WHAT SEPARATES PHYSICALLY ACTIVE IBD PATIENTS FROM INACTIVE ONES?

Exploration of the effects of health beliefs, guidance from healthcare providers, intention, self-regulation, and psychological well-being.

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Tulehduksellisten suolistosairauksien (IBD) esiintyvyys kohoaa eri puolilla maailmaa. Sairauteen liittyy myös kohonnut riski ahdistus- ja masennusoireisiin. Keinoja vähentää sairauden negatiivisia vaikutuksia on etsitty, yhtenä tällaisena keinona on tutkittu fyysistä aktiivisuutta, millä onkin havaittu olevan positiivia vaikutuksia. Tämä tutkimus pyrki selvittämään mahdollisia fyysisen aktiivisuuden ennustajia tässä ryhmässä sekä tuottamaan vastauksia kysymykseen: ”Mikä erottaa fyysisesti aktiiviset IBD-potilaat heistä, jotka eivät ole aktiivisia?”

Tämän tutkimuksen lähtöasetelmana on, että sekä motivaationaaliset että tahdonalaiset käyttäytymisen säätelyyn liittyvät tekijät ovat tärkeitä fyysisen aktiivisuuden näkökulmasta. Niinpä tämän poikkileikkaavan määrällisen tutkimuksen kohteeksi on valikoitunut potilaiden terveysuskomukset, terveydenhoitohenkilökunnan tarjoama ohjaus liittyen fyysiseen aktiivisuuteen, aikeet olla fyysisesti aktiivisia, sekä itsesäätely keinona toteuttaa nämä aikeet. Näiden mahdollisten ennustavien tekijöiden vaikutuksia fyysisen aktiivisuuden määrään ja intensiteettiin pyrittiin selvittämään tilastollisilla menetelmillä. Mahdollisten ennustajien lisäksi tutkimuksessa pyrittiin myös tarkastelemaan fyysisen aktiivisuuden ja psyykkisen hyvinvoinnin välistä suhdetta. Otos koostui 69 suomalaisesta aikuisesta, jotka ilmoittivat sairastavansa IBD:tä.

Yksi tutkimuksen selkeimmistä löydöksistä oli vastaajien kokema ohjauksen ja kiinnostuksen puute fyysiseen aktiivisuuteen hoitohenkilökunnan taholta. Fyysisen aktiivisuuden aikeita ja joitain itsesäätelyn strategioita raportoitiin otoksessa laajasti, samoin kuin myönteisiä uskomuksia sekä kohtuullisen korkeaa itsepystyvyyden tunnetta fyysiseen aktiivisuuteen liittyen. Lisäksi tutkimuksessa havaittiin tilastollisesti merkittäviä eroja aktiivisten ja ei-aktiivisten IBD:tä sairastavien ihmisten välillä. Merkityksellisimmiksi potentiaalisiksi ennustajiksi osoittautuivat koetut esteet fyysiselle aktiivisuudelle, itsepystyvyys, aikeet, itsetarkkailu ja ajanhallinta. Ennakko-oletuksista poiketen, psyykkisellä ahdingolla oli positiivinen suhde kävelyn määrään; vastaajat, jotka kokivat enemmän ahdinkoa, kävelivät enemmän. Muita merkityksellisiä suhteita fyysisen aktiivisuuden ja psyykkisen hyvinvoinnin väliltä ei löydetty.

Tulokset viittaavat siihen, että koetut esteet, itsepystyvyys, aikeet, itsetarkkailu ja ajanhallinta ovat tärkeitä tekijöitä IBD:tä sairastavien henkilöiden fyysisen aktiivisuuden näkökulmasta. Heidän fyysistä aktiivisuuttaan voitaisiin kenties kohottaa tarjoamalla tällä hetkellä puuttuvaa ohjausta terveydenhoitohenkilökunnan taholta keskittyen näihin potentiaalisiin fyysisen aktiivisuuden ennustajiin.

Asiasanat: IBD, Tulehdukselliset suolistosairaudet, fyysinen aktiivisuus, terveysuskomukset, ohjaus, itsesäätely, aikeet, psyykkinen hyvinvointi.

ABSTRACT
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Inflammatory bowel disease (IBD) has a rising prevalence in many regions of the world. People with IBD frequently report higher levels of anxiety and depression compared to healthy controls. Additional therapies that could offer benefits have been investigated, one of those being physical activity (PA). This study aimed to investigate potential predictors of physical activity among IBD patients and provide some answers to the question "What separates physically active IBD patients from inactive ones?"

This study subscribes to the notion that both motivational and volitional constructs are important for physical activity engagement. Therefore, in this cross-sectional quantitative study the investigation focused on what types of health beliefs about physical activity do IBD patients have, what kind of guidance from healthcare providers are they receiving regarding physical activity, what are their intentions to engage in physical activity, and what kinds of self-regulatory skills concerning physical activity do they use. This thesis also aimed to investigate the relationships these possible predictors have with different intensities of physical activity, and to what extent these predictors can predict the level of physical activity engagement. In addition, the relationship between different intensities of physical activity and psychological well-being was explored. The sample consisted of 69 Finnish adults with self-reported diagnosis of IBD.

One of the clearest findings from the study was that patients perceive lack of guidance and interest from healthcare providers regarding physical activity. Intentions to engage in physical activity and some self-regulatory strategies were reported at quite high rates, favourable beliefs and high self-efficacy regarding physical activity were also discovered. Further, significant differences between physically active and inactive IBD patients were found, with some robust potential predictors being identified. These significant potential predictors were perceived objective barriers, self-efficacy, intention, self-monitoring, and time management. In contrast to expectations, psychological distress had a positive relationship with walking, meaning that those respondents who reported more symptoms of distress, also engaged in more walking. No other statistically significant relationships were found between physical activity and psychological well-being.

These results indicate that perceived barriers, self-efficacy, intention, self-monitoring, and time management have important relationships with physical activity in people with IBD. Physical activity of this population could potentially be increased by offering the now lacking guidance from healthcare providers focusing on these potential predictors.

Key words: IBD, Inflammatory bowel disease, physical activity, health beliefs, guidance, self-regulation, intention, psychological well-being

CONTENTS

1 INTRODUCTION

Inflammatory bowel disease (IBD) has a rising prevalence in many regions of the world. In 2017, estimated 6.8 million people had IBD (Alatab et al., 2020). In Finland, at the end of the year 2022, almost 58 000 people had a diagnosis that allowed them to access medical reimbursement for inflammatory bowel disease, this same number at the end of the year 2023 was over 60 000. In 2022, 2665 new diagnoses were reported, in 2023 this number was over 3000 (Social Insurance Institution of Finland, 2024). These numbers can be taken as indicators of prevalence in Finland, and even though these are just examples from the past two years, a rising trend can be seen.

IBD is commonly considered to be comprised of Crohn's disease and ulcerative colitis. Both illnesses are characterized by remitting and relapsing course of symptoms. Sometimes, if a definite classification cannot be made between the two main types, the illness is referred to as indeterminate colitis (Geboes et al., 2008). Common symptoms of IBD include diarrhea, abdominal pain, bowel urgency, rectal bleeding, nausea, vomiting, and extraintestinal manifestations (Singh et al., 2011). In addition to these symptoms, IBD is associated with various comorbidities, such as fatigue (Schreiner et al., 2021), osteoporosis (Lee et al., 2005), muscle mass loss (Shephard, 2016), anxiety, depression, sleep disturbances (Kappelman et al., 2014), anemia (Eriksson et al., 2018), and a decreased quality of life (Knowles et al., 2018). IBD is also associated with increased incidence of colon cancer (Lakatos & Lakatos, 2008**).** Treatment is aimed at managing the symptoms and through those efforts reaching and maintaining clinical remission. The exact causes of IBD are not completely understood yet, though many researchers have conducted extensive research on the aetiology and risk factors and concluded that it is a complex disease that has roots in the interaction of genetics, environmental factors, and gut microbiota (Ramos & Papadakis, 2019).

The economic cost of IBD is considerable. Typical on-set age is from late teens to young adulthood (Johnston & Logan, 2008) although people of all ages can develop the disease. Since the on-set age is in early adulthood, IBD can cause an economic burden for both societies and the individual for decades. IBD patients often need medications, healthcare services and even surgeries, and therefore they put a strain on the healthcare system. A study from 2021 found that in Europe the yearly mean direct healthcare cost per patient was around 3500 € and 2000 € for Crohn's disease and ulcerative colitis, respectively (Zhao et al., 2021). Adding to these high

direct costs, IBD can cause a loss in work productivity which has been estimated to be as high as 1900 € per patient yearly (Zhao et al., 2021).

