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**Department of Brain and Behavioral Sciences (DBBS)
MSc in Psychology, Neuroscience and Human Sciences**



The Gut-Brain Axis and Mental Health: A Systematic Review of Psychological, Emotional and Cognitive Impairments After Stoma Surgery

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DEDICATION

To my parents, the hardest-working people I know, who made room for every dream I had. To the small things that have kept me grounded and made life feel full; trees, waves, books, shared meals, hugs, animals, laughter, tears, love, and forgiveness. To the people I love, and to the people who have loved me back.

Abstract

The gut-brain axis provides a useful framework for understanding how gastrointestinal function may relate to psychological and cognitive outcomes. This may be particularly relevant in the context of intestinal surgery, including stoma formation, which is commonly performed for conditions such as colorectal cancer and inflammatory bowel disease. Despite this potential relevance, cognitive outcomes following stoma surgery remain comparatively under-explored, and the biological mechanisms that may contribute to these outcomes have received little direct investigation.

This mixed-methods systematic review synthesised evidence on emotional, psychosocial, and cognitive outcomes in adults following stoma surgery and interpreted the findings within a gut-brain axis framework. Of 701 records identified, 21 studies met the eligibility criteria. Quantitative and qualitative evidence was appraised using Joanna Briggs Institute critical appraisal tools and synthesised narratively.

Depression, anxiety, and difficulties with psychosocial adjustment were reported across several studies, although the severity and persistence of these problems differed between participants and over time. Adjustment was also associated with factors such as self-efficacy, social support, body image, and experiences of stigma.

Comparative evidence suggested that stoma formation may add to the psychological burden associated with major surgery, although the available studies do not establish the mechanisms underlying this additional burden. Psychological and psychosocial adaptation should therefore be considered an important component of stoma care. Against this background, the gut-brain axis provides a hypothesis-generating framework for future research aimed at clarifying cognitive outcomes, distinguishing stoma-specific effects from the broader consequences of major surgery, and directly testing potential biological mechanisms.

Key words: gut-brain axis, stoma surgery, mental health, psychological outcomes, psychosocial adjustment, cognitive functioning, health-related quality of life, systematic review.

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List of Abbreviations

Abbreviation	Full Term
ACTH	Adrenocorticotrophic Hormone
BDNF	Brain-Derived Neurotrophic Factor
BMI	Body Mass Index
CES-D-10	10-item Center for Epidemiological Studies Depression Scale
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CRC	Colorectal Cancer
CRH	Corticotropin-Releasing Hormone
COH-QOL-O	City of Hope Quality of Life–Ostomy Questionnaire
DASS-21	Depression Anxiety Stress Scales-21
EORTC QLQ-C30	European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire–Core 30
FACT-Cog	Functional Assessment of Cancer Therapy–Cognitive Function
HADS	Hospital Anxiety and Depression Scale
HPA	Hypothalamic–Pituitary–Adrenal Axis
HRQoL	Health-Related Quality of Life
IBD	Inflammatory Bowel Disease
IBS	Irritable Bowel Syndrome
IL-1 β	Interleukin-1 Beta

IL-6	Interleukin-6
IPA	Interpretative Phenomenological Analysis
JBI	Joanna Briggs Institute
MeSH	Medical Subject Headings
MoCA	Montreal Cognitive Assessment
OAI-23	Ostomy Adjustment Inventory-23
PICO	Population, Intervention, Comparison, Outcome
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
POCD	Postoperative Cognitive Dysfunction
QoL	Quality of Life
RoB	Risk of Bias
SCFA / SCFAs	Short-Chain Fatty Acid(s)
SF-36	36-Item Short Form Health Survey
SPIDER	Sample, Phenomenon of Interest, Design, Evaluation, Research Type
Stoma-QoL	Stoma Quality of Life Questionnaire
TNF- α	Tumour Necrosis Factor Alpha

Chapter 1

The Gut-Brain Axis: Theoretical Framework

1.1 Conceptual Overview

The gut-brain axis refers to the bidirectional communication between the gastrointestinal system and the brain. This communication happens through the nervous, hormonal, immune, metabolic, and microbial systems. Changes in the gut can affect the brain and mental processes, while the brain can also influence gut activity (Mayer, 2011; Carabotti et al., 2015; Cryan et al., 2019).

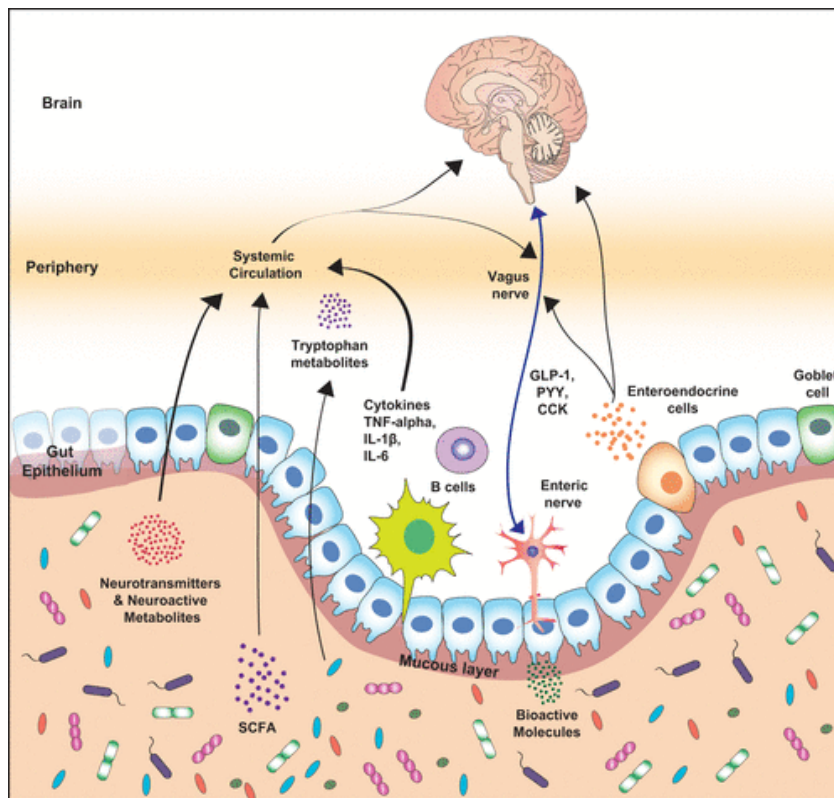
This bidirectional relationship is important because gastrointestinal function is closely linked with stress, mood, and behaviour. Psychological stress can influence gastrointestinal motility, permeability, and immune activity, while changes within the gut may affect neural and inflammatory signals reaching the brain. The gut microbiota has also become an important part of this framework because microbial activity and metabolites may influence immune, metabolic, and neuroendocrine processes (Cryan & Dinan, 2012; Cryan et al., 2019).

However, the gut-brain axis should not be interpreted as a direct causal explanation for psychological or cognitive difficulties. Many other factors may contribute, including illness, treatment, stress, ageing, medication, and social circumstances. In this thesis, the gut-brain axis is therefore used as a theoretical and hypothesis-generating framework.

1.2 Biological Pathways

The gut and the brain communicate through several biological pathways. These include the HPA axis, the vagus nerve, immune signalling, microbial metabolites, and tryptophan metabolism. These pathways may help explain how changes in the gut can influence stress, mood, and cognitive function (Cryan & Dinan, 2012; Cryan et al., 2019).

Figure 1. Schematic representation of the microbiota-gut-brain axis.



The figure illustrates bidirectional communication between the gut and the brain through neural, immune, endocrine and metabolic pathways. Key mechanisms include signalling via the vagus and enteric nervous systems, systemic circulation, inflammatory cytokines, tryptophan metabolites, short-chain fatty acids (SCFAs), microbial bioactive molecules and enteroendocrine signalling.

Adapted from Cryan et al. (2019).

The hypothalamic-pituitary-adrenal (HPA) axis is one of the main systems involved in the stress response. When a person experiences stress, the hypothalamus releases corticotropin-releasing hormone (CRH), which causes the pituitary gland to release adrenocorticotrophic hormone (ACTH). ACTH then stimulates the adrenal glands to produce cortisol. The gut microbiota may also interact with this stress system, meaning that changes in the gut may influence the way the body responds to stress (Cryan & Dinan, 2012; Cryan et al., 2019). Long-term activation of the HPA axis may affect immune activity, intestinal permeability, and gastrointestinal function. At the same time, inflammation and changes in the gut microbiota may influence HPA-axis activity. This provides one possible explanation for the two-way relationship between psychological stress and gastrointestinal symptoms (Cryan & Dinan, 2012).

The vagus nerve is another important pathway in the gut-brain axis. It carries information from the gastrointestinal tract to the brain and also allows the brain to influence gastrointestinal function. It is involved in processes such as gut motility, secretion, immune regulation, and the stress response (Bonaz et al., 2018). Research also suggests that gut microorganisms may influence vagal signalling indirectly through microbial metabolites and interactions with

intestinal and immune cells. This means that changes in the gut environment may affect brain signalling without bacteria themselves having to enter the brain (Bonaz et al., 2018).

The immune system also plays an important role in gut-brain communication. Gastrointestinal inflammation can lead to the release of inflammatory cytokines, including interleukin-1 beta (IL-1 β), interleukin-6 (IL-6), and tumour necrosis factor-alpha (TNF- α). These inflammatory signals may influence the central nervous system and have been suggested as one pathway linking chronic gut inflammation with psychological symptoms (Cryan et al., 2019). Inflammatory signalling may also affect microglia, which are immune cells within the brain. Changes in microglial activity have been linked with neuroinflammatory processes and may influence neuronal function. However, much of the detailed mechanistic evidence comes from experimental studies, so the extent of this effect in humans is still being investigated.

Gut bacteria produce short-chain fatty acids (SCFAs), mainly acetate, propionate, and butyrate, through the fermentation of dietary fiber. SCFAs are important for maintaining the intestinal barrier and regulating immune and metabolic processes (Dalile et al., 2019). SCFAs may also be involved in communication with the brain through immune, endocrine, neural, and circulatory pathways. Experimental research suggests that butyrate may influence brain-derived neurotrophic factor (BDNF), which is involved in neuronal survival, learning, memory, and neuroplasticity. However, direct evidence for a clear SCFA–BDNF pathway in humans is still limited, so this relationship should be interpreted cautiously (Dalile et al., 2019).

Serotonin is another important part of gut-brain communication. A large proportion of the body's serotonin is produced within the gastrointestinal tract, where it helps regulate motility, secretion, and sensory function. However, serotonin produced in the gut does not readily cross the blood-brain barrier, so changes in intestinal serotonin do not directly mean that serotonin levels in the brain will also change. Instead, the gut may influence central serotonin pathways indirectly through neural signalling and through the metabolism of tryptophan, which is the amino-acid precursor needed for serotonin production. Tryptophan metabolism is therefore increasingly considered an important link between the gut microbiota, immune activity, and brain function (Cryan et al., 2019).

Tryptophan can be metabolised through several pathways, including the serotonin, kynurenine, and microbial indole pathways. The kynurenine pathway is particularly relevant during inflammation because inflammatory activity can increase the amount of tryptophan that is

directed towards kynurenine metabolism rather than serotonin synthesis. Some metabolites produced through this pathway can also affect the nervous system. For example, kynurenic acid may have neuroprotective properties, while quinolinic acid may have neuroactive or potentially neurotoxic effects under some conditions.

This pathway has therefore been proposed as one possible link between inflammation, gut changes, and psychological symptoms, although the clinical importance of these mechanisms in humans is still being studied (Cryan et al., 2019).

1.3 Psychological and Cognitive Dimensions

The gut-brain axis has been studied in relation to both psychological and cognitive functioning. Research has examined links between gastrointestinal processes, stress, inflammation, and outcomes such as anxiety and depression.

Evidence from gastrointestinal conditions provides some support for this relationship. In IBS, anxiety and depression are common, with one systematic review finding that people with IBS had around three times the odds of anxiety or depression compared with healthy controls (Zamani et al., 2019). Similar findings have been reported in inflammatory bowel disease (IBD). Barberio et al. (2021) found that symptoms of anxiety and depression were common among people with IBD, particularly during active disease. Longitudinal evidence also suggests that the relationship may be bidirectional. Fairbrass et al. (2022) found that active IBD was associated with a greater risk of later anxiety and depression, while existing anxiety or depression was also associated with poorer IBD outcomes. These findings support the idea that gastrointestinal and psychological processes can influence one another, although they do not show that gut changes directly cause psychological symptoms. They also cannot automatically be applied to patients with stomas, whose clinical circumstances may be different.

