N.L.D., Biddle, S.J.H., 2002. A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: predictive validity and the contribution of additional variables. Journal of Sport and Exercise Psychology 24 (1), 3–32. http://dx.doi.org/10.1123/jsep.24.1.3.

Hewitson, P., Glasziou, P., Watson, E., Towler, B., Irwig, L., 2008. Cochrane systematic review of colorectal cancer screening using the fecal occult blood test (hemoccult): an update. Am. J. Gastroenterol. 103 (6), 1541–1549. http://dx.doi.org/10.1111/j.1572-0241.2008.01875.x.

Honein-AbouHaidar, G.N., Kastner, M., Vuong, V., Perrier, L., Daly, C., Rabeneck, L., Baxter, N.N., 2016. Systematic review and meta-study synthesis of qualitative studies evaluating facilitators and barriers to participation in colorectal cancer screening. Cancer Epidemiology and Prevention Biomarkers 25 (6), 907–917. http://dx.doi.org/10.1158/1055-9965.EPI-15-0990.

Javanparast, S., Ward, P., Young, G., Wilson, C., Carter, S., Misan, G., Matt, M.A., 2010. How equitable are colorectal cancer screening programs which include FOBTs? A review of qualitative and quantitative studies. Prev. Med. 50 (4), 165–172. http://dx.doi.org/10.1016/j.ypmed.2010.02.003.

Jemal, A., Bray, F., Center, M.M., Ferlay, J., Ward, E., Forman, D., 2011. Global cancer statistics. CA Cancer J. Clin. 61 (2), 69–90. http://dx.doi.org/10.3322/caac.20107.

Jezewski-Serra, D., Salines, E., 2013. Évaluation épidémiologique du programme de dépistage organisé du cancer colorectal en France (Epidemiological evaluation of the colorectal screening program in France). Institut de Veille Sanitaire, Saint-Maurice.

Joseph, D.A., King, J.B., Miller, J.W., Richardson, L.C., Centers for Disease Control and Prevention (CDC), 2012. Prevalence of colorectal cancer screening among adults—behavioral risk factor surveillance system, United States, 2010. MMWR Supplements 61 (2), 51–56.

Kamada, T., Kawai, S., 1989. An algorithm for drawing general undirected graphs. Inf. Process. Lett. 31 (1), 7–15.

Kimura, A., Sin, M.-K., Spigner, C., Tran, A., Tu, S.-P., 2014. Barriers and facilitators to colorectal cancer screening in Vietnamese Americans: a qualitative analysis. J. Cancer Educ. 29 (4), 728–734. http://dx.doi.org/10.1007/s13187-014-0646-6.

Lejeune, C., Arveux, P., Dancourt, V., Béjean, S., Bonithon-Kopp, C., Faivre, J., 2004. Cost-effectiveness analysis of fecal occult blood screening for colorectal cancer. Int. J. Technol. Assess. Health Care 20 (4), 434–439.

Markland, D., Ryan, R.M., Tobin, V.J., Rollnick, S., 2005. Motivational interviewing and self–determination theory. J. Soc. Clin. Psychol. 24 (6), 811–831. http://dx.doi.org/10.1521/jscp.2005.24.6.811.

Miller, W.R., Rollnick, S., 2013. Motivational Interviewing: Helping People Change (Third). Guilford Press, New York.

Munro, S., Lewin, S., Swart, T., Volmink, J., 2007. A review of health behaviour theories: how useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS? BMC Public Health 7, 104. http://dx.doi.org/10.1186/1471-2458-7-104.

OECD, 2012. Screening, survival and mortality for colorectal cancer. In: Health at a Glance: Europe (pp. 110–111). Organisation for Economic Co-operation and Development, Retrieved from. http://www.oecd-ilibrary.org/content/chapter/9789264183896-48-en.

Osgood, C.E., 1959. Representational Model and Relevant Research Methods. In: Pool, I. (Ed.), Trends in Content Analysis. Illinois Press, Urbana, pp. 33–88.

Pornet, C., Delpierre, C., Dejardin, O., Grosclaude, P., Launay, L., Guittet, L., Launoy, G., 2012. Construction of an adaptable European transnational ecological deprivation index: the French version. J. Epidemiol. Community Health 66 (11), 982–989. http://dx.doi.org/10.1136/jech-2011-200311.

Prochaska, J.O., DiClemente, C.C., 1982. Transtheoretical therapy: toward a more integrative model of change. Psychotherapy: Theory, Research & Practice 19 (3), 276–288. http://dx.doi.org/10.1037/h0088437.

Rohleder, P., Lyons, A.C., 2015. Qualitative Research in Clinical and Health Psychology. Palgrave MacMillan, London.

Ryan, R.M., Deci, E.L., 2000. Self-determination theory and the facilitation of intrinsic

motivation, social development, and well-being. The American Psychologist 55 (1), 68–78.

Segnan, N., Patnick, J., von Karsa, L., 2010. European Guidelines for Quality Assurance in Colorectal Cancer Screening and Diagnosis. Publications Office of the European Union, Luxembourg.

Senore, C., Armaroli, P., Silvani, M., Andreoni, B., Bisanti, L., Marai, L., Segnan, N., 2010. Comparing different strategies for colorectal cancer screening in Italy: predictors of patients' participation. Am. J. Gastroenterol. 105 (1), 188–198. http://dx.doi.org/10.1038/ajg.2009.583.

Shelton, R.C., Jandorf, L., Ellison, J., Villagra, C., DuHamel, K.N., 2011. The influence of sociocultural factors on colonoscopy and FOBT screening adherence among low-income Hispanics. J. Health Care Poor Underserved 22 (3), 925–944. http://dx.doi.org/10.1353/hpu.2011.0074.

Smith, S.K., Trevena, L., Simpson, J.M., Barratt, A., Nutbeam, D., McCaffery, K.J., 2010. A decision aid to support informed choices about bowel cancer screening among adults with low education: randomised controlled trial. BMJ (Clinical Research Ed.) 341, c5370.

Vergès, P., Bouriche, B., 2001. L'analyse des données par les graphes de similitude. In:

Sciences Humaines, Retrieved from. http://m.scienceshumaines.com/textesInedits/Bouriche.pdf.

Wardle, J., Robb, K., Vernon, S., Waller, J., 2015. Screening for prevention and early diagnosis of cancer. The American Psychologist 70 (2), 119–133. http://dx.doi.org/10.1037/a0037357.

Weinberg, D.S., Miller, S., Rodoletz, M., Egleston, B., Fleisher, L., Buzaglo, J., Bieber, E., 2009. Colorectal cancer knowledge is not associated with screening compliance or intention. J. Cancer Educ. 24 (3), 225–232. http://dx.doi.org/10.1080/08858190902924815.

Whitaker, K.L., Good, A., Miles, A., Robb, K., Wardle, J., von Wagner, C., 2011. Socioeconomic inequalities in colorectal cancer screening uptake: does time perspective play a role? Health Psychol. 30 (6), 702–709. http://dx.doi.org/10.1037/a0023941.

Witte, K., Allen, M., 2000. A meta-analysis of fear appeals: implications for effective public health campaigns. Health Educ. Behav. 27 (5), 591–615.

Wools, A., Dapper, E.A., de Leeuw, J.R.J., 2016. Colorectal cancer screening participation: a systematic review. Eur. J. Pub. Health 26 (1), 158–168. http://dx.doi.org/10.1093/eurpub/ckv148.