Considering the economic costs, the strain to healthcare system, and the potential health and quality of life consequences for patients, it is no surprise that there has been interest in additional therapies to treat the disease. One of these additional therapies is physical activity (PA) which has been shown to have beneficial effects for many chronic illnesses (Pedersen & Saltin, 2015) and reduce the risk of developing a variety of chronic conditions (Rhodes et al., 2017). Physical activity is defined as any bodily movement produced by skeletal muscles that result in energy expenditure (Caspersen et al., 1985). Physical activity has been found beneficial for IBD patients with possible mechanisms of effect having been identified (Engels et al., 2017). Studies suggests that physical activity may even be a protective factor against developing IBD, especially Crohn's disease. Specifically, one meta-analysis found that physical activity seemed to serve as a protective factor towards Crohn's disease, but the same conclusion could not be drawn for ulcerative colitis (Wang et al., 2016). In their review Engels et al. (2017) concluded that there appears to be a significant association between the onset of Crohn's disease and low physical activity, yet this association was not supported for ulcerative colitis. Davis et al. (2022) in their integrative review also found more support for exercise as a protective factor against Crohn's disease rather than ulcerative colitis. In addition to possibly being a protective factor against developing IBD, studies also suggests that physical activity may help maintain disease remission (Davis et al., 2022). One important point in interpreting studies is that the terms physical activity and exercise seem to often be used interchangeably in the research literature.

There have already been a number of studies where the safety and benefits of physical activity have been studied for people with IBD. Eckert and her colleagues (2019) performed a review where they investigated the effects of physical activity as a complimentary therapy for IBD patients. They found that physical activity interventions seem to be safe and can be considered beneficial for both psychological and physical health. Specifically, they discovered that patients experienced improvements in fitness, bone mineral density, quality of life, and a decrease in stress and anxiety. However, the research group did go on to caution that more high-quality studies are needed**.** Shephard (2016) also suggested that further research should be done, but he argued that there is enough evidence supporting the positive effects of physical activity regarding IBD-related health and well-being including disease activity and quality of life. He went on to say that moderate-intensity exercise programs should in the future be considered an integral

part of IBD treatment. Finally, Davis and his colleagues in their review (2022) found evidence for the following benefits in addition to the already mentioned ones: improvements in sleep quality, ameliorating of gastrointestinal symptoms, improvements in cardiorespiratory fitness, and a decrease in fatigue.

Most of the evidence on the benefits of physical activity for people with IBD have come from studies investigating the effects of moderate- to low-intensity exercise, both aerobic and resistance (Davis et al. 2022; Eckert et al. 2019; Packer et al., 2010; Shephard, 2016). Vigorous physical activity has received mixed support; it seems to be safe and beneficial at least to a subpopulation of IBD patients (Engels et al., 2017; Shephard, 2016). Currently there are no physical activity guidelines specifically for IBD patients, although Eckert et al. (2019) did suggest those based on their review. The main recommendations were to engage in moderate-intensity physical activity at least 3 times per week, 5 times if possible, with minimum of 30 minutes of exercise per day. They recommended a mixture of endurance and resistance training. However, there seems to be no empirical evidence of implementation of these recommendations nor of their efficacy. The World Health Organization (2020) has recommendations for adults in the general population; they recommend that adults should engage in at least 150–300 minutes of moderate-intensity, or 75–150 minutes of vigorous-intensity aerobic physical activity weekly; or some combination of these. The World Health Organization (WHO) also recommends muscle-strengthening activities at moderate or higher intensity on 2 or more days weekly. In addition, the organization recommends limiting time being sedentary.

There is evidence suggesting that a significant portion of IBD patients do not meet the movement recommendations set by WHO. Shephard (2016) conducted a brief review of 16 studies and found that 12 of those reported significantly reduced levels of physical activity in IBD patients compared to controls. More recently, Mareschal et al. (2022) concluded in their review that IBD patients appear to have low levels of physical activity. The percentage of physically active respondents vary between individual studies, as exemplified by findings from two recent groups; an Irish study reported that 55% of respondents met physical activity recommendations set by the World Health Organization (Gettigan et al., 2022), while another recent study from New Zealand found adherence levels of 66% (Fagan et al., 2021). When it comes to the types of physical activity, IBD patients have been found to prefer low-impact types of activities. Walking has often been mentioned as the most preferred type of physical activity (Davis et al., 2022; DeFilippis et al., 2016; Fagan et al., 2021; Gettigan et al., 2022; Tew et al., 2016), also

mentioned are running and cycling (Davis et al., 2022; DeFilippis et al., 2016; Gettigan et al., 2022) water-based activities and bodyweight exercises/high-intensity interval training (Fagan et al., 2021; Gettigan et al., 2022), and yoga/pilates (DeFilippis et al., 2016: Gettigan et al., 2022).

Based on the research discussed above, it seems evident that physical activity can offer benefits for IBD patients. Just as evidently, IBD patients are frequently not engaging in recommended levels of physical activity. This thesis aimed to provide some answers to the question "What separates physically active IBD patients from inactive ones?" Different potential predictors of physical activity were explored, and their predictive power investigated. In addition, psychological health was explored as a potential correlate of physical activity. Next follows a brief discussion of the possible predictors of physical activity, followed by a closer look at the psychological well-being of IBD patients and its connection with physical activity.

1.1 Predictors of physical activity

This study aimed to identify some predictors of physical activity among people with IBD. This thesis subscribes to the notion that both motivational and volitional factors are relevant to physical activity enactment as proposed by models such as the Integrated Behavior Change Model (Hagger & Chatzisarantis, 2014), Health Action Process Approach (Schwarzer, 2016), and the Multi-process action control framework (Rhodes & de Brujin 2013b; Rhodes & Yao, 2015; Rhodes 2021). In this paper, the investigation focused on what types of health beliefs about physical activity do IBD patients have, what kind of guidance from healthcare providers are they receiving regarding physical activity, what are their intentions to engage in physical activity, and what kinds of self-regulatory skills concerning physical activity do they use. In addition, this thesis aimed to investigate the relationships these possible predictors have with different intensities of physical activity, and to what extent these predictors can predict the level of physical activity engagement. Next the hypothesized predictors of physical activity and the theoretical models they are based upon are discussed, with some previous research findings being presented. Research concerning IBD patients will be discussed when it is available, otherwise topics are covered more broadly.

1.1.1 Health beliefs about physical activity

The Health Belief Model (Rosenstock, 1974) has been used to predict and successfully increase physical activity (Hosseini et al., 2017; Price et al., 2021; Rahmati-Najarkolaei et al., 2015; Shafieian & Kazemi, 2017). It identifies 6 groups of determinants relevant for health-related behaviours, specifically these determinants are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Champion & Skinner, 2008). Using the health belief model to investigate physical activity among people with IBD it is hypnotised that 1. If an individual beliefs that a lack of physical activity might have serious negative consequences and pose a threat to them, 2. Believe that physical activity might be beneficial to them, 3. Believe that those benefits outweigh the barriers to physical activity, 4. Believe that they are capable of being physically active and 5. Receive cues to engage in physical activity, then they are more likely to be physically active.

Some of the predictors present in the health belief model have been studied in relation to physical activity and IBD. Perceived barriers have been the focus of numerous studies and several barriers have been identified. Davis et al. (2022) conducted an integrative review and found several often-cited barriers to physical activity such as fatigue, abdominal and/or joint pain and bowel urgency and disease flare-ups. Other studies have, in addition, mentioned the following barriers: lack of time (Gettigan et al., 2022), weakness and embarrassment (DeFilippis et al., 2016). There is considerable evidence that people with IBD perceive limitations to physical activity due to their illness. Gettigan et al. (2022) found that majority of the patients they surveyed mentioned difficulties in adhering to exercise, with majority of those respondents specifying IBD as being the cause of difficulties. In the same study, 66% of participants reported that their PA behaviour had changed after receiving the diagnosis (Gettigan et al., 2022). Furthermore, in studies by Tew et al. (2016) and Fagan et al. (2021) majority of IBD patients reported that IBD limited their physical activity or exercise participation (79% and 66%, respectively). Similarly, in another study 80% of respondents said that IBD had stopped them exercising either at some point or permanently (Chan et al., 2014). Tew et al. (2016) found that perceived barriers were statistically associated with physical activity in Crohn's disease patients: higher perception of barriers was associated with lower physical activity.

Perhaps unsurprisingly there is evidence indicating that those patients going through a relapse report higher levels of barriers (Fagan et al., 2021). What can be considered surprising is that according to the same study, there was no actual difference in physical activity levels between patients with active disease and those in remission. Elsewhere, a negative association has been found between increased disease activity and physical activity participation (Tew et al., 2016**)**. Two studies have provided information about physical activity and barriers of Finnish people with IBD. Haapamäki et al. (2009) found that over 70% of respondents in their study experienced IBD as limiting their leisure-time activities. Mattila et al. (2022) provided more detailed information as they found that 52.8% of respondents in their study reported IBD as limiting their leisure-time activities, with most commonly reported activities being physical activities.