Cognitive functioning is also relevant. Cognitive abilities include memory, attention, executive functioning, concentration, and processing speed. These functions may be affected by inflammatory, neuroendocrine, and metabolic processes, particularly in older adults or in people undergoing major medical treatment.

Postoperative cognitive changes have been recognised across surgical populations and may involve several of these domains (Evered et al., 2018). More recent research has also explored whether changes in the gut microbiota and inflammatory signalling may contribute to

perioperative neurocognitive dysfunction, although the evidence remains limited and mainly mechanistic (Lu et al., 2022). For this reason, cognitive and psychological outcomes should not be treated as interchangeable. Emotional distress, anxiety, and depression differ from objective impairment in areas such as memory or attention, even though they may influence one another.

1.4 Effects of Surgery on Gut-Brain Communication

Major surgery can affect several processes involved in gut-brain communication, including inflammation, stress responses, medication exposure, diet, bowel function, and the intestinal microbiota. Surgical trauma can trigger systemic inflammatory responses, which have been proposed as one possible pathway contributing to postoperative cognitive change (Terrando et al., 2010).

Postoperative cognitive difficulties are also seen in non-stoma surgical populations. Huang et al. (2025), for example, found that postoperative cognitive dysfunction was present at different stages after non-cardiac surgery, with prevalence decreasing over time. This suggests that cognitive difficulties observed in stoma patients may partly reflect the broader effects of major surgery and recovery. Gastrointestinal surgery may also alter the intestinal environment through changes in bowel anatomy, transit, diet, antibiotic exposure, and other perioperative factors. Studies have reported changes in the composition and diversity of the gut microbiota following gastrointestinal surgery, although the clinical importance of these changes is still uncertain (Ferrie et al., 2021; Keskey et al., 2022). This may be particularly relevant to ileostomy and colostomy because stoma formation directly changes the normal route of intestinal contents and may involve bowel resection or diversion. These anatomical changes may alter the environment in which gut microorganisms live and, therefore, influence microbial composition and metabolism.

Antibiotic exposure is another important factor. Patients undergoing gastrointestinal surgery commonly receive antibiotics around the time of surgery, while some may require further treatment because of infection or postoperative complications. Antibiotics can alter the diversity and composition of the gut microbiota, although the extent and duration of these effects vary between individuals (Zimmermann & Curtis, 2019).

Dietary changes after stoma formation may also be relevant. People with an ileostomy may modify their fibre intake, fluid intake, food choices, and eating patterns to help manage stoma output and gastrointestinal symptoms (Mitchell et al., 2021). Dietary fibre also influences the gut microbiota and contributes to the production of short-chain fatty acids such as acetate, propionate, and butyrate (Makki et al., 2018). These dietary changes could therefore influence microbial activity and metabolite production, although direct evidence for this pathway in people with a stoma remains limited.

Chapter 2

Stoma Surgery and Mental Health

2.1 Clinical Background and Indications

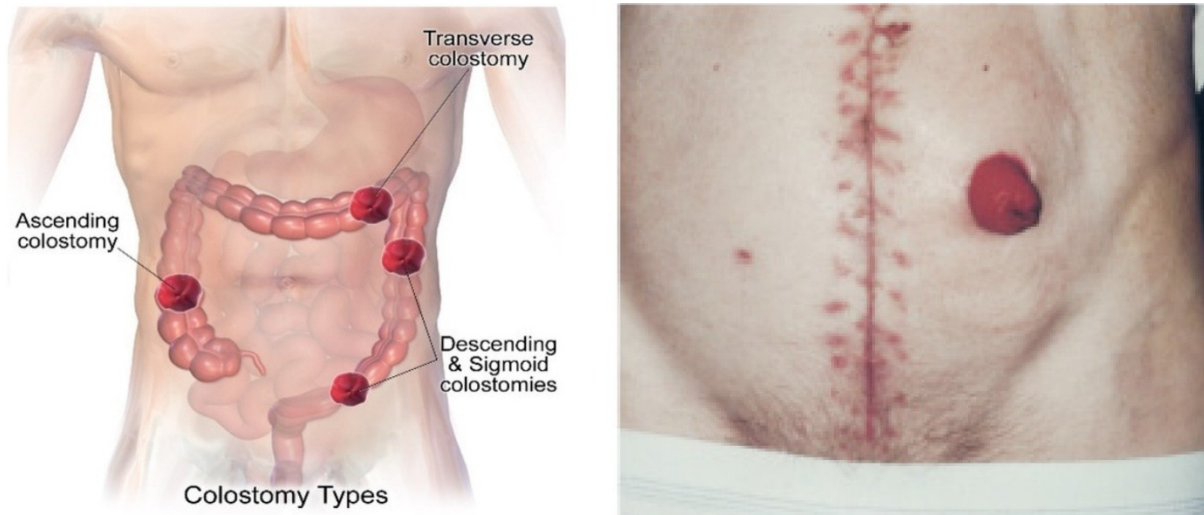
Stoma surgery involves creating an artificial opening on the abdominal wall, known as a stoma, to divert the flow of bodily waste from either the gastrointestinal or urinary system. It can be a life-saving treatment for a range of conditions, including colorectal cancer, inflammatory bowel disease (IBD), diverticular disease, bowel obstruction, trauma, pelvic floor disorders, and congenital conditions such as Hirschsprung's disease.

The three main types of stoma are colostomy, ileostomy, and urostomy. These differ depending on where the stoma is formed, the type of output it produces, and the level of care needed:

A colostomy is formed using part of the colon and usually results in a more formed stool output. An ileostomy, however, is created from the terminal ileum and produces a thinner, higher-volume output, which can increase the risk of dehydration and electrolyte imbalances. A urostomy is different as it involves the diversion of urine, usually following bladder removal, which is commonly performed as part of treatment for bladder cancer (Carmel et al., 2016). Because these differences affect daily management demands, complication risk, and psychological adjustment, findings from one stoma type cannot always be generalised to another.

Figure 2. Anatomical location and external appearance of a colostomy.

Reproduced from Barbosa et al. (2024), Body Fluid Collection Devices for Ostomy Patients: A Review, Figures 2 and 3.



Stoma surgery has been performed for several centuries; the first recorded colostomy was carried out in 1711. At the time, such procedures were highly risky because of limited surgical knowledge and poor infection control. Advances in anesthesia, antisepsis, and postoperative care have greatly improved survival and outcomes (Pittman et al., 2008). Today, stoma surgery is an established and often essential treatment, although it can still have major physical and psychological effects.

The reasons for stoma formation vary and may affect how patients adjust after surgery. Some procedures are planned well in advance, allowing time for preoperative education and psychological preparation, while others take place under emergency conditions with little or no opportunity for preparation. In some cases, individuals wake from surgery to find that a stoma has been formed unexpectedly, which can heighten feelings of shock and distress in the early stages of recovery (Persson & Hellström, 2002). Stomas may be either temporary or permanent, though this distinction is often more complicated in practice than it initially appears. Research indicates that a substantial proportion of stomas originally intended to be temporary are never reversed, owing to factors including disease progression, surgical complications, and patient comorbidity (Arumugam et al., 2003). Uncertainty about reversal can itself be a source of ongoing psychological distress.

Living with a stoma also carries the risk of complications beyond the immediate postoperative period. Early complications include stomal ischaemia, retraction, and peristomal skin irritation,

while longer-term complications include parastomal hernia, prolapse, and stenosis (Shabbir & Britton, 2010). Parastomal hernia is particularly common, with some studies reporting rates exceeding 50% in long-term colostomy patients (Londono-Schimmer et al., 1994). These ongoing complications contribute to the view that stoma formation is best understood as a chronic adjustment process rather than a discrete surgical event (Krouse et al., 2009).

Stoma surgery represents a significant and growing public health concern. In the United Kingdom, approximately 205,000 individuals are currently living with a stoma, with around 21,000 new formations performed each year (Colostomy UK, 2023). In the United States, 750,000–1 million people are estimated to be living with a stoma (Pittman et al., 2008), with comparable rates reported across Western Europe and Australia. Although stoma surgery has historically been more common in older adults, the incidence of colorectal cancer in younger adults has increased in recent decades, meaning that stoma formation can also affect younger patients with distinct psychosocial and developmental needs (Siegel et al., 2023).

2.2 Mental Health Following Stoma Surgery

Mental health can be understood as a state of wellbeing where individuals are able to manage everyday challenges, use their abilities effectively, engage in productive activities, and participate within their communities (World Health Organization, 2022). In clinical research, mental health is often assessed through outcomes such as depression, anxiety, psychological distress, coping, and emotional adjustment. Broader measures, such as health-related quality of life (HRQoL), can also reflect psychological and social wellbeing. HRQoL describes how people perceive their physical, psychological, and social health. For people with a stoma, this is especially relevant because stoma formation can affect identity, relationships, confidence, and daily activities as well as physical functioning (Ware & Sherbourne, 1992).

Although psychological difficulties after stoma surgery are increasingly recognised, gaps remain, especially around cognitive outcomes and the factors that may contribute to them. Research has reported depression, anxiety, altered body image, stigma, and difficulties with identity, relationships, and social participation (Vonk-Klaassen et al., 2016; Thorpe et al., 2014). However, the prevalence and severity of these difficulties vary substantially across studies, populations, and stages of postoperative recovery (Tang et al., 2022).

Mental health outcomes have also been assessed using a wide range of instruments, including generic measures such as the HADS and SF-36, as well as stoma-specific quality-of-life

measures (Zigmond & Snaith, 1983; Ware & Sherbourne, 1992; Prieto et al., 2005; Krouse et al., 2009). This heterogeneity makes direct comparison across studies difficult and limits conclusions about the overall pattern and severity of psychological difficulties following stoma surgery. A number of psychosocial factors have been examined in relation to adjustment, including body image, self-efficacy, social support, stigma, intimacy, and self-management demands (Brown & Randle, 2005; Fingren et al., 2018; Recalla et al., 2013). Previous studies have examined these factors in relation to psychological wellbeing, but their relative importance and consistency across the literature remain unclear.

Qualitative research has also highlighted experiences of loss of bodily control, changes in identity, and difficulties with social and interpersonal adjustment, while some individuals report positive adaptation over time (Danielsen et al., 2013; Thorpe et al., 2014; Macêdo et al., 2020). Taken together, existing research indicates that psychological adjustment after stoma surgery is multifaceted, but the diversity of study designs, measures, and populations makes systematic synthesis necessary.

2.2.1 Emerging Evidence on Cognitive Outcomes

Compared with the extensive literature on emotional and psychosocial outcomes, cognitive functioning following stoma surgery has received considerably less systematic attention. Most research has focused on affective and social dimensions of mental health, while formal neuropsychological assessment in stoma populations appears to be uncommon. This does not imply that cognitive difficulties are unimportant or prevalent, but rather reflects a gap in how cognitive functioning has been studied within this population.

Many individuals undergoing stoma surgery do so in the context of colorectal or other cancers. Postoperative cognitive impairment can affect memory, attention, concentration, processing speed, and problem-solving, and may reflect a combination of disease-related, treatment-related, biological, and psychological factors (Janelins et al., 2014).

Stoma self-management may also place substantial cognitive demands on patients. Individuals must learn and retain procedural knowledge relating to appliance care, diet, hydration, skin care, and complication monitoring, while making ongoing decisions about when to seek medical attention (Lim et al., 2015; Morris et al., 2017). These demands are relevant when considering cognitive burden, but should not themselves be interpreted as evidence of cognitive impairment.

Overall, cognitive outcomes remain comparatively under-explored within stoma research. Potential biological pathways that may be relevant to emotional and cognitive functioning following intestinal stoma surgery are considered separately in Section 1.4.

2.3 Mental Health in Broader Surgical Populations

Stoma formation usually takes place as part of major surgery and often occurs in the context of serious underlying illness. It is therefore important to consider whether the psychological and cognitive difficulties reported by people with a stoma are specific to stoma formation or reflect some of the wider effects of surgery and postoperative recovery.