Studies examining the perceived benefits of and self-efficacy for physical activity can also be found. IBD patients seem to have favourable beliefs regarding physical activity, and they report receiving benefits from it. Chae et al. (2016) found that majority of IBD patients found exercise to be pleasant, beneficial, sensible, uplifting, and good. Another study found that 45.8% of patients reported exercise as helpful in controlling symptoms (Gatt et al., 2019). In addition, they found that respectively 41.3% and 79.4% of patients believed that exercise reduced the risk of relapse and could improve quality of life. Yet another study discovered that patients believed exercise to be beneficial in making them feel physically better (92%), improving their energy levels and mood (84% and 93%, respectively), and relieving anxiety (87%) (Gettigan et al., 2022). Tew et al. (2016) found that perceived benefits were statistically associated with physical activity in IBD patients; higher perception of benefits was associated with higher levels of physical activity. Regarding self-efficacy, Chae et al. (2016) found that 75.5% of respondents felt that they would be able to participate in an exercise program, more specifically over half reported that they would be able to exercise for over 30 minutes per session. When asked about the number of sessions per week, most commonly reported number was 3 times (Chae et al., 2016). These results provide some limited evidence of self-efficacy regarding physical activity.

As can be seen, there has been some exploration regarding barriers to and benefits of physical activity among IBD patients. Physical activity self-efficacy has not been rigorously studied, even though some hints regarding that can be found in the literature. Clearly there is still much we do not know when it comes to the health beliefs IBD patients hold concerning physical activity. This thesis aimed to provide some information on these matters.

1.1.2 Guidance from healthcare providers

As another possible predictor of physical activity, the experience of receiving physical activity guidance from IBD-related healthcare providers was explored with the assumption that the perception of having received supportive physical activity guidance from a trustworthy source might increase PA-behaviour. This belief is supported by several theoretical models such as the health belief model (Rosenstock, 1974). There have been very few studies investigating the physical activity guidance given to IBD patients. Two notable exceptions are a study by Nathan et al. (2013) and a study by Gatt et al. (2019). The former (2013) interviewed 11 patients, most of whom reported having received either vague, or no advice at all from healthcare providers regarding exercise. The latter (2019) found that almost half of the patients (46.1%) felt that healthcare providers did not place enough importance on physical activity, and 75.5% felt that complementary and alternative methods to manage their disease would be an important topic of discussion with healthcare providers. In the same study, some patients also mentioned that getting more support from healthcare providers and receiving better education concerning IBD and physical activity could increase their levels of physical activity (Gatt et al., 2019). Similarly, interest in receiving physical activity guidance was expressed in surveys by Gettigan et al. (2022) and Chae et al. (2016). The former (2022) discovered that 70% of respondents had interest in getting personalized exercise advice, while Chae et al. (2016) found that 76.5% of their study participants would like to receive information regarding exercise programs. Based on the literature, a conclusion can be drawn that people with IBD would like to receive better guidance concerning appropriate physical activity participation. Yet, it is unclear whether IBD patients in Finland receive physical activity guidance from their healthcare providers, and if they do, does this have an actual effect on their physical activity behaviour. This thesis aimed to explore these issues.

1.1.3 Intention

Intention has been defined multiple different ways; the Cambridge dictionary (2001) defines intention as something that you want and plan to do, while Rhodes & Rebar (2017) suggest that intention holds two distinct meanings; a decisional aspect to do a behaviour, and a commitment to that decision. Nevertheless, intention is treated as a proximal determinant of behaviour in

many different theories, such as the theory of planned behavior (Ajzen, 1991) and the social cognitive theory (Bandura, 1986). However, there is an abundance of evidence suggesting that having an intention to do physical activity does not necessarily lead to actual enactment of physical activity. According to Rhodes and de Bruijn (2013a) intention seems to be the strongest known correlate of physical activity, in spite of that, there is conflicting evidence on the strength of the association. Supporting a strong link between intention and physical activity, Hagger et al. (2002) found the relationship between intention and physical activity to be reliable and large, similarly McEachan et al. (2011) in their meta-analysis found intention to have a strong relationship with prospective health behaviours with medium to large effect size. On the other hand, Rhodes and Dickau (2012) caution that correlational evidence should not be interpreted as causal evidence: they performed a meta-analysis of experimental evidence and found that meaningful changes in intention only led to trivial changes in actual physical activity. It seems clear that intention is a predictor of physical activity, yet more rigorous studies with different populations are needed to determine the strength of the association.

This problem of intention not leading to behaviour despite theoretical assumptions has been termed the intention-behaviour gap. In a literary review and meta-analysis, intention-PA gap was found to be 48% at the level of public health guidelines (Rhodes & de Bruijn, 2013a). This gap was due to people who intended to engage in physical activity, yet failed to do so. The meta-analysis showed that while 21% of respondents had no intention to be active, as much as 36% of participants failed to translate their positive intention into action. This finding is meaningful since it points to the fact that there is a great number of inactive people who do not need motivational interventions to increase their intention to engage in physical activity, they need help in closing the intention-behaviour gap.

There is some preliminary evidence that IBD patients have favourable intentions toward physical activity: Chae et al. (2016) found that 68.5% of IBD patients in their study planned to start regularly exercising within the next month. As this seems to be the extent of current research regarding physical activity intentions of people with IBD, data on this matter is clearly very limited and more research is needed regarding physical activity intentions and their enactment in IBD patients. This thesis aimed to provide some answers to this matter.

1.1.4 Self-regulation

There have been attempts to provide a solution to this problem of intention-behaviour gap through models that include a volitional phase after a motivational one. Specific definitions and precise predictors differ between models, yet examples of models including some division between motivational and volitional phases include the Integrated Behavior Change Model (Hagger & Chatzisarantis, 2014) Health Action Process Approach (Schwarzer, 2016) and the Multi-process action control framework (Rhodes & de Brujin 2013b; Rhodes & Yao, 2015; Rhodes 2021). This volitional phase is in part composed of self-regulatory skills, which are exemplified by self-monitoring, goal setting, and time management among other regulatory behaviours. To take the multi-process action control framework as an example, it is hypothesized that motivational, self-regulatory and habituated processes may be useful in translating intention into action (Rhodes and de Brujin, 2013b; Rhodes & Yao, 2015). According to the framework, after intention formation there comes an action control phase where regulatory behaviours are needed. Therefore, it is suggested that intentions, while necessary, need to be supplemented with self-regulatory strategies to help initiate and maintain PA intentions and behaviour (Rhodes & Yao, 2015; Rhodes, 2021).

There is evidence for the effectiveness of self-regulation skills in increasing physical activity. Rhodes et al. (2017) conducted a review of narrative reviews and meta-analyses and found that some behaviour change techniques (Michie et al., 2013) that were in line with self-regulation strategies had indeterminate to positive association with increased PA-behaviour. Rhodes and Pfaeffli (2010) reviewed studies on mediators of physical activity change and discovered evidence suggesting that self-regulation processes acted as a mediator. Rhodes et al. (2021) conducted a systematic review and a meta-analysis and found intention and behavioural regulations (with self-efficacy beliefs) to have the largest effect estimates in physical activity interventions. Teixeira (2015) reviewed studies on successful behaviour change in obese individuals and found self-regulation skills to be one of the main predictors of successful outcomes. Finally, Murray et al. (2018) reviewed studies on behaviour change maintenance and found evidence suggesting that self-regulatory skills are associated with maintained behavioural change post-intervention.

Clearly there is a large amount of evidence suggestive of the efficacy of self-regulation skills in increasing and maintaining physical activity. Yet, when it comes to IBD patients, there is a

lack of data concerning the use of self-regulation skills concerning physical activity and whether these skills translate into higher levels of physical activity. This thesis aimed to provide some answers to these questions.

1.2 Physical activity and psychological well-being

IBD patients are known to face many challenges to their psychological well-being. People with IBD report high levels of stigmatization which is related to poor outcomes, such as increased psychological distress and decreased quality of life (Taft & Keefer, 2016). They also experience high fatigue; it has been found that over 70% of IBD patients with active disease and 30% of those with inactive disease report fatigue (Graff et al., 2011). In the same study, fatigue had a positive association with higher perceived stress and distress, and a negative association with IBD-related quality of life. A systematic review by Mikocka-Walus and colleagues (2016) found that IBD patients had higher levels of anxiety compared to healthy controls (19.1% for IBD patients, 9.6% for controls), same was found regarding depression (21.2% for IBD patients, 13.4% for controls). There was a difference in anxiety and depression levels as an effect of disease activity; those with active disease experienced higher levels of anxiety (66.4%) and depression (34.7%) compared to those with inactive IBD (28.2% and 19.9%, respectively). Similar findings were made by Neuendorf et al. (2016) who found that estimated 20.7% of IBD patients filled the criteria for anxiety disorders and 35.1% for symptoms of anxiety, with higher prevalence in those with active disease. Regarding depression, their study estimated that 15.2% of IBD patients filled the criteria for depression disorders and 21.6% for symptoms of depression, with higher prevalence in those with active disease. Therefore, higher prevalence of anxiety and depression, and a lower quality of life compared to non-clinical populations is a consistent finding among IBD patients.

There is evidence that IBD and psychological disorders affect each other bi-directionally. Gracie et al. (2018) conducted a follow-up study where they discovered that patients who at baseline had normal anxiety scores and active disease were more likely to present with higher levels of anxiety at follow-up than those with non-active disease at baseline. Thus showing evidence for disease activity affecting mood disorders. On the other hand, they also discovered that patients who had low disease activity at baseline, but high anxiety scores were more likely to have had flares or need for escalation of medication during the follow-up period compared

to those with low anxiety scores. This points to mood disorders affecting IBD activity. Further evidence for the idea that mood disorders and IBD have a bi-directional relationship comes from a systematic review and meta-analysis exploring follow-up studies (Fairbrass et al., 2022). It was discovered that both anxiety and depression at baseline were significantly associated with higher occurrence of adverse outcomes such as hospitalisations, escalation of therapy and visits to emergency departments later on. They also found there to be an association between active disease at baseline and higher levels of anxiety or depression at follow-up despite normal anxiety or depression scores at baseline (Fairbrass et al., 2022).

As can be seen, people with IBD have an increased risk for developing mood disorders and experiencing psychological distress. Fortunately, as has already been discussed, physical activity has been found to have psychological benefits for IBD patients (Davis et al., 2022; Eckert et al., 2019; Mareschal et al., 2022; Packer et al., 2010; Shephard, 2016). Majority of the studies investigating the relationship between physical activity and psychological well-being is correlational in nature. One of these is a study by Fagan et al. (2021) showing that higher level of vigorous physical activity in Crohn's disease patients was associated with lower levels of fatigue and higher quality of life, whereas for ulcerative colitis patients, lower level of total physical activity was associated with lower quality of life. Recently, another correlational study found that physical activity of IBD patients had a significant positive relationship with quality of life and a significant negative relationship with depression, anxiety, and fatigue (Qiao et al., 2024). Also, Tew et al. (2016) found negative relationships between depression, anxiety, and fatigue in relation to physical activity of IBD patients. There have been some notable deviations from correlational studies, such as an experimental study by van Erp et al. (2021) where a 12-week exercise program significantly improved fatigue and health-related quality of life of IBD patients who had had severe fatigue prior to the experiment. Another experimental study investigated the effects of a 3-month walking program on Crohn's disease patients and found that the experimental group experienced significant improvements in quality of life measures (Ng et al., 2007). Finally, Klare et al. (2015) found that a 10-week moderate-intensity physical activity program increased the quality of life of participants, although the difference to control group did not reach significance.

It seems evident that IBD patients face challenges to their psychological well-being and that physical activity could be used to mitigate the negative effects of these challenges. This study

aimed to investigate the psychological distress experienced by Finnish adults with IBD and explore its connection with different intensities of physical activity.

1.3 Research aims and question

Physical activity can be a beneficial additional therapy for IBD patients, and therefore it is an important topic for research. In Finland, there has been little research interest regarding physical activity and IBD, and therefore there is a lack of data and a gap in knowledge when it comes to physical activity of people with IBD in Finland. Globally speaking, some predictors of physical activity among people with IBD have been investigated, yet a lot remains shrouded in mystery. Similarly, there is evidence linking physical activity and psychological well-being of IBD patients, yet more research is needed and the situation in Finland is unknown. Therefore, this study had five aims. 1. Explore the health beliefs, guidance from healthcare providers, intention, and self-regulation of IBD patients regarding physical activity. 2. Identify any significant differences in these potential predictors of physical activity between the groups of physically active IBD patients and insufficiently active IBD patients. 3. Investigate how these potential predictors are associated with different intensities of physical activity. 4. Investigate to what extent these predictors can explain differences in physical activity levels. 5. And finally, explore the connection between physical activity and psychological well-being. Overarching question that defined this research was “What separates physically active IBD patients from inactive ones?”

Based on previous research, it was hypothesised that there is a substantial number of Finnish IBD patients that are not adhering to physical activity guidelines and that explored potential predictors could account for some of the variance in physical activity levels at different intensities. Specifically, it was predicted that the following determinants of the health belief model would be positively related to higher participation in physical activity: self-efficacy, cues to action, perceived severity and perceived benefits. Perceived barriers were expected to have a negative relationship with physical activity. In addition, guidance from healthcare providers, intention to engage in physical activity, and having effective self-regulation skills were predicted to have positive relationships with physical activity. Finally, a positive relationship was predicted to exist between physical activity and psychological well-being.

2 METHOD

This study had five aims that all focused on providing information regarding one bigger theme: "What separates physically active IBD patients from inactive ones?" The study was cross-sectional in nature and utilized both established assessment instruments and scales developed specifically for this study. The sample was recruited, and the survey hosted online. Next follows an overview of the process, instruments, and analysis methods used. This section will conclude with ethical considerations.

2.1 Participants and process

Data was collected through an anonymous cross-sectional online survey, which was hosted on REDCap. A link to the survey was posted to two private Facebook groups for people with IBD. After being provided with research aims, privacy notice, and information sheet, informed consent was obtained from participants. The author's contact details were provided in case the participants had questions. Over 18-year-old adults who had an IBD diagnosis were eligible to answer the online survey. Data was collected over a period of two consecutive weeks in November and December of 2023. At the end of the two-week data collection period, 69 fully completed survey responses had been received. There were some incomplete responses, with almost all of those only containing answers for the first few demographical questions, therefore, the incomplete survey responses were discarded from further analysis. Most respondents were female and had self-reported diagnosis of ulcerative colitis.

2.2 Instruments

The appropriateness of the chosen instruments was discussed with thesis supervisors. Most of the instruments were not available in Finnish, nor had they been validated with the target population. Those were translated from English to Finnish by the author who is a native Finnish-speaker. Next, selected parts of the instruments that could have been susceptible to changes in meaning or connotation were translated back to English by another individual and discrepancies were assessed. In addition to these instruments, guidance from healthcare providers and intention were assessed with scales developed specifically for this study. The survey was piloted by

two Finnish IBD patients to check for comprehension and to receive feedback. After the data was collected, Cronbach's alpha was calculated to assess the internal consistency of the instruments. Next follows a brief introduction to the scales used.

Demographic and illness data. First, some demographic and illness data was collected. These included: gender, age range, type of IBD, how long since the onset of illness, and perception on whether the illness has affected or affects the respondent's physical activity. Additionally, symptom severity within the last 6 months was assessed using the Manitoba IBD Index (Clara et al. 2009).

Physical activity. Next, physical activity levels were assessed using the International Physical Activity Questionnaire Short Form (IPAQ-SF) developed by the World Health Organization. It assesses how much time respondents spend participating in vigorous, moderate, and walking activity during the last 7 days. Data was processed according to guidelines (Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ)-Short and Long Forms, 2005) and respondents were divided into three activity categories: inactive, minimally active, and HEPA-active. The last category refers to Health Enhancing Physical Activity and is considered a high active category that allows for the collection of full health and functional benefits from physical activity. To be classified as HEPA-active, the respondents need to either participate in vigorous physical activity on at least 3 days per week and reach at least 1500 MET-min/week or engage in any combination of walking, moderate and vigorous physical activity on all 7 days reaching at least 3000 MET-min/week. To reach the minimally active category, respondents need to fill one of these three criteria: 1. Engage in vigorous physical activity for at least 20 minutes per day on 3 or more days. 2. Engage in moderate physical activity and/or walking for at least 30 minutes per day on 5 or more days. 3. Engage in any combination of walking, moderate, or vigorous physical activity on 5 or more days reaching a minimum of at least 600 MET-minutes/week. The inactive category is for those respondents who either report no activity, or activity that is not enough to qualify them for the other categories. (Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ)-Short and Long Forms, 2005.) In addition to classifying respondents, physical activity scores in MET-min/week were calculated first for each intensity of physical activity, and then for total physical activity by adding up the MET-min/week scores of walking, moderate-intensity, and vigorous physical activity for each respondent. Different number of responses

were included in these analyses, because different number of acceptable responses were available after cleaning the data according to the guidelines.

Health beliefs about physical activity. Health beliefs concerning physical activity were assessed using the Health Belief Model Scale for Exercise (Wu et al., 2020). It contains six subscales measuring predictors of the health belief model in exercise context. For this study, questions referring to 'exercise' were rephrased as 'physical activity.' Specifically, the instrument assesses: perceived benefits (e.g., *I belief that daily regular physical activity is beneficial in controlling chronic diseases*), perceived severity (e.g., *Lack of physical activity can increase the risk of chronic diseases*), self-efficacy (e.g. *I'm sure that I can find time to be physically active*), perceived subjective barriers (e.g. *I think that it's painful to do physical activity*), perceived objective barriers (e.g., *I have no time to be physically active*) and cues to action (e.g., *My family always reminds me to be physically active*). Answers were provided on a 5-point Likert scale (1 = Completely disagree, 5 = Completely agree). The scale includes 18 items and has been found to have acceptable internal consistency (Sheng et al., 2023; Wu et al., 2020), with Cronbach's coefficients for the subscales having ranged from 0.63 to 0.84 in a previous study (Wu et al., 2020). In this study, Cronbach's alpha was calculated for each subscale and it was discovered that some subscales had acceptable to good internal consistency (Perceived benefits, 3 items, $\alpha = .85$, Perceived objective barriers, 4 items, $\alpha = 72$, Self-efficacy, 3 items, $\alpha = .76$, and Cues to action, 3 items, $\alpha = .82$), while others had poor to unacceptable internal consistency (Perceived subjective barriers, 3 items, $\alpha = .45$ and Perceived severity, 2 items, $\alpha = .54$). Removing any items from these problematic subscales would not have led to meaningful increases in internal consistency.