2.3.1 General Postoperative Mental Health

Research across surgical populations shows that major surgery can affect psychological wellbeing beyond the immediate recovery period. Depression and anxiety have been reported following cardiac, orthopaedic, abdominal, and other major surgical procedures, although prevalence estimates vary depending on the population studied, timing of assessment, and measures used (Chung et al., 2025; Ghoneim & O'Hara, 2016). Psychological outcomes after surgery are likely to be influenced by several factors, including pain, complications, prolonged recovery, the impact of serious illness, and changes in physical functioning or body image.

Cognitive changes may also occur following major surgery. Postoperative cognitive decline, historically referred to as postoperative cognitive dysfunction (POCD), can involve changes in memory, attention, executive functioning, and processing speed, particularly among older adults (Evered et al., 2018). Reported rates vary considerably across studies because of differences in patient groups, assessment methods, and timing of follow-up. Older age, lower educational attainment, perioperative complications, and pre-existing vulnerability have been identified as possible risk factors (Møller et al., 1998; Evered et al., 2018).

Several processes may contribute to these emotional and cognitive outcomes. Surgical trauma can produce systemic inflammation and neuroendocrine stress responses, while sleep disruption, medication, complications, and the psychological burden of recovery may also play a role (Terrando et al., 2010; Evered et al., 2018). Postoperative delirium is another important concern, particularly among older and medically vulnerable patients (Rudolph & Marcantonio, 2011). These findings show that psychological and cognitive difficulties can occur following major surgery even when a stoma is not involved.

2.3.2 Why Comparison With Non-Stoma Surgery Matters

The wider surgical literature is important when interpreting mental health outcomes after stoma formation because it provides context for understanding what may be related specifically to the stoma and what may reflect major surgery more generally. For example, depression, anxiety, fatigue, and cognitive difficulties may be linked to the underlying illness, anesthesia, inflammation, complications, hospitalisation, or recovery rather than to the stoma itself.

At the same time, living with a stoma brings additional challenges, including stoma management, concerns about leakage and odour, body image, stigma, intimacy, disclosure, and changes in social participation. Comparing patients who undergo similar surgery with and without stoma formation may therefore help distinguish difficulties associated specifically with the stoma from those related to major surgery, underlying disease, and recovery. Such comparisons should be interpreted cautiously because differences in diagnosis, age, treatment, follow-up, and outcome measurement may influence the findings.

Chapter 3

Methodology

3.1 Research Gap, Aim, and Research Questions

The previous sections highlight several gaps in the current literature. Emotional and psychosocial outcomes after stoma surgery have been studied quite widely, but much less is known about cognitive outcomes such as memory, attention, and concentration. Research looking directly at gut–brain mechanisms together with psychological or cognitive outcomes in people with stomas is also very limited. The existing evidence also has a number of methodological weaknesses, including small samples, mainly cross-sectional designs, differences between study populations, and the use of different outcome measures. These differences make it harder to compare studies and draw clear conclusions.

An important question is whether mental health difficulties after stoma surgery are mainly related to the stoma itself or to the wider effects of major surgery. Comparing people with a stoma to those undergoing similar surgery without stoma formation may help clarify which psychological effects are stoma-specific. Clarifying this distinction has implications for clinical

practice, as it would help to identify what is unique about the psychological needs of stoma patients and what can be addressed through existing general surgical rehabilitation frameworks.

The aim of this systematic review is therefore to synthesise existing evidence on mental health outcomes in adults following stoma surgery and critically consider how these findings may be contextualised within a gut-brain axis theoretical framework. This review examines how stoma surgery may affect mental health, with a focus on emotional, psychosocial, and cognitive outcomes. It also considers the gut-brain axis as a theoretical perspective for discussing possible biological pathways and gaps in the current evidence.

The primary research question is: What does the available evidence show about mental health outcomes in adults following stoma surgery?

The secondary research questions are:

- (1) What patient, clinical, and psychosocial factors are associated with mental health outcomes following stoma surgery?
- (2) How have cognitive outcomes been assessed, and what does the available evidence suggest about cognitive functioning following stoma surgery?
- (3) How do qualitative studies describe the lived experience of psychological and psychosocial adjustment to a stoma?
- (4) What direct comparative evidence exists regarding mental health outcomes in patients undergoing surgery with stoma versus without stoma formation?

RQ4 is addressed mainly through comparative evidence identified in the systematic review. Broader surgical literature is considered in the Discussion to help distinguish stoma-specific difficulties from the wider effects of major surgery.

Chapter 3 outlines the methodology used in the systematic review, including the research questions, search strategy, eligibility criteria, study selection process, data extraction, quality assessment, and approach to synthesis. Chapter 4 presents the findings of the review, while Chapter 5 discusses these findings in relation to previous research, including the wider literature on postoperative mental health and the gut-brain axis. It also considers implications for stoma care and identifies priorities for future research, particularly in relation to cognitive outcomes and potential biological mechanisms.

3.2 Rationale for Systematic Review Methodology

A systematic review methodology was selected as the most appropriate approach for addressing the research questions guiding this thesis. Systematic reviews are distinguished from traditional narrative reviews by their use of explicit, pre-specified, and reproducible methods for identifying, selecting, appraising, and synthesising relevant literature (Higgins et al., 2022).

3.3 Review Design: Mixed-Methods Systematic Review

A mixed-methods systematic review design was adopted, integrating evidence from quantitative, qualitative, and mixed-methods primary studies within a single synthesis (Stern et al., 2020). This design was chosen for several interconnected reasons.

First, the different research questions require different types of evidence. The primary question looks at what the available evidence shows about mental health outcomes following stoma surgery. Questions about patient, clinical, and psychosocial factors are addressed mainly through quantitative studies, including cross-sectional and longitudinal research. The cognitive question considers both how cognition has been assessed and what the available evidence suggests about cognitive functioning. The qualitative question draws on interviews, focus groups, and other qualitative studies exploring patients' experiences of psychological and psychosocial adjustment. The comparative question is addressed mainly through studies included in the review that directly compare patients with and without stoma formation.

Second, the literature on stoma surgery and mental health includes both quantitative studies measuring outcomes and qualitative studies exploring patients' lived experiences. Leaving out either type of evidence would give an incomplete picture of mental health following stoma surgery. Bringing these two types of evidence together therefore allows for a fuller understanding of adjustment and mental health in this population (Pearson et al., 2015).

Because the gut-brain axis is used as an interpretive theoretical framework rather than as a separate empirical review question, relevant biological and theoretical literature was used in the Discussion to contextualise the findings. Similarly, literature from broader surgical populations was used to provide comparative context. This external literature was not treated as part of the systematic review evidence base.

3.4 Review Framework: SPIDER

The search strategy and eligibility criteria were structured using the SPIDER framework which was developed to support systematic searches incorporating qualitative and mixed-methods evidence alongside quantitative studies (Cooke et al., 2012). SPIDER was selected in preference to the PICO framework because PICO was designed for intervention-based clinical research and is less suitable for reviews examining observational, experiential, and psychosocial evidence. The SPIDER components for the present review were defined as follows:

Sample: Adults aged 18 years or older who had undergone stoma surgery, including colostomy, ileostomy, urostomy, or other intestinal or urinary stoma formation.

Phenomenon of interest: Psychological, psychosocial, emotional, and cognitive outcomes experienced after stoma surgery.

Design: Empirical studies using quantitative, qualitative, or mixed-methods approaches were included. These included cross-sectional surveys, longitudinal cohort studies, qualitative interviews, focus groups, and phenomenological studies.

Evaluation: Outcomes were assessed using standardised psychological measures, neuropsychological assessments, relevant psychological or psychosocial domains from validated multidimensional quality-of-life tools, semi-structured interview data, and self-reported outcomes.

Research type: Primary empirical research published in peer-reviewed academic journals.

3.5 Eligibility Criteria

3.5.1 Inclusion Criteria

Studies were eligible for inclusion if they met all of the following criteria:

- Included adults aged 18 years or older who had undergone stoma surgery, including colostomy, ileostomy, urostomy, or other intestinal or urinary stoma formation.
- Reported at least one postoperative psychological, psychosocial, emotional, or cognitive outcome associated with living with a stoma.
- Examined one or more specific psychological, psychosocial, emotional, or cognitive outcomes, including depression, anxiety, psychological distress, emotional adjustment,

coping, resilience, body image, self-esteem, stigma, psychosocial adjustment, subjective wellbeing, memory, attention, executive functioning, concentration difficulties, cognitive load, mental fatigue, postoperative cognitive dysfunction, or subjective cognitive experiences such as “brain fog”.

- For quantitative studies, at least one outcome had to measure a specific psychological, psychosocial, emotional, or cognitive aspect using a validated measure or a clearly reported subscale from a broader instrument. Studies that focused on health-related quality of life were only included if they reported a psychological, psychosocial, emotional, or cognitive domain separately, rather than only presenting an overall or mainly physical quality-of-life score. For qualitative studies, psychological, psychosocial, emotional, or cognitive experiences were required to form an explicit focus of the data collection or reported themes.
- Used quantitative, qualitative, or mixed-methods empirical study designs.
- Were published in peer-reviewed academic journals.
- Were published in English.

3.5.2 Exclusion Criteria

Studies were excluded if they:

- Focused exclusively on children or adolescents under 18 years of age.
- Included mixed surgical or disease populations where stoma-specific results were not reported separately.
- Focused only on preoperative outcomes and did not report any psychological or cognitive outcomes after surgery.
- Focused mainly on surgical, physical, or clinical outcomes, such as complications, stoma function, appliance performance, wound care, skin problems, nutrition, or physical recovery after surgery, without reporting psychological, psychosocial, emotional, or cognitive outcomes.
- Reported health-related quality of life only as an overall or mainly physical measure, without separately analysing psychological, psychosocial, emotional, or cognitive outcomes or subscales.
- Were non-empirical publications, including review articles, systematic reviews, meta-analyses, editorials, conference abstracts, dissertations, case reports, study protocols, and letters.

- Were published in a language other than English.

3.6 Literature Search and Data Sources

A systematic search was carried out in June 2026 using four electronic databases: PubMed/MEDLINE, PsycINFO, CINAHL (Cumulative Index to Nursing and Allied Health Literature), and Scopus. These databases were chosen because together they cover a broad range of biomedical, psychological, nursing, and multidisciplinary research relevant to the review. PubMed/MEDLINE was used to identify clinical and medical studies on stoma surgery and related outcomes. PsycINFO was included because of its coverage of psychological, psychiatric, and psychosocial research. CINAHL was searched to identify nursing and allied health studies, particularly those focusing on stoma care, patient education, and self-management. Scopus was also used to broaden the search across both health and social science literature.

The search was limited to journal articles published in English. Where databases allowed, a peer-reviewed filter was applied, and this was also checked during the eligibility screening process. The search terms were organised into two main groups: terms related to stoma surgery and terms related to mental health, psychological outcomes, or quality of life. Terms within each group were combined using OR, while the two groups were combined using AND. This was done to identify studies that addressed both stoma-related topics and psychological or psychosocial outcomes.

Quality-of-life terminology was deliberately included to maximise sensitivity because psychological and psychosocial functioning is frequently reported within broader quality-of-life research; consequently, not all records retrieved using these terms ultimately met the outcome-focused eligibility criterion.

Because each database uses a different indexing system and search interface, the search strategy was adapted for each one. In Scopus, stoma-related terms were searched in the title field, while mental health terms were searched across the title, abstract, and keyword fields. Filters were then used to limit results to journal articles involving human participants and, where possible, to studies in medicine and psychology.

In PubMed/MEDLINE, Medical Subject Headings (MeSH) were combined with free-text terms in the title and abstract. This helped identify both indexed articles and newer records that

may not yet have been indexed. MeSH terms included surgical stomas, colostomy, ileostomy, ostomy, enterostomy, psychological adaptation, anxiety, depression, quality of life, and body image. Results were limited to English-language journal articles. For CINAHL, stoma-related terms were searched mainly in the title field, while mental health terms were searched in the abstract field. Filters were applied for peer-reviewed articles, English language, and journal article publication type. Additional terms, including body image, psychosocial adjustment, coping, and wellbeing, were added to the CINAHL and PubMed searches to improve sensitivity and reduce the chance of missing relevant studies. In PsycINFO, the same field structure was used, with an additional limiter restricting results to empirical studies. The full search strings for each database are provided in Appendix A.

The four database searches retrieved a combined total of 701 records: 348 from PubMed/MEDLINE, 284 from CINAHL, 46 from Scopus, and 23 from PsycINFO. All retrieved records were exported in standard citation formats (NBIB for PubMed, RIS for CINAHL, PsycINFO, and Scopus) and imported into Rayyan (Ouzzani et al., 2016), a web-based systematic review management platform used to organise references, identify and remove duplicate records, and support the two-stage screening process.