Guidance from IBD-related healthcare providers. Guidance from healthcare providers was assessed with a scale developed for this study. First the respondents were asked whether they had received physical activity guidance from some IBD-related healthcare provider (e.g., doctor or nurse) options being "yes", "no" and "I do not know". Following this were questions on whether the possible benefits of physical activity had been discussed with healthcare providers *(My IBD-related healthcare provider tells me about the benefits of physical activity)*, whether the respondents perceive healthcare providers to be interested in their physical activity (*My IBD-related healthcare provider is interested in my physical activity*), whether the respondents have been asked about their physical activity (*My IBD-related healthcare provider asks me about my physical activity*), whether healthcare providers had encouraged the respondents to be

physically active *(My IBD-related healthcare provider has encouraged me to be physically active),* or helped the respondents to increase their physical activity *(My IBD-related healthcare provider has helped me to increase my physical activity).* Answers were provided on a 5-point Likert scale (1 = Completely disagree, 5 = Completely agree). The scale showed excellent internal consistency (Cronbach's alpha .93).

Intention. Intention was also assessed using a scale developed for this study. The scale assessed the respondents' intentions to engage in different intensities of physical activity over the last 7 days, and how committed they had felt to their intentions. First question was answered on a scale of 0 - 7 (*Within the last 7 days, on how many days did you intend to engage in some physical activity?).* Rest of the statements *(Within the last 7 days I intended to engage in light physical activity; Within the last 7 days I intended to engage in moderate-to-vigorous physical activity; I felt committed to my intentions to engage in physical activity; I did not think about physical activity at all)* were answered on a 5-point Likert scale (1 = Completely disagree, 5 = Completely agree). The scale also aimed to assess the intention-PA gap that might be present in the sample by asking the respondents to indicate whether they had intended to be much less, less, as, more, or much more physically active than they ended up being. The scale showed acceptable internal consistency (Cronbach's alpha .77).

Self-regulation. Self-regulation strategies regarding physical activity were assessed using the Physical Activity Self-Regulation Scale (PASR-12) (Umstattd et al., 2009). It contains 12 questions and assesses self-monitoring, goal setting, eliciting social support, reinforcement, time management, and relapse prevention. Respondents were asked how often they had used these self-regulatory skills concerning physical activity within the last 7 days (*e.g. I set PA goals that focused on my health*), answers were provided on a 5-point Likert scale (1 = Never, 5 = Very often). The scale has been found reliable and valid with different populations (Tam & Cheung, 2020; Umstattd et al., 2009; Watanabe et al., 2017). In this study, self-regulation subscales were checked for internal consistency using Cronbach's alpha. One subscale had questionable internal consistency (Reinforcement, 2 items, $\alpha = .64$), while others ranged from acceptable to excellent (Self-monitoring, 2 items, $\alpha = .76$, Goal setting, 2 items, $\alpha = .92$, Eliciting social support, 2 items, $\alpha = .89$, Time management, 2 items, $\alpha = .92$, Relapse prevention, 2 items, $\alpha = 73$).

Psychological distress. Psychological distress was assessed using the Kessler Psychological Distress Scale (Kessler et al., 2002). It contains 10 items assessing how often anxiety and depressive symptoms had been experienced within the last month *(e.g. During the last 30 days, about how often did you feel nervous?)*. Answers were provided on a 5-point Likert scale (1 = None of the time, 5 = All of the time). Scores can vary on a scale of 10 – 50. Those scoring under 20 points are considered to have likely been well, scores of 20 – 24 indicate mild distress, 25 – 29 moderate distress, and scores over 30 severe distress. The scale has shown reliability and validity with diverse populations (e.g., Arnaud et al., 2010; Furukawa et al., 2003; Hoffman et al., 2022; Kessler et al., 2002).

2.3 Analysis

Data was analysed using SPSS version 28. Descriptive statistics were calculated and are presented as frequencies and percentages, means and standard deviations, or as medians and interquartile ranges when appropriate. As already discussed, internal consistency of the scales was assessed using Cronbach's alpha.

To meet the aims of the study, different methods of analysis were employed. First, exploration of health beliefs, guidance from healthcare providers, intention, self-regulation, and psychological well-being was done in depth. Then the sample was divided into two categories: Insufficiently active (combination of inactive and minimally active groups) and HEPA-active, thresholds for the groups are defined earlier in this methods-section. These two groups were compared to look for group-level differences in the hypothesized predictors and psychological well-being using the Mann-Whitney U-test. This particular test was chosen because the data violated the assumption of normality present in parametric tests. Although, as an exercise in curiosity the data was also examined using a parametric t-test and same significant differences were found with that method. Only results from the Mann-Whitney U-test will be reported as that was deemed to be the more appropriate method for analysing this data. After this group-level exploration, the relationships between potential predictors and different intensities of physical activity were explored using Spearman's rank correlation. Similarly, the relationships between psychological well-being and different intensities of physical activity were explored with Spearman's rank correlation. This non-parametric test was chosen because the assumptions for a parametric Pearson's correlation were not met, mainly due to the lack of normal distribution.

Those variables that demonstrated a significant relationship with one or more intensity levels of physical activity (2-tailed $p < 0.05$) were carried out to multiple linear regression models. The analysis was done in this 2-step manner for a few reasons. First, the limitation of small sample size and its effects on the power of regression analyses was recognized. As a test, preliminary multiple linear regression analysis was calculated for total physical activity with all possible predictors of interest, not just those from Spearman's correlation. This model did not fit well, it had problems with autocorrelation and multicollinearity, and struggled to find significant predictors. Therefore, this 2-step approach of identifying likely predictors through correlation and then using those results to build regression analyses was employed. In total, 4 different models were created: one for walking, moderate-intensity, vigorous-intensity, and total physical activity.

2.4 Ethical considerations

The need for ethical review was discussed with thesis supervisors. After reviewing the guidelines of The Finnish National Board on Research Integrity TENK and The Medical Research Act, it was concluded that ethical review was not needed for this study. Nevertheless, the sensitive nature of the research topic was recognized and taken into consideration during the planning, conducting, and reporting phases of the study. Before data collection, data management plan was written by the author and reviewed and approved by University of Jyväskylä's Open Science Centre. Only necessary data was collected, and the instruments and wording chosen in the survey aimed to cause minimal potential distress to respondents. The survey was hosted on REDCap which is specifically meant to be used for collecting sensitive data. Data was collected anonymously. The participants were provided with information about the aims of the research, and the voluntary nature of participation was emphasized. Privacy notice and information sheet were provided before informed consent was obtained. The author's contact details were provided in case the participants had questions. After the survey was closed to participants, the responses were downloaded to a secure university server and kept there until being erased at the end of the thesis process.

3 RESULTS

Next the main results of the study are presented, starting with describing the sample and their physical activity levels. Following this, the potential predictors of physical activity and psychological well-being of the sample are explored all in isolation. Then the HEPA-active group and the insufficiently active group of IBD patients will be compared to each other to look for differences in the potential predictors and psychological well-being. Finally, bivariate correlation and multiple linear regression results will be presented for different intensities of physical activity. Different numbers of acceptable responses were available for different analyses; and therefore the sample size varies across results.

3.1 Demographic characteristics and illness history

There were 69 fully completed responses to the survey. Vast majority of respondents were female (95.7%), most belonged to age categories 34 – 41 and 42 – 49 years (26.1%, respectively). Majority reported having ulcerative colitis (81.2%), with 58% having received their diagnosis within the last five years. Regarding disease activity, 4.3% responded that their illness had given them symptoms daily over the past six months, while 18.8% reported being in remission during the last 6 months. Table 1 presents the key findings.

3.2 Physical activity

Different number of responses were included in the analyses for MET-min/week scores for walking, moderate, vigorous and total physical activities. Out of the 69 fully completed survey responses 60 had all the necessary data to go through the whole analysis procedure and these respondents were classified either as inactive, minimally active or HEPA-active. Results showed that 33.3% of respondents were participating in enough physical activity to be classified in the high active HEPA-category (n=20), half of respondents (50%) were classified as minimally active (n=30), and 16.7% as inactive (n=10). When asked whether IBD affects or has affected their physical activity 78.3% answered yes (54/69), 20.3% answered no (14/69), and 1.4% (1/69) did not know.

TABLE 1. Demographic and illness data

Demographic data	n (%)
Gender	
Female	66 (95.7)
Male	3 (4.3)
Age*	
18 – 33	17 (24.6)
34 – 49	36 (52.2)
50 – 73	16 (23.1)
Disease type	
Crohn's disease	10 (14.5)
Ulcerative colitis	56 (81.2)
Indeterminate colitis	3 (4.3)
Time since diagnosis	
0 – 2 years	22 (31.9)
3 – 5 years	18 (26.1)
6 – 8 years	6 (8.7)
9 – 11 years	4 (5.8)
12 – 14 years	5 (7.2)
Over 15 years	14 (20.3)
Illness activity within the last 6 months	
Constantly active, giving symptoms every day	3 (4.3)
Often active, giving symptoms most days	16 (23.2)
Sometimes active, giving symptoms on some days	13 (18.8)
Occasionally active, giving symptoms 1 – 2 days/month	11 (15.9)
Rarely active, giving symptoms only a few days of the past 6 months	13 (18.8)
I was well in the past 6 months, what I consider remission	13 (18.8)

*Some age categories have been combined in the table.

3.3 Health beliefs about physical activity

This sample of IBD patients perceived physical activity as beneficial, for example 87% believed that physical activity is beneficial in controlling chronic diseases. The sample, on average, did not perceive high levels of objective barriers to physical activity. For subjective barriers, there was considerably more division: 46.4% disagreed that they were too lazy to be physically active, while 30.4% agreed with the statement. 53.6% disagreed that physical activity causes pain, while 31.9% agreed with the statement. Self-efficacy for physical activity seemed to be relatively high within the sample as majority perceived themselves capable of being physically active even daily and alone. It was perceived that a lack of physical activity can lead to negative outcomes, for example 69.6% agreed that it can increase the risk of chronic illnesses. Finally, this sample did not report receiving a lot of cues to be physically active. Table 2 provides more detailed information on health beliefs.

TABLE 2. Health beliefs about physical activity.

Perceived benefits of PA	% of respondents agreed
Regular daily PA is beneficial in controlling chronic diseases	87%
Regular daily PA is beneficial in weight control	95.7%
Reasonable daily amount of PA is good for the health	97.1%
Objective barriers to PA	% of respondents disagreed
I cannot find appropriate venues to do PA at	69.6%
I have no one to do physical activity with	49.3%
I do not have the time to be physically active	66.7%
I have not found a suitable physical activity	68.3%
Subjective barriers to PA	% of respondents disagreed
I am too lazy to be physically active	46.4%
Physical activity causes pain	53.6%
I cannot see the benefits of physical activity	95.7%
Self-efficacy	% of respondents agreed
I can be physically active daily	66.7%
I can be physically active even alone	78.3%
I can find the time to be physically active	81.1%
Perceived severity	% of respondents agreed

Lack of PA can increase the risk of chronic illnesses	69.6%
Lack of physical activity can lead to weight gain	95.7%
Cues to action	% of respondents disagreed
My friends remind me to be physically active	81.2%
My family reminds me to be physically active	66.6%
My doctor reminds me to be physically active.	56.5%

3.4 Guidance from healthcare providers

Out of the 69 respondents, only 5 individuals (7.2%) reported having received guidance from their IBD-related healthcare provider regarding physical activity, 4 respondents (5.8%) could not say, and 60 respondents (87%) reported having received no guidance on the matter. Clear majority of the respondents perceived that their IBD-related healthcare providers are not interested in their physical activity, do not ask them about their physical activity, do not encourage physical activity, have not told them about the benefits of physical activity, or helped them to increase their physical activity. Table 3 provides more details on guidance.

TABLE 3. Perceptions on PA-guidance from healthcare providers.

Survey items	**% that disagreed**
I have received PA-guidance from any IBD-related healthcare provider	87 %
My IBD-related healthcare provider tells me about the benefits of PA	76.8%
My IBD-related healthcare provider is interested in my PA	73.9%
My IBD-related healthcare provider asks me about my PA	76.8%
My IBD-related healthcare provider has encouraged me to be physically active	69.9%
My IBD-related healthcare provider has helped me to increase my PA	87%

3.5 Physical activity intentions

Respondents reported high levels of intention to engage in physical activity: 91.3% had intended to engage in light physical activity during the last 7 days, and 65.2% had intended to engage in moderate or vigorous physical activity. On average, the sample had felt committed to their intentions (69.6%). Majority of respondents (78.2%) reported having thought about physical activity during the last 7 days. There was considerable variability on how many days the respondents had intended to engage in some physical activity, most common answers were 3 days (20.3%), 4 days (21.7%) and 7 days (21.7%) (Figure 1). 53.6% ended up being as physically active as they had intended to be, 14.5% ended up being more physically active than intended, while 31.9% intended to be more or a lot more physically active than they ended up being.

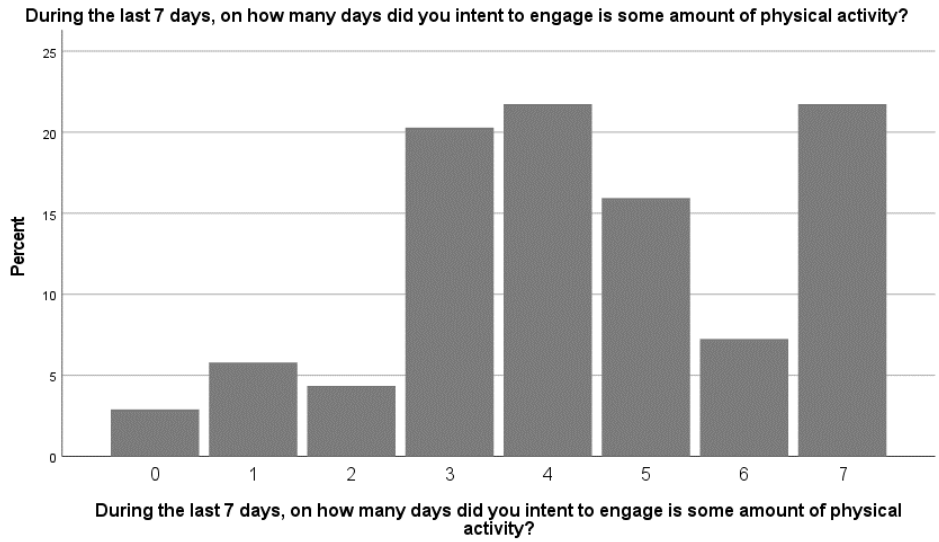

FIGURE 1: Intention to engage in PA during the last 7 days.

3.6 Physical activity self-regulation

When respondents were asked to indicate how often during the last 7 days they had engaged in self-regulatory behaviours regarding physical activity, there were marked differences in popularity of different strategies. Most respondents engaged in self-monitoring their physical activity, for example 72.4% mentally kept track of their physical activity often (combination of often

and very often). Less than half of the respondents often engaged in goal setting, while eliciting social support was very rare: 81.2% said they had rarely or never asked advice regarding physical activity from anyone. Over 60% of the respondents often engaged in reinforcing their PA behaviour. Majority of respondents also engaged in time management, with almost 70% often mentally scheduling time for physical activity. Finally, answers about relapse prevention were spread: 40.6% of respondents never or rarely planned how to be active even in bad weather, 21.7% sometimes planned how to be active in such a situation, and 37.7% often planned ways to be active even in a bad weather. Table 4 provides more details.

TABLE 4. Physical activity self-regulation

Survey items	%
Self-monitoring	
Often mentally kept track of their PA	72.4%
Often paid attention to what things helped them to be physically active	57.9%
Goal setting	
Often set short-term goals concerning the frequency of PA	46.3%
Often set PA-goals focusing on health	50.7%
Eliciting social support	
Rarely or never asked advice regarding PA from anyone	81.2%
Rarely or never asked advice regarding PA from a professional in the medical or physical activity fields	89.9%
Reinforcement	
Often focused on how good it felt after PA	62.3%
Often reminded themselves of the health benefits of PA	63.7%
Time management	
Often mentally scheduled time for PA	69.6%
Often arranged their schedule in a way to make sure they have time to be active	57.9%
Relapse prevention	
Never or rarely planned how to be physically active during travels away from home	60.9%
Never or rarely planned how to be active even in bad weather	40.6%

3.7 Psychological well-being

The respondents completed a scale assessing experienced distress within the last 30 days. Based on their results, they were divided into 4 groups according to the guidelines of The Kesser Distress Scale (Kessler et al., 2002). Those scoring under 20 points were considered to have likely been well, scores of 20 – 24 indicated mild distress, 25 – 29 moderate distress, and scores over 30 severe distress. Out of the 69 respondents 33.3% (n=23) got low scores and were classified as having been well, another 33.3% (n=23) had experienced mild distress, 15.9% (n=11) had experienced moderate distress, while 17.4% (n=12) reported having experienced severe distress. (See Figure 2 for visual representation.)