3.7 Study Selection Process

Study selection was conducted in two sequential stages: title and abstract screening followed by full-text review. Following import into Rayyan, 134 duplicate records were identified and removed from the 701 records retrieved across the four databases, leaving 567 unique records for title and abstract screening. At this stage, 292 records were excluded because they did not meet the eligibility criteria, leaving 275 reports for which full texts were sought.

Seven full-text reports could not be retrieved because they were unavailable through the institutional library resources, leaving 268 full-text articles assessed for eligibility. Of these, 247 were excluded because they did not meet one or more of the pre-specified eligibility criteria. Reasons for exclusion included studies reporting only overall or general health-related quality of life without separately analysing a psychological, psychosocial, emotional, or cognitive outcome; studies without separately reported stoma-specific data; studies examining only physical or clinical outcomes; studies involving an ineligible population (for example, paediatric samples, mixed or non-stoma populations without separately extractable stoma-specific data, or unrelated patient populations); studies assessing preference-based health-utility outcomes rather than psychological outcomes; preoperative-only studies; and non-

eligible publication types. Following full-text assessment, 21 studies met all inclusion criteria and were included in the final review. The study-selection process is summarised in the PRISMA flow diagram.

3.8 Characteristics of Included Studies

A total of 21 studies were included in the final review, published between 2007 and 2026 and conducted across 10 countries: China, the United States, the United Kingdom, Turkey, South Korea, Iran, Italy, Australia, Singapore, and Japan. Sample sizes varied substantially, ranging from 11 participants in the qualitative phenomenological study by Villa et al. (2018) to 19,909 participants in the national Chinese cross-sectional study by Zhang X et al. (2026). Stoma types represented across the included studies included colostomy, ileostomy, urostomy, and mixed stoma populations.

In terms of study design, 14 studies used quantitative cross-sectional designs. Four reports contributed qualitative evidence, including interpretative phenomenological analysis, phenomenological inquiry, focus-group research, and qualitative thematic analysis of open-ended survey responses (Smith et al., 2017; Villa et al., 2018; Son and Kang, 2021; Whiteley et al., 2025). Three studies used cohort or longitudinal designs. Jin et al. (2019) used a longitudinal design assessing participants before surgery and again before hospital discharge; Xu et al. (2023) used a retrospective cohort design to examine predictors of postoperative cognitive impairment among patients undergoing ileostomy for colorectal cancer; and Lau et al. (2025) used a prospective longitudinal observational design, assessing health-related quality of life from diagnosis to 12 months after surgery. Krouse et al. (2009), included among the cross-sectional studies, used a matched cross-sectional comparison of rectal cancer survivors with and without permanent ostomies. The diversity of study designs supported the mixed-methods review approach by allowing quantitative psychological, psychosocial, emotional, and cognitive outcomes to be considered alongside qualitative accounts of patients' experiences.

3.9 Data Extraction

Data were extracted from all 21 included studies with the following information:

- Bibliographic details: author(s), year of publication, country, and journal.

- Study design: The type of study, how the data were collected, and the follow-up period where applicable.
- Sample characteristics: The number of participants, their age or age range, sex or gender, type of stoma, underlying condition, and time since stoma formation.
- Outcome measures: The scales, assessment tools, or qualitative methods used to measure psychological, psychosocial, emotional, or cognitive outcomes. Where broader quality-of-life measures were used, the relevant psychological or psychosocial domains were recorded separately. Information about the reliability and validity of the measures, as well as when assessments were carried out in relation to surgery, was also collected where available.
- Key findings: Main quantitative results, such as means, standard deviations, prevalence rates, correlations, regression results, and statistical significance. For qualitative studies, the main themes and sub-themes were recorded, together with the authors' overall conclusions.
- Methodological limitations: Any limitations of the study reported by the authors.

The extracted outcomes were grouped into three main areas. The first included emotional and psychosocial outcomes, such as depression, anxiety, body image, stigma, coping, psychosocial adjustment, self-esteem, self-efficacy, and relevant psychological or psychosocial domains from quality-of-life measures. The second area covered cognitive and neuropsychological outcomes, including cognitive impairment and general cognitive functioning. The third included functional and self-management experiences where these helped to explain or provide context for psychological burden.

If a study reported an overall health-related quality-of-life score, this was also extracted where it helped with interpretation. However, a total quality-of-life score alone was not enough for a study to meet the outcome eligibility criteria. When results were reported at several time points, relevant data were extracted to examine changes from baseline and throughout the postoperative period. The synthesis mainly focused on outcomes measured after stoma formation. Because cognitive outcomes were included within the scope of the review, included studies were examined for formal assessment of memory, attention, executive functioning, concentration, processing speed, postoperative cognitive dysfunction, and subjective cognitive complaints. Formal cognitive assessment was identified in Xu et al. (2023), who assessed postoperative cognitive impairment using the Montreal Cognitive Assessment (MoCA) and

Functional Assessment of Cancer Therapy-Cognitive Function (FACT-Cog). Lau et al. (2025) also reported cognitive functioning using the EORTC QLQ-C30, comparing patients with and without stomas over time, as well as temporary and permanent stoma groups. None of the other included studies formally assessed cognitive impairment. Qualitative findings relating to planning, learning, and self-management were kept as useful contextual information, but they were not treated as evidence of cognitive impairment.

3.10 Quality Assessment and Risk of Bias

The methodological quality and risk of bias of all 21 included studies were assessed using the Joanna Briggs Institute (JBI) critical appraisal tools appropriate to each study design. Individual checklist items were rated as Yes, No, Unclear, or Not Applicable (Joanna Briggs Institute, 2020). In accordance with the criterion-based nature of the JBI appraisal tools, no numerical summary score or fixed quality threshold was applied.

Studies were not excluded just because they were judged to be of lower methodological quality. Instead, the appraisal results were taken into account when interpreting how reliable and convincing the evidence was during the narrative synthesis. Overall quality was considered based on the importance of any criteria rated as No or Unclear, rather than simply counting how many criteria each study met. Particular attention was paid to possible sources of bias, including how participants were selected, whether confounding factors were addressed, the reliability and validity of the measures used, completeness of follow-up, and whether the statistical or analytical methods were appropriate.

The following JBI critical appraisal tools were applied according to study design:

- **JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies:** applied to 14 studies, including the matched cross-sectional study by Krouse et al. (2009). The eight-item checklist assesses the clarity of inclusion criteria, description of participants and setting, validity and reliability of exposure and outcome measurement, identification and management of confounding factors, and appropriateness of statistical analysis.
- **JBI Critical Appraisal Checklist for Cohort Studies:** This checklist was used for three studies: Jin et al. (2019), Xu et al. (2023), and Lau et al. (2025). These studies used longitudinal, retrospective cohort, and prospective longitudinal observational designs, respectively. The checklist considers areas such as participant recruitment and

comparability, how exposures and outcomes were measured, whether confounding factors were identified and addressed, whether outcomes were present at baseline, the completeness of follow-up, how missing follow-up data were handled, and whether the statistical analysis was appropriate.

- JBI Critical Appraisal Checklist for Qualitative Research: this checklist was applied to four studies that reported qualitative findings (Smith et al., 2017; Villa et al., 2018; Son and Kang, 2021; Whiteley et al., 2025). For Whiteley et al. (2025), the JBI Qualitative Research Checklist was applied specifically to the qualitative thematic-analysis component of the study, as this was the component contributing qualitative evidence to the present review. It was used to assess whether the research methodology was appropriate for the study aims, whether the methods of data collection and analysis were suitable, and whether the interpretation of the findings was supported by the data. The checklist also considers researcher reflexivity, how clearly participants' views are represented, ethical issues, and whether the conclusions are consistent with the findings.

Overall, most studies met the main appraisal criteria, although some limitations were noted in individual studies. For the qualitative studies, Son and Kang (2021) did not clearly describe the researcher's position and gave limited attention to researcher reflexivity. For the cohort studies, Xu et al. (2023) had some uncertainty around participants' cognitive status at baseline, the timing and completeness of follow-up, and how incomplete follow-up was managed. Lau et al. (2025) also had concerns relating to loss to follow-up over the 12-month period and the handling of missing follow-up data. In addition, several cross-sectional studies had limitations in the identification or control of potential confounding factors. These appraisal findings were considered when interpreting the credibility and strength of the evidence during narrative synthesis. Full item-level JBI critical appraisal results are presented in Appendix C.

3.11 Data Synthesis

The included studies differed substantially in their designs, participant characteristics, stoma types, outcome measures, and analytical methods. Because of this clinical and methodological heterogeneity, the studies were not considered sufficiently comparable for meaningful statistical pooling, and a meta-analysis was therefore not undertaken. Findings were instead synthesised narratively.

Quantitative findings were organised according to the main outcome domains identified during data extraction, including depression and anxiety, psychosocial adjustment, body image and stigma, self-efficacy and self-esteem, cognitive functioning, and psychological or psychosocial domains of health-related quality of life (HRQoL). Broader health-related quality-of-life findings were also included where they provided useful context for the main psychological outcomes. Where available, statistics such as prevalence rates, mean scores, correlations, regression findings, and explained variance were extracted and compared between studies. The synthesis also looked at factors that may have affected psychological outcomes, including time since surgery, type of stoma, sex or gender, independence in stoma care, self-efficacy, and social support.

Qualitative findings were synthesised narratively by comparing recurrent concepts and experiences across studies. Recurring areas included identity and body image, interpersonal relationships, coping and adaptation, self-management, social participation, and experiences associated with temporary and permanent ostomies. These findings were integrated with the quantitative evidence where they provided complementary or explanatory context.

Cognitive and neuropsychological outcomes were also considered as a review domain. Formal cognitive assessment was reported by Xu et al. (2023), who assessed postoperative cognitive impairment using the Montreal Cognitive Assessment (MoCA) and Functional Assessment of Cancer Therapy–Cognitive Function (FACT-Cog). Lau et al. (2025) also reported cognitive functioning as a functional domain of the EORTC QLQ-C30. Because cognitive outcomes were reported in only a small number of included studies and were assessed using different approaches, statistical pooling of cognitive outcomes was not considered appropriate. Qualitative findings about planning, problem-solving, and self-management were included as contextual information but were not considered evidence of cognitive impairment.

The synthesis was mainly descriptive and focused on identifying similarities and differences across the included studies rather than combining results into a pooled effect estimate. The methodological quality of the studies and any potential risk of bias were also considered when judging how reliable and consistent the overall findings were.

3.12 Ethical Considerations

As this study was a systematic review of previously published research, no new data were collected directly from human participants and formal ethical approval was therefore not required. Ethical approval and informed consent procedures reported in the included studies were considered as part of the methodological quality assessment where relevant.

The review was conducted in accordance with principles of research integrity, including accurate representation of study findings, transparent reporting of eligibility and study-selection procedures, appropriate citation of original sources, and avoidance of selective reporting. Particular care was taken not to infer causal relationships from cross-sectional findings and not to interpret qualitative descriptions of self-management, planning, or adaptation as evidence of cognitive impairment where cognitive outcomes had not been formally assessed.

Chapter 4

Results

4.1 Overview of Included Studies

A total of 21 studies were included in the final review, published between 2007 and 2026. Studies were conducted across 10 countries, with the highest representation from China (n=7), followed by the United Kingdom (n=3), South Korea (n=2), Iran (n=2), the United States (n=2), and Italy (n=2), with one study each involving Turkey, Australia, and Singapore. One comparative study included participants from both the United Kingdom and Japan (Simmons et al., 2011). The geographic breadth of the included literature reflects the international relevance of stoma surgery, although the relatively high number of recent studies from China and other parts of Asia suggests a growing research focus in this region.

Sample sizes varied considerably across the included studies, ranging from 11 participants in a qualitative phenomenological study (Villa et al., 2018) to 19,909 participants in a large national cross-sectional study conducted across 202 hospitals in China (Zhang et al., 2026). The majority of quantitative studies recruited samples of between approximately 45 and 403 participants.

In terms of study design, 14 studies used quantitative cross-sectional designs, including the matched cross-sectional comparison by Krouse et al. (2009). Three studies used cohort or longitudinal designs: Jin et al. (2019) used a longitudinal design, Xu et al. (2023) used a retrospective cohort design, and Lau et al. (2025) used a prospective longitudinal observational design. Four studies used qualitative approaches (Smith et al., 2017; Villa et al., 2018; Son and Kang, 2021; Whiteley et al., 2025).

The stoma types represented across the included studies included colostomy, which was the most frequently studied, as well as ileostomy, urostomy, and mixed populations including two or more stoma types. Underlying diagnoses included colorectal cancer, inflammatory bowel disease, bladder cancer, and mixed clinical indications. Time since stoma formation ranged from the early postoperative period to more than five years after surgery. Long-term survivors were represented particularly in Krouse et al. (2009), which examined long-term rectal cancer survivors living with permanent ostomies.

Table 1. Summary of included studies.

Study	Year	Country	Design	n	Stoma type	Main outcomes
Smith et al.	2017	UK	Qualitative IPA	21	Ileostomy	Body image, self-concept, sexuality, relationships
Villa et al.	2018	Italy	Qualitative phenomenological	11	Urostomy	Lived experience, psychological change, body image
Xian et al.	2018	China	Cross-sectional	1010	Enterostomy	Psychosocial adjustment, social support
Son & Kang	2021	South Korea	Qualitative focus group	19	Enterostomy	Coping, emotional distress, social adjustment
Doucette et al.	2023	USA	Cross-sectional	183	Mixed	Psychosocial adjustment, predictors
Özden & Kılıç	2023	Turkey	Cross-sectional	62	Intestinal stoma	Self-efficacy, stoma adaptation

Rafiei et al.	2017	Iran	Cross-sectional	70	Intestinal ostomy	Depression, anxiety, stress (DASS-21)
Xu et al.	2023	China	Retrospective cohort	108	Ileostomy	Postoperative cognitive impairment, cognitive predictors (MoCA, FACT-Cog)
Simmons et al.	2011	UK/ Japan	Cross-sectional comparative	948	Mixed	Psychosocial function, cultural comparison
Simmons et al.	2007	UK	Cross-sectional	51	Colostomy	Adjustment, self-efficacy, relationships
Dellafiore et al.	2022	Italy	Cross-sectional multicenter	403	Mixed	Predictors of adjustment (OAI-23)
Yuan et al.	2018	China	Cross-sectional	209	Mixed stoma	Stigma, body image, self-esteem
Zhang X et al.	2026	China	Cross-sectional national	19,909	Intestinal stoma	Psychosocial adaptation, network analysis
Park et al.	2018	South Korea	Cross-sectional	217	Permanent ostomy (≥55 yrs)	Depression, risk factors (CES-D-10)
Zhang Y et al.	2019	China	Cross-sectional	1,053	Enterostomy	Psychosocial adaptation, HRQoL
Tian et al.	2026	China	Cross-sectional latent profile	332	Colorectal stoma	Body image, influencing factors
Jin et al.	2019	China	Longitudinal cohort	67	Colostomy	Anxiety, depression, psychosocial needs
Krouse et al.	2009	USA	Matched cross-sectional	491	Permanent ostomy	HRQoL by sex, SF-36, COH-QOL-O

Whiteley et al.	2025	Australia	Multicentre longitudinal observational study; qualitative thematic analysis of open-ended survey responses	700	Temp. & permanent	Adjustment, temp vs. permanent comparison
Nasiriziba et al.	2020	Iran	Cross-sectional	155	Intestinal stoma	Self-efficacy, self-esteem
Lau et al.	2025	Singapore	Prospective longitudinal observational	240 CRC, 91 had stoma	Ileostomy/colostomy	HRQoL, emotional functioning, cognitive functioning, temporary vs. permanent stoma

RoB = Risk of Bias; HRQoL = Health-Related Quality of Life; QoL = Quality of Life; IPA = Interpretative Phenomenological Analysis; NR = Not Reported; OAI-23 = Ostomy Adjustment Inventory-23; DASS-21 = Depression Anxiety Stress Scales; CES-D-10 = Center for Epidemiological Studies Depression Scale.

4.2 Emotional and Psychosocial Outcomes

Emotional and psychosocial outcomes were the most consistently examined dimension of mental health across the included studies. Most studies reported outcomes in this domain, although the specific outcomes measured and the instruments used varied considerably. Xu et al. (2023) differed from the majority of the included literature by focusing primarily on postoperative cognitive impairment. The following subsections summarize findings relating to depression and anxiety, emotional functioning, psychosocial adjustment, body image and stigma, and coping and resilience.

4.2.1 Depression, Anxiety and Emotional Functioning

Several studies provided quantitative data on depression, anxiety, stress, and emotional functioning in stoma populations. Rafiei et al. (2017) assessed depression, anxiety, and stress in 70 Iranian ostomy patients using the validated Depression Anxiety Stress Scales-21 (DASS-21) and found that depression was reported by 87% of participants, anxiety by 92.1%, and stress by 71%. These findings indicate a high level of emotional distress within this sample.

Park et al. (2018) found that 50.7% of older South Korean ostomates met the study's criterion for depressive status. Social isolation was the strongest independent predictor, while poor

perceived health, poorer quality of life, limited leisure activity, and poorer economic status were also independently associated with depression.

Jin et al. (2019) assessed 67 patients before permanent colostomy surgery and again before discharge. Anxiety significantly decreased after surgery, with mean HADS anxiety scores falling from 7.18 to 6.19 ($p = .029$). The proportion of participants classified as suspected or definite cases of anxiety also decreased from approximately 50% before surgery to 37.3% before discharge. Depression scores also decreased, from 5.70 to 5.06, but this change was not statistically significant ($p = .125$). Psychosocial needs remained high at both time points, and anxiety and psychosocial needs were significant predictors of psychosocial behavioral reaction.

Tian et al. (2026) studied anxiety, depression, and body image in 332 Chinese patients with colorectal cancer who had a stoma. They found that anxiety and depression levels were different across the three body-image groups; the higher anxiety and depression were associated with more severe body-image problems and social avoidance.

Lau et al. (2025) provided additional longitudinal evidence on emotional functioning in colorectal cancer patients with and without stomas. At one month after surgery, emotional functioning measured using the EORTC QLQ-C30 was significantly lower among patients with a stoma than among those without a stoma (76.71 vs. 89.90, $p < .05$). The difference remained significant at three months (82.11 vs. 90.20, $p < .05$), but was no longer statistically significant at later follow-up points.

4.2.2 Psychosocial Adjustment

Psychosocial adjustment was the most frequently examined outcome across the quantitative studies and was commonly assessed using the OAI-23 or culturally adapted versions. Although the specific subscales varied across versions, they generally assessed dimensions such as acceptance, negative or anxious responses, and social engagement.

Dellafiore et al. (2022) examined predictors of acceptance, negative feelings and social engagement among 403 Italian adults with enterostomies or urostomies. Higher education was associated with better stoma acceptance and greater social engagement. Planned surgery was also linked to higher acceptance and social engagement, although it was associated with more negative feelings. People with a urostomy reported lower acceptance and social engagement

but fewer negative feelings. Longer time since stoma formation was generally linked to greater acceptance and fewer negative feelings, while social engagement decreased slightly over time.

Simmons et al. (2007) assessed 51 adults with colostomy in the United Kingdom approximately six months after surgery. Stoma-care self-efficacy was the strongest contributor to psychosocial adjustment, while stoma acceptance and interpersonal relationships were also independently associated with adjustment.

In another study, Simmons et al. (2011) compared psychosocial adjustment in 948 British and Japanese people with ostomies. British participants generally adjusted better, especially in accepting the stoma and taking part in social activities. Country and time since surgery were also important factors. The authors noted that cultural views about illness and body image may help explain these differences.

Doucette et al. (2023) examined factors associated with psychosocial adjustment among 183 adults who had been living with a colostomy, ileostomy, or urostomy for less than one year. Factors associated with adjustment included age, assistance with ostomy care, educational background, stoma type, body mass index, ostomy height, preoperative education, and stoma siting. Participants who could manage their ostomy care independently had better psychosocial adjustment in all four OAI-23 areas.

Özden and Kiliç (2023) studied the relationship between self-efficacy and stoma adaptation in 62 Turkish patients using the Stoma Self-Efficacy Scale and the OAI-23. They found a strong positive relationship ($r = 0.844$, $p < 0.001$), meaning that patients with higher self-efficacy adapted better to living with a stoma. Nasiriziba et al. (2020) found a significant positive relationship between total self-efficacy and self-esteem ($r = .54$), with social self-efficacy showing a similarly strong association ($r = .53$).

Zhang Y et al. (2019) found a strong positive relationship between psychosocial adaptation and HRQoL ($r = .781$). In hierarchical regression, psychosocial-adaptation dimensions added 52.1% to the explained variance in HRQoL, increasing the final model R^2 to .708. Reduced continuous worry was the strongest adaptation-related predictor.

Zhang X et al. (2026) used network analysis in a large sample of 19,909 patients in China and found that patterns of psychosocial adaptation differed depending on the level of adjustment. In patients with lower adaptation, restricting activities, worrying about leakage or odour, and

continuing to see themselves as a patient were more central concerns. In those with moderate or high adaptation, confidence in managing the stoma and feeling that life was meaningful or rewarding became more important.

4.2.3 Body Image and Stigma

Body image disturbance and stigma were examined as specific dimensions of psychosocial burden in several included studies, often in relation to other emotional and adjustment outcomes.

Tian et al. (2026) used latent profile analysis to examine body image in 332 Chinese patients with colorectal cancer who had a stoma. The researchers identified three body-image profiles: low disturbance–emotional stability (31.7%), moderate disturbance–cognitive regulation (39.4%), and high disturbance–social avoidance (28.9%). Patients in the high-disturbance group had higher anxiety and depression, poorer stoma adaptation, and more negative views of their illness. This group was also more likely to include younger patients, women, people living in rural areas, those who had recently received a stoma, and those with stoma-related complications. Lower social support was also linked with greater body-image disturbance.

Yuan et al. (2018) found that greater stigma was associated with lower coping self-efficacy, poorer body image, lower self-esteem and more frequent leakage. In multivariable analysis, coping self-efficacy was the strongest predictor, while spouse/family acceptance, body-image loss, leakage, peer participation and age also independently contributed.

4.2.4 Coping, Resilience, and Qualitative Accounts

Four qualitative studies provided detailed accounts of the lived psychological experience of individuals with stomas, complementing the quantitative findings by showing how patients experienced and adapted to life with a stoma.

Smith et al. (2017) identified two main themes: the intrapersonal impact of ileostomy and its impact on relationships with others. Participants described changes in body image, identity, sexuality, and sense of self, alongside experiences of disclosure, stigma, intimate relationships and social support. Some participants also described positive reframing and increased confidence over time.

Villa et al. (2018) explored the experiences of 11 Italian adults living with an urostomy and identified themes relating to the impact of surgery, body image, daily and social activities, sexuality, stoma management, education, and support from family and friends. Participants described increasing confidence and a greater sense of control as they became more competent in self-care.

Son and Kang (2021) used focus-group interviews with 19 South Korean adults with colostomies and ileostomies. They identified three broad coping themes: struggling and suffering, learning to adapt to everyday life with a stoma, and developing longer-term acceptance and adjustment. Participants described gradually adapting daily routines, managing disclosure and developing practical strategies for stoma care. Some gender-related differences were also reported.

Whiteley et al. (2025) explored adjustment to temporary and permanent ostomies using 626 open-ended responses from 217 participants. Three main themes were identified: adjusting to an unfamiliar and unpredictable body, navigating uncharted territory, and psychological adjustment. Both groups reported difficulties with leakage, body changes, sleep, social activities, intimacy, work, and self-care. Participants with temporary stomas sometimes postponed activities while waiting for reversal, whereas those with permanent ostomies described more ongoing adjustment. Overall, the similarities between the groups were greater than the differences.

4.3 Cognitive and Neuropsychological Outcomes

Cognitive outcomes were examined in two of the included studies, although the methods used differed. Xu et al. (2023) directly assessed postoperative cognitive impairment in 108 older adults undergoing ileostomy for colorectal cancer using the Montreal Cognitive Assessment (MoCA) and the Functional Assessment of Cancer Therapy–Cognitive Function (FACT-Cog). Of the 108 participants, 52 (48.1%) were classified as having postoperative cognitive impairment at follow-up.