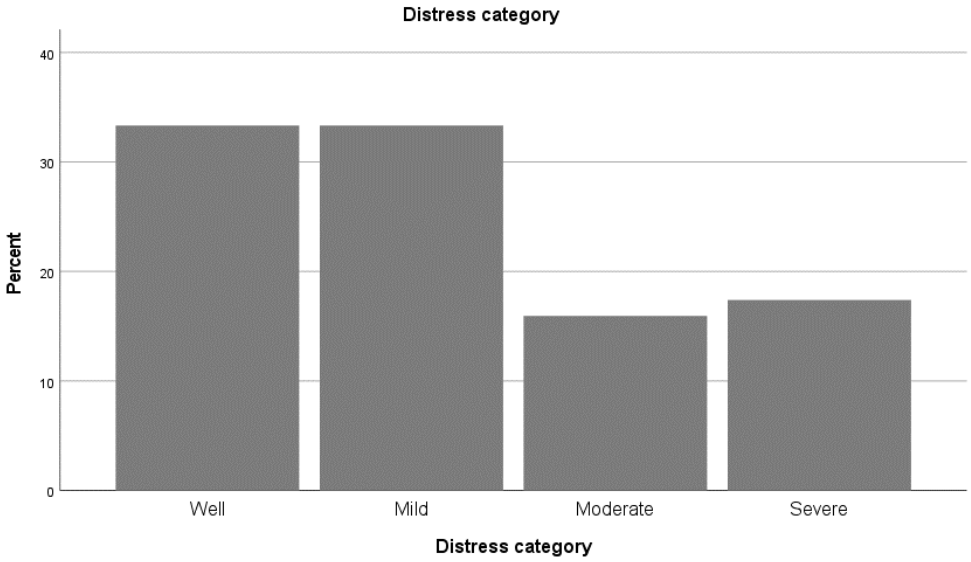

FIGURE 2. Experienced distress within the last 30 days.

3.8 Differences between activity groups

Differences in possible predictors and psychological well-being between the insufficiently active group (combination of inactive and minimally active, n = 40) and HEPA-active group (n = 20) were explored using the Mann-Whitney U test. When it comes to health beliefs about physical activity, results suggest that HEPA-active group perceived significantly higher benefits from physical activity, lower objective barriers to physical activity, and higher self-efficacy for physical activity. HEPA-active group also employed some self-regulatory strategies at a significantly higher level than the inactive group, namely self-monitoring, eliciting social support,

time-management, and relapse prevention. Finally, HEPA-active group had significantly higher intention to engage in physical activity. There were no significant differences in levels of psychological distress between the groups. Table 5 summarizes the key findings.

TABLE 5. Significant differences between the groups.

Variable	**z-value**	**p-value**
Perceived benefits	-2.03	.042
Objective barriers	-2.23	.026
Self-efficacy	-2.75	.006
Self-monitoring	-3.09	.002
Eliciting social support	-2.96	.003
Time-management	-2.77	.006
Relapse prevention	-2.95	.003
Intention	-2.50	.013

3.9 Bivariate analyses

Spearman's rank correlation was used to assess the relationships between potential predictors of physical activity and levels of physical activity at different intensities. Also, the relationship between psychological well-being and different intensities of physical activity was explored. Table 6 presents the significant relationships found.

There was a significant negative relationship between total physical activity and objective barriers. Positive relationships were found between total physical activity and self-efficacy, self-monitoring, eliciting social support, time management, and intention. Vigorous physical activity was significantly associated with some of the same potential predictors as total physical activity; it had a negative relationship with objective barriers, and positive relationships with self-efficacy, self-monitoring, eliciting social support, time management, and intention. In addition to these, vigorous physical activity also had positive relationships with goal setting, and relapse prevention. Contrary to expectations, vigorous physical activity had a negative relationship with perceived severity of inactivity, which was non-significantly positively associated with walking and moderate-intensity physical activity.

Moderate-intensity physical activity also shared some significant potential predictors with total and/or vigorous physical activity, such as a negative relationship with objective barriers, and positive relationships with self-efficacy, self-monitoring, goal setting, time management, and intention. Unique correlates so far were age in a negative direction, and reinforcement as a positive correlate. Finally, walking only had one significant correlate. Unexpectedly, it was positively related to experienced distress, which did not have a significant relationship with any other intensity of physical activity.

TABLE 6. Significant correlations to physical activity.

Variables	Total PA			Vigorous PA			Moderate PA			Walking		
	r	p	n	r	p	n	r	p	n	r	p	n
Health beliefs												
Objective barriers	-.32	.014	60	-.26	.035	65	-.27	.027	66			
Self-efficacy	.36	.005	60	.44	<.001	65	.33	.007	66			
Perceived severity				-.30	.015	65						
Intention												
Intention	.40	.002	60	.63	<.001	65	.30	.014	66			
Self-regulation												
Self-monitoring	.35	.007	60	.32	.010	65	.30	.013	66			
Goal setting				.27	.031	65	.25	.045	66			
Eliciting social support	.28	.031	60	.32	.009	65						
Relapse prevention				.39	.001	65						
Time management	.27	.037	60	.42	<.001	65	.35	.004	66			
Reinforcement							.27	.032	66			
Other												
Age							-.32	.009	66			
Distress										.26	.043	60

3.10 Linear regressions

Multiple linear regression was conducted to predict the total physical activity level based on the potential predictors identified in Spearman's rank correlation. The model for total physical

activity was non-significant, perhaps due to low sample size ($F(6, 53) = 1.917$, $p = .095$, $R^2 = .178$). No individual predictor showed statistical significance, although self-efficacy came the closest. (See table 7 for more details.)

TABLE 7. Linear regression for total PA

Variable	B	SE	t	p
Constant	-978.53	2137.26	-.458	.649
Objective barriers	40.96	77.06	-.532	.597
Self-efficacy	184.50	100.46	1.837	.072
Self-monitoring	201.72	210.72	.957	.343
Eliciting social support	119.31	140.90	.847	.401
Time management	-251.92	151.82	-1.659	.103
Intention	95.59	88.06	1.085	.283

$R^2 = .178$ ($p = 0.95$)

Similarly, multiple linear regression was conducted to predict the levels of vigorous physical activity from the potential predictors identified in Spearman's rank correlation. The model was significant ($F(9, 55) = 3.601$, $p = .001$, $R^2 = .268$). Out of the individual predictors self-efficacy and perceived severity of inactivity were significant predictors. (See table 8 for more details.)

TABLE 8. Linear regression for vigorous PA

Variable	B	SE	t	p
Constant	-517.811	1270.654	-.408	.685
Objective barriers	13.47	38.86	.347	.730
Self-efficacy	114.05	51.72	2.205	**.032**
Perceived severity	-227.21	90.57	-2.509	**.015**
Self-monitoring	88.62	117.00	.757	.452
Goal setting	39.40	66.41	.593	.555
Eliciting social support	106.22	69.60	1.526	.133
Time management	-77.13	85.82	-.902	.371
Relapse prevention	-26.15	72.53	-.361	.720
Intention	73.72	48.27	1.527	.132

$R^2 = .371$ ($p = 001$).

The multiple linear regression for moderate-intensity physical activity based on the potential predictors identified in Spearman's rank correlation was significant ($F(8, 57) = 2.133$, $p = .047$, $R^2 = .230$). Out of the individual predictors the only significant one was age. (See table 9 for more details.)

TABLE 9. Linear regression for moderate PA

Variable	B	SE	t	p
Constant	741.42	774.17	.958	.342
Age	-153.17	55.64	2.753	**.008**
Objective barriers	-38.14	25.51	-1.495	.140
Self-efficacy	27.16	34.06	.798	.428
Self-monitoring	57.15	70.14	.815	.419
Goal setting	39.75	47.80	.832	.409
Reinforcement	-18.78	59.45	-.316	.753
Time management	53.25	59.22	-.899	.372
Intention	7.14	30.24	.236	.814

$R^2 = .230$ ($p = .047$).

Simple linear regression was conducted to predict walking based on psychological distress. The model was significant ($F(1, 58) = 5.667$, $p = .021$, $R^2 = .089$), with experienced distress remaining as a significant predictor. (See table 10 for more details.)

TABLE 10. Simple linear regression for walking

Variable	B	SE	t	p
Constant	134.52	496.78	.271	.788
Distress	48.63	20.43	2.380	**.021**

$R^2 = .089$ ($p = .021$).

4 DISCUSSION

This thesis hoped to provide some answers to the question: "What separates physically active IBD patients from inactive ones?" To do this, health beliefs, guidance from healthcare providers, intention, and self-regulation of Finnish adult IBD patients regarding physical activity were explored. After this, groups of insufficiently active patients and active patients were compared on the potential predictors. Correlations between potential predictors and different intensities of physical activity were explored, and the extent to which these predictors could explain differences in physical activity levels at different intensities were investigated. Finally, the connection between physical activity and psychological well-being was explored.

It was found that 33.3% of respondents participated in enough physical activity to be classified as HEPA-active and therefore gain the full health benefits of physical activity. This is in-line with previous studies suggesting that a substantial portion of people with IBD are insufficiently physically active (Fagan et al., 2021; Gettigan et al., 2022; Mareschal et al., 2022; Shephard, 2016; Tew et al., 2016). Further, these results are extremely similar to results from the Finnish general population, where 39% of men and 34% of women have been reported to reach the recommendations for health enhancing levels of physical activity (FinTerveys 2017 -tutkimus). This study also shows that despite the high-quality medical care that Finland has, people with IBD feel their disease as influencing their physical activity (78.3% of respondents), although this does not necessarily translate to lower physical activity levels compared to the general public. This is similar to previous findings where patients have reported IBD as affecting and limiting their physical activity (Chan et al., 2014; Fagan et al., 2021; Tew et al., 2016)

4.1 Exploration of possible predictors

This study shed a light on some issues that have either not been studied in regard to people with IBD at all, or have received the bare minimum of interest, such as physical activity guidance from IBD-related healthcare providers. Aligned with previous results (Gatt et al. 2019; Nathan et al. 2013), this study found that IBD patients are typically not receiving physical activity guidance from healthcare providers, and they perceive a lack of interest on the topic from them. Typically, the respondents had not been asked about their physical activity nor had the benefits of it been discussed with IBD-related healthcare providers. Previous research has shown IBD

patients' desire to discuss physical activity with their healthcare providers and receive education on the matter (Gatt et al. 2019; Gettigan et al. 2022), this study shows that this desire is not currently met in the Finnish healthcare system. Also, this study was the first – as far as the author is aware – to investigate physical activity intentions and self-regulation of IBD patients. High levels of intentions were found, with majority of respondents having felt committed to their intentions. This study also found evidence of intention-PA gap, with 32% of respondents not having been as active as they had intended. This is a similar level of intention-PA gap found elsewhere (Rhodes & de Bruijn, 2013a). This suggest that IBD patients need help in turning their intention into action, perhaps by improving their use of self-regulatory strategies. Self-monitoring was the most popular form of self-regulation, with time management, self-reinforcement and goal setting done by slightly fewer number of respondents. Eliciting social support and relapse prevention were rare. When examining health beliefs, results from this study support previous findings that IBD patients perceive physical activity as beneficial (Chae et al., 2016; Gatt et al., 2019; Gettigan et al., 2022). Regarding barriers, over half of the respondents disagreed with physical activity causing pain. This is a positive finding considering that pain is a very often cited limitation to physical activity among IBD patients (e.g., Davis et al., 2022). Yet, it can be taken as a negative finding that 32% of respondents do, indeed, feel that physical activity causes them pain.

4.2 Relationships with physical activity

When examinations were made at a group level, the HEPA-active and insufficiently active groups differed on many possible predictors. There were differences in health beliefs concerning physical activity; HEPA-active group perceived higher benefits from physical activity, lower levels of barriers, and higher self-efficacy. There were also marked differences in some self-regulatory strategies; HEPA-actives engaged in higher levels of self-monitoring, eliciting social support, time-management, and relapse prevention. Intention to engage in physical activity was also significantly higher for those in the HEPA-active group.

When looking at the correlates of physical activity through bivariate analysis, some potential predictors emergent as robust, affecting all intensities of physical activity excluding walking. These were: objective barriers, self-efficacy, self-monitoring, time management, and intention. It is worth noticing that these same predictors were also present as significant differences at the

group-level comparison. There have been conflicting reports concerning the significance of perceived barriers to physical activity. Fagan et al. (2021) found no correlation between the level of reported barriers and physical activity levels, while Tew et al. (2016) found barriers to have a significant negative relationship with physical activity of Crohn's disease patients. The findings from this study support those of Fagan's team (2021) highlighting the importance of minimizing the perceived barriers that IBD patients feel limit their physical activity. This was also the first study, as far as the author is aware, that demonstrated the importance of physical activity self-efficacy for people with IBD. All-in-all, self-efficacy for physical activity was relatively high in the sample. More importantly, self-efficacy was a reliable correlate of physical activity at all intensity levels excluding walking and predicted vigorous physical activity in the multiple linear regression. Self-efficacy has been shown to be an important predictor of physical activity in other studies and is an important predictor in the Health Action Process Approach model (Schwarzer, 2016). These findings emphasize the importance of supporting the self-efficacy beliefs of IBD patients in order to increase physical activity and gain the potential health benefits from it.

As was mentioned, out of self-regulatory behaviours self-monitoring was the most prevalent, followed by time management, reinforcement, and then goal setting. Findings seem to indicate that at least some self-regulatory behaviours are important for physical activity engagement, yet some skills are employed more often than others and seem to exert a stronger influence on PA-behaviour. There might be an effect by intensity of physical activity seeing as some self-regulatory skills differed between different intensities of physical activity. When it comes to intention, this study supports those done with different populations and settings: intention is a strong predictor of physical activity, yet having an intention to engage in physical activity is not enough. The sample had high intentions toward physical activity, intention had a significant relationship with all intensities of physical activity except for walking, and yet there was considerable intention-behaviour gap to be noted. As was already suggested in this paper and in models such as the Integrated Behavior Change Model (Hagger & Chatzisarantis 2014), Health Action Process Approach (Schwarzer, 2016), and the Multi-process action control framework (Rhodes & de Brujin 2013b; Rhodes & Yao, 2015; Rhodes 2021), self-regulatory skills might be one way to start bridging this gap.

There have been some mixed results over whether disease activity affects the level of physical activity of IBD patients. This study managed to provide some additional evidence regarding

this question. Tew et al. (2016) found that increased disease activity was associated with lower levels of physical activity, whereas Fagan et al. (2021) found that disease activity was not associated with physical activity levels. This study supports findings of the latter by discovering no association between reported disease activity and physical activity levels. Perceived benefits have been found to have a positive relationship with physical activity (Tew et al., 2016), in this study, when examinations were made at group-level, there was a significant difference in perceived benefits between the groups of HEPA-active and insufficiently active patients, surprisingly this relationship was no longer found when examined the variables through Spearman's correlation.

Some unexpected relationships that contradicted expectations and findings from other studies were also found. This study's findings concerning the relationship between physical activity and psychological well-being were unexpected. A consistent finding among IBD patients is higher prevalence of depressive and anxiety symptoms (Mikocka-Walus et al., 2016; Neuendorf et al., 2016). In this study 66.6% of respondents were classified as having been well or having experienced mild distress within the last 30 days, unfortunately this means that 33.3% had experienced either moderate or severe distress. When comparisons were made between the HEPA-active and insufficiently active groups, the level of psychological distress was not significantly different between the groups. Nor was distress associated with vigorous, moderate, or total level of physical activity. This is in contrast to findings from other studies, where positive relationships between physical activity and different indicators of psychological well-being have been discovered (Fagan et al., 2021; Klare et al. 2015; Ng et al., 2007; Qiao et al., 2024; Tew et al., 2016; van Erp et al. 2021). Unexpectedly distress had a positive relationship with walking. Could the experience of distress lead patients to self-treat themselves with light physical activity such as walking? Or does the small sample size just lead to false interpretations? It is impossible to answer these questions or explore other alternative hypotheses based on this research, but further studies should investigate this matter. It should be noted that it is not surprising that walking did not have other significant correlates. Walking might often be a form of incidental physical activity that is not affected by health beliefs, guidance, intention, or self-regulation to the same degree as more planned forms of activity.

4.3 Limitations

There are numerous limitations to this study that need to be noted. First, this study is cross-sectional and true cause-effect relationships between assumed predictors and outcome variables cannot be proven as the data is merely correlational. Second, the sample size is low, which lowers the ability to find significant connections and generalize findings. Findings from regression analyses in this study were underwhelming, perhaps due to this low sample size. Third, there is a clear risk of selection bias since participants were recruited from social media and there is a possibility that this self-selection into the study resulted in non-representative sampling. In fact, there was a large majority of women as respondents which makes generalizing the results to males with IBD problematic. Fourth, this study relied on self-reported data which is vulnerable to recall bias. Fifth, there are possible limitations concerning the assessment tools. The instruments have not been specifically developed and/or validated for this population and therefore might not be sensitive or specific enough. Also, some instruments were translated from English to Finnish and not all items were back translated by another person, only those that were deemed complex. Some subscales of some instruments showed a cause for worry concerning internal consistency. Finally, the IPAQ-SF assesses all physical activity. The hypothesized predictors of physical activity are likely to affect leisure time physical activity more than the global physical activity level since leisure time behaviour is more within the individual's control.

4.4 Conclusion

The strengths and contributions of this study should also be noted. This study covered new ground concerning IBD patients, their physical activity, and its predictors. These issues were explored using multiple different methods and new findings were made especially concerning intention, self-regulation, and self-efficacy, strengthening the idea that these are important constructs regarding physical activity within this population. It was found that IBD patients are not receiving guidance or encouragement regarding physical activity from healthcare providers. Although based on this study it cannot be claimed that receiving this support would have meaningful effects on physical activity of the patients, as guidance received from healthcare providers did not have a significant relationship with physical activity, this would seem plausible and supported by previous studies (Gatt et al., 2019). Based on the results from this study, further

studies of, and physical activity guidance to, IBD patients should in the future focus on constructs that have shown robust relationships with physical activity. These are objective barriers, self-efficacy, self-monitoring, time management and intention. It is recommended that in the future patients should receive guidance from a specialist who understands the possible limitations the illness can produce (such as pain) and offer help in increasing physical activity by focusing on these potential predictors. Also based on the linear regression of moderate-intensity physical activity, it seems that older patients could benefit from efforts to increase their moderate-intensity physical activity. All this can mean short-term costs to the healthcare system, yet would likely be cost-effective in the long run if effects of improved guidance would reflect on improved quality of life, and better physical and psychological well-being of patients. The author strongly suggests that more research on these matters should be conducted with larger and more representative samples. Finally, it should always be kept in mind that people with IBD have every right to determine their own physical activity levels and ways. Offered guidance should be autonomy-supportive and respect the right of people with IBD to decide for themselves why and how physical activity suits them.

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