Lau et al. (2025) assessed cognitive functioning as part of the EORTC QLQ-C30 in a prospective longitudinal study of 240 colorectal cancer patients, including 91 who underwent stoma formation. At one month after surgery, cognitive-functioning scores were lower in the stoma group than in the non-stoma group (88.35 vs. 93.41), although the difference did not

reach statistical significance ($p = .06$). Patients with permanent stomas, however, showed consistently lower cognitive-functioning scores than those with temporary stomas, with the largest difference observed at one month (73.08 vs. 91.19, $p < .025$).

Together, these findings provide early evidence that cognitive functioning may represent an important but underexplored aspect of adjustment following stoma surgery. The evidence remains limited, as only one study used dedicated cognitive assessment tools and the two studies used different approaches to measuring cognition. Nevertheless, the findings suggest that cognitive outcomes may warrant greater attention in future stoma research, particularly in older patients and those living with permanent stomas. Some qualitative studies also described the practical and planning demands associated with learning and managing stoma care. These findings were retained as contextual evidence of cognitive burden but were not interpreted as evidence of cognitive impairment where cognition had not been formally assessed.

4.3.1 Cognitive Demands of Stoma Self-Management

Several qualitative studies described the practical demands involved in learning to live with a stoma. Participants described learning self-care routines, planning activities around stoma management, preparing supplies, managing possible leakage or complications, and adapting everyday routines (Smith et al., 2017; Son and Kang, 2021; Villa et al., 2018). These studies did not use validated cognitive measures or explicitly assess cognitive load as an outcome. The findings were therefore interpreted primarily as self-management and planning demands, while also providing useful context for considering the possible cognitive burden associated with adapting to stoma care.

4.4 Health-Related Quality of Life

Health-related quality of life was examined as either a primary or secondary outcome in several of the included studies. Measurement approaches varied, with some studies using generic instruments such as the SF-36 and others using stoma-specific or cancer-related quality-of-life measures, including the Stoma-QoL, City of Hope Quality of Life–Ostomy (COH-QOL-O) questionnaire, and EORTC QLQ-C30.

Krouse et al. (2009) compared 246 long-term rectal cancer survivors with permanent ostomies with 245 survivors without ostomies. Both male and female ostomy survivors had poorer social wellbeing, but women showed a broader pattern of impairment, including poorer overall

HRQoL and psychological wellbeing. Intimacy was particularly affected in both sexes. The findings showed that the long-term HRQoL profile associated with an ostomy differed by sex.

Zhang Y et al. (2019) found a strong positive association between psychosocial adaptation and HRQoL ($r = .781$). In hierarchical regression, psychosocial adaptation added 52.1% to the explained variance in HRQoL, increasing the final model R^2 to .708. Reduced continuous worry was the strongest adaptation-related predictor of HRQoL.

4.5 Moderating Factors: Patient and Clinical Characteristics

A number of patient and clinical characteristics were found to be associated with variation in mental health and quality-of-life outcomes across the included studies, addressing the first secondary research question.

4.5.1 Time Since Surgery

Several studies suggested that adjustment to a stoma changes over time, although the pattern was not uniform across outcomes or study designs. Jin et al. (2019) found that anxiety levels were significantly lower before discharge than they were before colostomy surgery. Depression scores also decreased, although this change was not statistically significant. Whiteley et al. (2025) described adjustment during the first nine months after ostomy formation as a gradual process. As time passed, participants became more confident and familiar with managing their stoma. However, difficulties such as leakage, reduced social activity, intimacy concerns, and psychological adjustment could still remain. Some participants with temporary ostomies postponed aspects of everyday life until reversal, while some with permanent ostomies described longer-term adjustment needs.

Qualitative findings from Smith et al. (2017) and Villa et al. (2018) also indicated that adaptation was a gradual process, involving changes in self-perception, relationships, self-care confidence, and engagement with everyday life.

4.5.2 Stoma Type

Findings regarding differences between stoma types were mixed and difficult to compare because of variation in study designs and outcome measures. Simmons et al. (2011) observed some differences in psychosocial adjustment according to stoma type in unadjusted analyses, but stoma type did not remain an independent predictor after other factors were taken into

account. Country and time since surgery appeared to be more important influences on adjustment.

Whiteley et al. (2025) similarly found that the experiences of people with temporary and permanent ostomies were more alike than different. Some participants with temporary ostomies delayed returning to work, intimacy, or other activities until reversal. Those with permanent ostomies sometimes reported longer-lasting psychological, sexual, and recovery-related difficulties.

Lau et al. (2025) found only a few significant differences in HRQoL between patients with ileostomies and colostomies. However, patients with permanent stomas had lower cognitive-functioning scores than those with temporary stomas, especially one month after surgery.

4.5.3 Sex and Gender

Sex- and gender-related differences were reported across several studies. Krouse et al. (2009) found broader HRQoL impairment among female than male long-term ostomy survivors. Rafiei et al. (2017) reported significantly higher anxiety and stress scores among women, while Dellafiore et al. (2022) found lower acceptance among female participants. Tian et al. (2026) also found that women were more likely to belong to moderate- or high-body-image-disturbance profiles. In the qualitative findings, Son and Kang (2021) described gender differences in spousal caregiving, with wives tending to provide greater practical stoma-care support to male partners.

4.5.4 Self-Efficacy and Social Support

Self-efficacy and social support were repeatedly associated with more favorable psychosocial outcomes, although their importance varied across studies and outcomes. Simmons et al. (2007) and Özden and Kılıç (2023) found strong associations between stoma self-efficacy and psychosocial adjustment, while Nasiriziba et al. (2020) reported a positive association between self-efficacy and self-esteem. Xian et al. (2018) and Yuan et al. (2018) identified social support and family acceptance as important correlates of psychosocial adjustment and stigma. In Zhang X et al. (2026), confidence in stoma care was particularly central within the moderate- and high-adaptation networks.

4.6 Comparative Evidence: Stoma Versus Non-Stoma Surgical Outcomes

Evidence directly comparing mental health outcomes in patients with and without stomas was limited across the included studies. Most studies focused only on people living with a stoma and did not include a comparison group without a stoma. However, two studies made direct comparisons. Krouse et al. (2009) compared long-term rectal cancer survivors with permanent ostomies to those without ostomies and found poorer social wellbeing in the ostomy group. Wider problems with HRQoL and psychological wellbeing were particularly noticeable among women. Lau et al. (2025) followed colorectal cancer patients over time and found that those with a stoma had significantly poorer emotional functioning at one and three months after surgery. However, these differences were no longer statistically significant at later follow-up.

Overall, the limited comparative evidence suggests that stoma formation may contribute to additional psychological burden in some patients, particularly during the early postoperative period and in specific domains of long-term wellbeing. However, the small number of comparative studies prevents firm conclusions about whether these outcomes are specifically attributable to stoma formation rather than underlying cancer, major surgery, or postoperative recovery.

4.7 Quality Assessment Summary

The methodological quality and risk of bias of the included studies were assessed using appraisal tools appropriate to each study design, as described in Chapter 3. Overall, most studies met the main appraisal criteria, although some study-specific limitations were identified. In the qualitative studies, Son and Kang (2021) had limitations relating to researcher positioning and reflexivity. Among the cohort studies, Xu et al. (2023) had some uncertainty around baseline cognitive status, follow-up timing, and the handling of incomplete follow-up. Lau et al. (2025) also had concerns relating to loss to follow-up and the handling of missing data. These issues were taken into account when interpreting the findings rather than being converted into numerical or categorical quality scores. Full item-level JBI critical appraisal results are presented in Appendix C.

A common limitation among the quantitative studies was the predominance of cross-sectional designs, which limits the ability to draw causal conclusions. Several studies used clinic-based or convenience samples and relied on self-reported measures, which may have reduced the representativeness of the findings and increased the possibility of response bias. At the same time, many studies used well-established and validated tools, including the OAI-23, DASS-21,

HADS, Stoma-QoL, MoCA, FACT-Cog, and EORTC QLQ-C30. Xu et al. (2023) contributed to the evidence on cognition by using formal cognitive assessments, while Lau et al. (2025) followed emotional and cognitive outcomes over a 12-month period.

The qualitative studies generally met most JBI appraisal criteria. Most used recognised qualitative methods and clearly described how the data were collected and analysed. However, some gave limited attention to researcher reflexivity and did not fully discuss how the researcher may have influenced the data collection or interpretation of the findings.

Overall, the included studies showed that emotional and psychosocial outcomes were the most frequently examined aspects of mental health following stoma surgery, while cognitive outcomes were much less studied. A range of patient, clinical, and psychosocial factors were associated with differences in adjustment, particularly time since surgery, self-efficacy, social support, sex, and stoma characteristics. Qualitative studies described adjustment as an ongoing process involving identity, body image, self-management, relationships, and social participation. Evidence comparing stoma patients with non-stoma patients was limited, but suggested that stoma formation may increase psychological burden for some patients, especially in the early postoperative period.

Chapter 5

Discussion

The findings show that living with a stoma can affect different areas of a person's mental and psychosocial wellbeing. However, the type and level of impact were not the same for every patient or across all of the studies. The main outcomes discussed were depression, anxiety, psychosocial adjustment, body image, stigma, self-efficacy, social support, and health-related quality of life. Cognitive functioning was looked at much less often, suggesting that this is still an area that needs more research.

Several factors seemed to influence how well patients adjusted to living with a stoma. For example, patients who had greater confidence in managing their stoma, more independence with stoma care, stronger self-efficacy, and good social support generally appeared to adjust better. In contrast, concerns about body image, stigma, leakage, social isolation, sexuality, and changes in relationships were often linked with more difficulty adjusting. The qualitative

studies also showed that adapting to a stoma is not only about learning how to manage it physically. Patients may also need to adjust to changes in their identity, relationships, intimacy, social life, and everyday routines.

Overall, the findings suggest that psychological and cognitive difficulties after stoma surgery are unlikely to be caused by the stoma alone. Other factors may also play a role, including the underlying illness, the effects of major surgery, the patient's age, postoperative complications, psychosocial adjustment, and the practical demands of living with a stoma. Because of this, it is useful to compare stoma patients with wider surgical populations.

5.1 Emotional, Psychosocial, and Cognitive Outcomes: Interpretation and Context

Psychological and psychosocial adjustment was an important part of living with a stoma, although the level of emotional difficulty differed across the studies. Depression, anxiety, and stress were reported in several patient groups. However, findings from Jin et al. (2019) and Lau et al. (2025) suggest that these feelings may change over time, with the early period after surgery being especially difficult for some patients. This suggests that psychological problems should not automatically be seen as a permanent or unavoidable result of having a stoma. Body image, stigma, and changes in personal identity also seemed to have an important impact on adjustment. Poor adjustment to changes in body image and higher levels of stigma were associated with anxiety, depression, lower self-esteem, and greater difficulty adapting to life with a stoma. The qualitative studies also showed that patients may worry about issues such as leakage, odour, telling other people about the stoma, intimacy, sexuality, and taking part in social activities. This suggests that living with a stoma involves much more than learning how to manage it physically. Adjustment also means getting used to changes in the body, relationships, social life, and what feels normal in everyday life.

Self-efficacy and social support were among the most consistent potentially modifiable factors identified in the review. Greater confidence in stoma management was generally associated with better psychosocial adjustment and self-esteem, which is consistent with Bandura's (1997) concept of self-efficacy. Family acceptance, social support, and feeling connected to others were also linked with better adjustment, while social isolation was associated with poorer outcomes. This suggests that support for people living with a stoma should not only focus on the practical side of stoma care. It should also help patients build confidence, maintain relationships, manage disclosure, and continue taking part in everyday and social activities.

Adjustment was also influenced by a person's wider social and personal circumstances. Differences linked to sex, culture, diagnosis, type of stoma, and social situation suggest that people's experiences of stoma formation are not simply individual psychological reactions. Instead, adjustment seems to be shaped by a combination of personal, medical, and social factors. Cultural expectations surrounding bodily function, independence, sexuality, caregiving, and disclosure may influence how patients experience and adapt to their stoma.

Cognitive outcomes were much less frequently examined than emotional and psychosocial outcomes. Xu et al. (2023), using the MoCA and FACT-Cog, identified cognitive impairment in 52 of 108 older patients following ileostomy for colorectal cancer. Factors associated with poorer cognitive outcomes included older age, lower BMI, lower exercise intensity, comorbidity, cancer-related anemia, and postoperative complications. Lau et al. (2025) also reported lower cognitive-functioning scores in patients with stomas at some follow-up points, with more pronounced differences between permanent and temporary stoma groups. However, the overall evidence remains limited because only a small number of studies assessed cognition and they used different measures. It is therefore not possible to determine whether cognitive difficulties are a consistent consequence of stoma formation or whether they reflect wider influences such as age, underlying disease, cancer treatment, major surgery, postoperative recovery, and psychological distress. These broader influences are considered further in the following comparison with other surgical populations.

Overall, the evidence suggests that emotional and psychosocial outcomes after stoma surgery can change over time and are influenced by several different factors. However, problems such as depression, anxiety, stress, fatigue, and cognitive difficulties are not only experienced by people with a stoma and can also occur after other types of major surgery. Comparing stoma patients with wider surgical populations is therefore helpful in understanding which difficulties may be part of general recovery after surgery and which may be more specifically related to living with a stoma.

5.2 Comparison With Broader Surgical Populations and Gut-Brain Axis Perspective

Evidence from broader surgical populations can help put the findings of this review into context and may help show which difficulties are part of general recovery after major surgery and which may be more related to living with a stoma. Anxiety and depression are common after many types of surgery, so these outcomes cannot automatically be linked to stoma formation.

However, some external studies suggest that people with a stoma may experience greater psychological difficulty than similar patients without one.

For example, Cotrim and Pereira (2008) compared colorectal cancer patients with and without a stoma and found poorer quality of life, body image, and social functioning in the stoma group, together with higher levels of anxiety and depression. Song et al. (2020) also compared patients with permanent stomas, temporary stomas, and no stoma during the early postoperative period. Both stoma groups reported worse body image and higher anxiety and depression than the non-stoma group. Body image was also found to explain part of the relationship between stoma status and psychological distress. These findings suggest that some of the additional psychological burden seen in stoma patients may be linked to the way patients experience changes to their body and daily life.

Other studies comparing patients with and without a stoma have found a similar pattern. Ross et al. (2007) reported higher levels of depression, poorer social functioning, and more body-image concerns in colorectal cancer patients with a stoma compared with those without one. However, most of these differences were not statistically significant, so the results should be interpreted with some caution. Similarly, Sceats et al. (2020) found that, among patients having major abdominal surgery for inflammatory bowel disease, those who had a stoma formed were more likely to experience anxiety and depression than those who had surgery without a stoma. This is important because it suggests that the emotional burden may not be explained by major abdominal surgery alone.

These external findings are broadly consistent with the direct comparative evidence included in the present review. Krouse et al. (2009) found poorer social wellbeing among long-term rectal cancer survivors with permanent ostomies compared with those without ostomies, while Lau et al. (2025) found poorer emotional functioning in patients with a stoma at one and three months after surgery. However, these differences were no longer significant at later follow-up. Taken together, the evidence suggests that stoma formation may add to the psychological and psychosocial burden for some patients, especially during the earlier stages of recovery.

At the same time, these findings should be interpreted carefully. The studies differed in diagnosis, patient characteristics, timing of assessment, and the measures used. It is also likely that some of the additional burden is explained by psychosocial factors that are particularly relevant to living with a stoma, including body image, stigma, leakage concerns, disclosure,

sexuality, relationships, and social participation. The evidence therefore does not show that stoma formation directly causes worse psychological outcomes, but it does suggest that it may introduce extra challenges beyond the general effects of surgery.

The evidence relating to cognition is less clear and has been rarely studied in stoma populations. Cognitive difficulties after major surgery may include problems with memory, attention, processing speed, and executive functioning, particularly among older adults. Huang et al. (2025) found that postoperative cognitive dysfunction can occur at different stages of recovery following non-cardiac surgery, including abdominal surgery. This suggests that cognitive difficulties observed in stoma patients may partly reflect the broader effects of major surgery rather than stoma formation itself.

Stoma-specific evidence is limited. Xu et al. (2023) found cognitive impairment in 52 of 108 older patients following ileostomy, while Lau et al. (2025) reported changes in cognitive functioning over time and lower cognitive-functioning scores among patients with permanent compared with temporary stomas at some assessment points. However, the small number of studies and differences in patient characteristics, cognitive measures, and follow-up timing mean that it remains unclear whether cognitive difficulties are more common in stoma patients than in comparable non-stoma surgical populations.

Overall, the evidence suggests that some people with a stoma may experience greater emotional and psychosocial difficulties than similar patients without a stoma, although this pattern is not seen in every study or for every outcome. The evidence around cognitive outcomes is much less clear, and any difficulties may be linked more to the broader effects of major surgery than to the stoma itself. The findings therefore support a multifactorial explanation, where general surgical effects, psychosocial challenges, and stoma-specific factors may all contribute. In patients with intestinal stomas, the direct changes to the gastrointestinal system also raise the question of whether gut-related biological processes could have an additional role, which is considered in the following section.

Gut-Brain Axis: A Hypothesis-Generating Perspective

The comparison with broader surgical populations suggests that some psychological difficulties may be greater in patients with a stoma than in similar patients without one. The comparative evidence also shows that psychosocial factors, especially body image and adjustment to living with a stoma, are likely to explain part of the additional burden. At the

same time, intestinal stoma surgery is different from many other types of surgery because it directly changes the structure and function of the gastrointestinal system. This makes it reasonable to consider whether gut-related biological changes could also contribute alongside general surgical and psychosocial factors.

As discussed in the Background, the gut-brain axis refers to the two-way communication between the gastrointestinal system and the brain through neural, hormonal, immune, and metabolic pathways. In people who undergo intestinal stoma surgery, several changes could potentially affect this communication. These include the inflammatory and hormonal response to surgery, changes in intestinal anatomy and bowel transit, dietary changes, antibiotic use, and possible changes in the gut microbiome. These factors may also interact with nutritional status, sleep disruption, fatigue, and psychological stress, all of which may influence emotional wellbeing or cognitive functioning.

The possible role of gut-related mechanisms may be especially relevant in people with ileostomies or colostomies because these procedures can lead to long-term changes in the gastrointestinal environment. Changes in bowel transit, diet, microbial exposure, and the parts of the intestine involved in digestion and fermentation could theoretically affect gut-brain signalling.

There are also several more established explanations for the outcomes identified in this review. Psychological difficulties may be strongly influenced by body image, stigma, self-efficacy, social support, and the everyday demands of stoma management. The comparative evidence discussed in the previous section also suggests that body image may explain part of the relationship between stoma status and psychological distress. Cognitive outcomes may also be affected by age, cancer and its treatment, anesthesia, postoperative complications, nutritional problems, inflammation, and general vulnerability to cognitive change after major surgery.

For this reason, the gut-brain axis should not be presented as the explanation for why some stoma patients may experience worse psychological or cognitive outcomes. Instead, it provides an additional biological perspective that has not yet been properly tested in this population. The current evidence suggests that psychosocial factors and the wider effects of surgery already explain some of these outcomes, while biological changes in the gut may also play a role.

The gut-brain axis should therefore be seen more as a useful framework for understanding and exploring possible links, rather than as a confirmed explanation. Future research could look at

changes in the gut microbiome, inflammation, microbial metabolites, nutritional status, and neuroendocrine activity, while also measuring psychological and cognitive outcomes in the same group of patients. Ideally, these studies would compare intestinal stoma patients with similar surgical patients without a stoma and follow them over time. This would help clarify whether gastrointestinal-specific biological changes contribute to outcomes beyond the effects of major surgery and the psychosocial challenges of living with a stoma.

5.3 Clinical Implications and Directions for Future Research

The findings of this review suggest that psychological and psychosocial care should be considered an important component of support following stoma surgery, alongside physical recovery and practical stoma management. Although psychological difficulties were not experienced uniformly, depression, anxiety, body-image concerns, stigma, relationship difficulties, and reduced social participation were reported across the included literature. Clinical care should therefore recognise that adjustment to a stoma involves more than learning how to manage the appliance.

Support may be particularly important during the early stages of recovery, when emotional difficulties may be more pronounced for some patients. However, adjustment may continue over a much longer period, particularly where concerns relating to body image, intimacy, disclosure, stigma, relationships, or social participation remain. Follow-up should therefore be responsive to individual needs rather than assuming that psychological adjustment is complete once practical stoma management has been established.

The links between self-efficacy, independence with stoma care, social support, and better psychosocial adjustment also have important practical implications. Education and support from specialist stoma nurses may help patients become more confident in managing their stoma independently. Psychological support or peer support may also be useful for patients who are struggling with body image, social confidence, relationships, or adjusting to everyday life.

Cognitive difficulties need to be interpreted more carefully because there is still limited evidence in this area. The findings of this review do not establish that cognitive problems are a consistent or direct consequence of stoma formation. However, cognitive concerns may still be important in older patients or those who are medically more vulnerable, especially if they report problems with memory, concentration, or managing their own care. These difficulties

should also be considered alongside other possible factors, such as age, underlying illness, major surgery, complications, nutritional status, and general recovery.

Future research should use more prospective and long-term study designs, ideally starting before surgery and following patients through their recovery. This would make it easier to identify whether psychological or cognitive difficulties were already present before the operation or developed afterwards. It would also help show how these outcomes change over time.

Direct comparative research is also needed to determine whether psychological and cognitive outcomes are specifically associated with stoma formation or reflect the broader effects of major surgery and underlying disease. Future studies should therefore include well-matched stoma and non-stoma groups assessed using comparable measures at similar timepoints.

Cognitive outcomes require more systematic investigation. Future studies should combine objective cognitive assessment with patient-reported cognitive functioning and, where possible, include preoperative assessment. Areas such as memory, attention, concentration, processing speed, executive functioning, and mental fatigue may be especially important to investigate.

The gut-brain axis should also be explored more directly in future research, rather than only being used as a possible explanation for the findings. Prospective studies could measure factors such as gut microbiome composition, microbial metabolites, inflammation, stress-related biological markers, and nutritional status, alongside psychological and cognitive outcomes in the same patients.

Finally, future studies should include a wider range of participants and explore whether experiences differ depending on factors such as whether the stoma is temporary or permanent, the underlying diagnosis, age, sex, cultural background, socioeconomic circumstances, and the length of time since surgery. A better understanding of who may be more at risk of experiencing difficulties, when these difficulties are most likely to occur, and what factors may contribute to them could help support more personalised and appropriate stoma care.

5.4 Limitations of the Review

There are several limitations that need to be considered when interpreting the findings of this review. The included studies differed considerably in their design, participant characteristics, type of stoma, whether the stoma was temporary or permanent, underlying diagnosis, time since surgery, cultural setting, and the measures used to assess psychological or cognitive outcomes. Because there was a high level of variation between the studies, it was not appropriate to carry out a meta-analysis. This also made it more difficult to compare findings directly across studies.

A related limitation concerns the comparisons with broader surgical populations discussed in this chapter. These comparisons were based on external literature rather than studies identified through the systematic review search and should therefore be treated as contextual and indirect. The external studies differed from the included stoma studies in patient characteristics, underlying diagnoses, assessment instruments, definitions of psychological or cognitive outcomes, and timing of measurement. Because of these differences, the numerical comparisons cannot be used as direct estimates of the effect of stoma formation.

Most of the studies included in this review also used cross-sectional designs. Although these studies identified associations between factors such as self-efficacy, social support, body image, stigma, and psychosocial adjustment, they could not show the direction of these relationships or establish causality. Several studies also used clinic-based or convenience samples, which may limit how well the findings apply to the wider population of people living with stomas. Self-report measures were also commonly used and may have been affected by recall bias or differences in how participants understood and reported their experiences.

The cognitive evidence was particularly limited. Only a small number of included studies formally assessed cognitive functioning, and these studies differed in design, population, measurement approach, and timing of follow-up. This means that the available findings cannot be generalised confidently to all stoma populations. They also do not allow firm conclusions to be drawn about whether cognitive difficulties are specifically related to stoma formation or whether they mainly reflect the effects of age, underlying illness, major surgery, or postoperative recovery.

Another important limitation concerns the gut-brain axis interpretation. This framework was based mainly on external biological and theoretical literature rather than direct measurements from the studies included in the systematic review. None of the included studies assessed gut

microbiome composition, inflammatory biomarkers, microbial metabolites, stress-related biological measures, or other gut–brain pathways alongside psychological or cognitive outcomes. The biological mechanisms discussed in this chapter should therefore be viewed as possible explanations and directions for future research rather than findings of the systematic review itself.

The search strategy also had some limitations. In several databases, stoma-related terms were searched only in the title field. This may have reduced the sensitivity of the search and meant that some relevant studies were missed. The review was also limited to peer-reviewed studies published in English, so evidence from other languages or non-journal sources may not have been included. A further limitation is that most of the review process was carried out by one reviewer. This means that decisions about study selection, data extraction, and quality assessment may have been more influenced by individual judgement. Despite these limitations, the review identified several common patterns, particularly in psychological and psychosocial adjustment. It also highlighted important gaps in the evidence, including limited research on cognitive outcomes, comparisons between people with and without a stoma, and possible biological mechanisms. Future research should examine these areas in more detail.

Chapter 6

Conclusion

This systematic review examined the psychological, psychosocial, emotional, and cognitive outcomes reported by adults following stoma surgery. Across the 21 included studies, the findings showed that adjusting to life with a stoma involves much more than physical recovery and learning how to manage the appliance. Depression, anxiety, psychosocial adjustment, body image, stigma, self-efficacy, social support, relationships, and health-related quality of life were all important parts of the postoperative experience. However, these experiences differed a lot between individuals and across the studies. This suggests that psychological difficulties do not affect everyone in the same way and should not be viewed as an inevitable result of having a stoma.

One of the clearest findings was how important psychosocial adjustment is for people living with a stoma. Better adjustment was generally associated with greater confidence, stronger self-

efficacy, more independence in managing stoma care, and better social support. In contrast, problems with body image, stigma, leakage, social isolation, intimacy, disclosure, and changes in relationships were associated with poorer psychological wellbeing. Qualitative studies also showed that adjustment is an ongoing process involving identity, daily routines, relationships, social life, and body image. This suggests that adapting to a stoma involves more than learning the practical aspects of stoma care.

Emotional distress was also reported across the literature, especially in relation to anxiety and depression. However, some studies suggested that these difficulties may improve over time. The early postoperative period may therefore be especially difficult for some patients, while adjustment may continue for months or even years after surgery. Psychological support should therefore be responsive to individual needs and should not necessarily stop once practical stoma management has been established.

Cognitive outcomes were much less studied than emotional and psychosocial outcomes. The small number of studies examining cognition suggests that cognitive difficulties may occur in some patients, particularly older or medically vulnerable individuals. However, the current evidence is too limited to determine how common these difficulties are, how long they last, or what causes them. Cognitive changes cannot currently be linked specifically to stoma formation because factors such as age, cancer and its treatment, anesthesia, inflammation, complications, nutritional problems, and the wider effects of major surgery may also contribute.

Comparisons with other surgical patients suggest that psychological and cognitive outcomes after stoma surgery are probably influenced by several factors rather than one single cause. Some difficulties may be related to the general effects of major surgery and the recovery process, while having a stoma can bring additional challenges that may continue over time. These may include changes in bodily function, the need to manage the stoma independently, worries about leakage or odour, body image concerns, stigma, sexuality, telling others about the stoma, changes in relationships, and taking part in social activities. The findings therefore support a multifactorial explanation rather than one single cause.

The gut-brain axis provides an additional way of thinking about these outcomes, particularly in patients with intestinal stomas. Because ileostomy and colostomy involve direct changes to the gastrointestinal system, biological processes involving the microbiome, inflammation,

neuroendocrine signalling, nutrition, and microbial metabolites may also be relevant. However, none of the studies included in this review directly examined gut–brain mechanisms alongside psychological or cognitive outcomes. The gut–brain axis should therefore be viewed as a possible and hypothesis-generating framework rather than a confirmed explanation for the difficulties reported by stoma patients.

These conclusions also need to be considered alongside the limitations of the evidence. The included studies differed considerably in their design, patient groups, stoma type and permanence, underlying diagnosis, follow-up period, cultural context, and outcome measures. Most studies were cross-sectional, which limited conclusions about causality and changes over time. Evidence on cognitive outcomes was particularly limited, and comparisons with other surgical populations were mostly indirect. The restriction to English-language peer-reviewed studies and the use of one main reviewer for study selection, data extraction, and quality assessment should also be considered.

Despite these limitations, the findings still have important implications for clinical care. Support for people living with a stoma should include psychological and social wellbeing as well as physical recovery and practical stoma management. Support may be especially important during the early stages of recovery, but longer-term follow-up may also be needed where concerns about body image, relationships, sexuality, stigma, or social participation continue. Support aimed at improving self-efficacy, independence, social support, and confidence with stoma care may be particularly useful. Cognitive concerns should also be taken seriously when patients report them, particularly in older adults or those who are more medically vulnerable.

Future research should use more prospective and long-term study designs, ideally starting before surgery and following patients throughout recovery. Studies that compare well-matched groups of patients with and without a stoma, use consistent psychological measures, and include objective cognitive assessments would help to show more clearly which outcomes are linked specifically to stoma formation and which may be explained by major surgery or the underlying illness. Further research should also examine gut–brain pathways more directly by measuring factors such as microbiome composition, inflammatory and metabolic markers, nutritional status, and psychological and cognitive outcomes in the same patients. Intervention studies focusing on self-efficacy, psychological support, body image, social participation, intimacy, and self-management would also be valuable.

Overall, this review shows that psychological and psychosocial adjustment is an important part of life after stoma surgery and should be considered as part of routine patient care. Cognitive outcomes are still not well understood and need much more research. At present, the evidence suggests that outcomes are most likely influenced by a combination of surgical, psychological, and social factors, while biological mechanisms related to the gastrointestinal system remain possible but unconfirmed. A more integrated approach to future research and care may therefore help provide a better understanding of recovery and support more individualised care for people living with a stoma.

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Appendix A - Database Search Strategies

The searches were conducted in June 2026. No publication-date restrictions were applied. Searches were restricted to English-language journal articles. Peer-reviewed limiters were applied where available within the database interface. The exact search strategies, field restrictions, filters, and numbers of records retrieved are reported below.

Database 1: Scopus

Date searched: 28 June 2026

TITLE (stoma* OR ostom* OR colostomy OR ileostomy OR urostomy) AND TITLE-ABS-KEY ("mental health" OR psychological OR psychosocial OR depression OR anxiety OR "quality of life" OR cognitive OR cognition) AND (LIMIT-TO (EXACTKEYWORD , "Human")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "MEDI") OR LIMIT-TO (SUBJAREA , "PSYC")) AND (LIMIT-TO (LANGUAGE , "English"))

Records retrieved: 46

Database 2: PubMed/MEDLINE

Date searched: 28 June 2026

(stoma*[tiab] OR ostom*[tiab] OR colostomy[tiab] OR ileostomy[tiab] OR urostomy[tiab] OR "Surgical Stomas"[MeSH] OR "Colostomy"[MeSH] OR "Ileostomy"[MeSH] OR "Ostomy"[MeSH] OR "Enterostomy"[MeSH]) AND ("mental health"[tiab] OR psychological[tiab] OR psychosocial[tiab] OR depression[tiab] OR anxiety[tiab] OR "quality of life"[tiab] OR cognitive[tiab] OR cognition[tiab] OR "Adaptation, Psychological"[MeSH] OR "Anxiety"[MeSH] OR "Depression"[MeSH] OR "Quality of Life"[MeSH] OR "Body Image"[MeSH]) AND ("journal article"[pt]) AND ("English"[lang])

Records retrieved: 348

Database 3: CINAHL (via EBSCOhost)

Date searched: 28 June 2026

TI (stoma* OR ostom* OR colostomy OR ileostomy OR urostomy)
AND
AB ("mental health" OR psychological OR psychosocial OR depression
OR anxiety OR "quality of life" OR "body image"
OR "psychosocial adjustment" OR coping OR wellbeing
OR cognitive OR cognition)

Limiters applied: Peer Reviewed; English Language; Document Type: Journal Article

Records retrieved: 284

Database 4: PsycINFO

Date searched: June 2026

Platform/interface: APA PsycInfo

TI (stoma* OR ostom* OR colostomy OR ileostomy OR urostomy)
AND
AB ("mental health" OR psychological OR psychosocial OR depression
OR anxiety OR "quality of life" OR coping OR wellbeing
OR cognitive OR cognition)

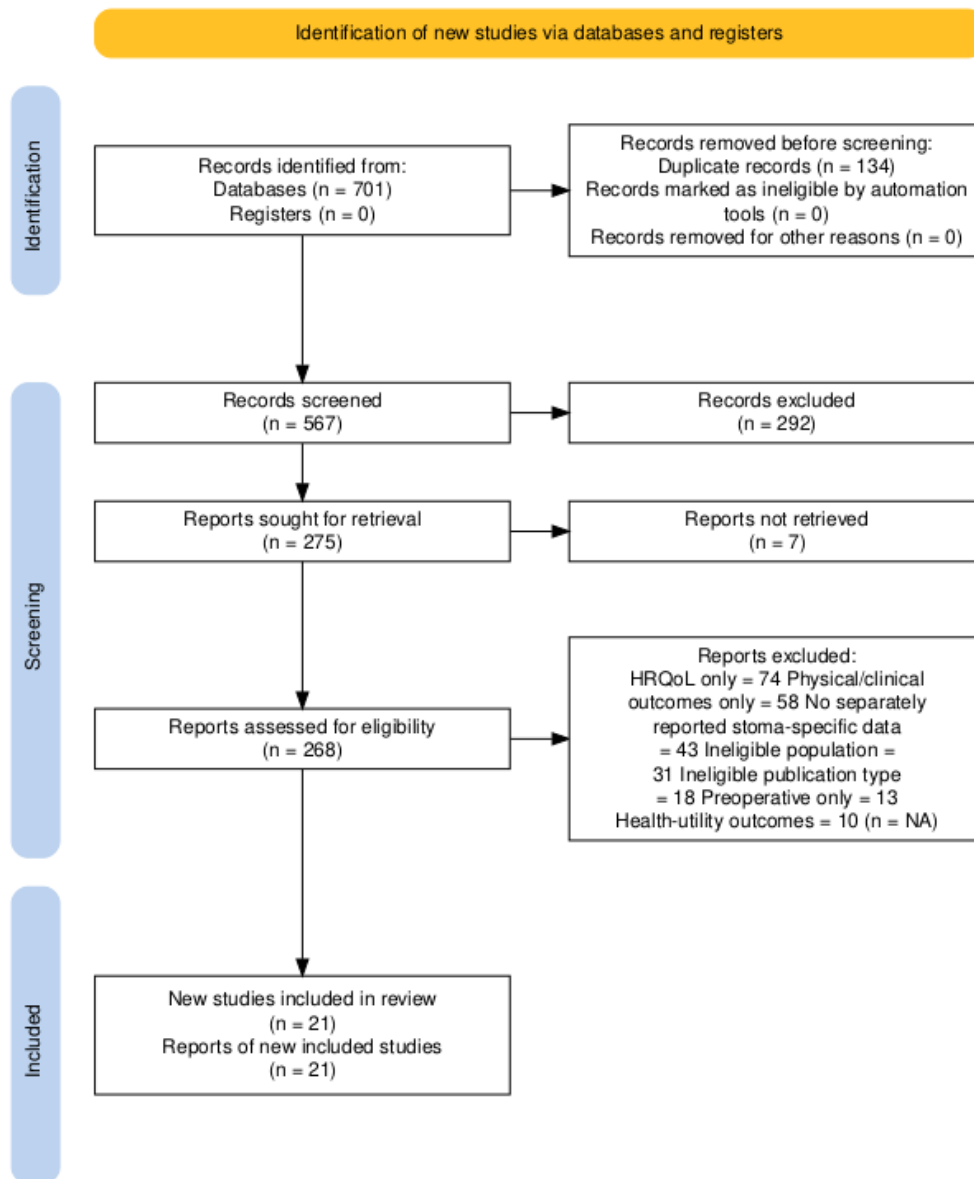
Limiters applied: Peer Reviewed Journal; English Language; Methodology: Empirical Study

Records retrieved: 23

Total records retrieved across all databases: 701

Appendix B

PRISMA



Appendix C

Risk of Bias Assessment

Table C1. JBI critical appraisal of analytical cross-sectional studies

Key: Y = Yes; N = No; U = Unclear

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Xian et al. (2018)	Y	Y	U	Y	Y	Y	Y	Y
Doucette et al. (2023)	Y	Y	U	Y	Y	Y	Y	Y
Özden & Kılıç (2023)	Y	Y	Y	Y	U	N	Y	Y
Rafiei et al. (2017)	Y	Y	Y	Y	U	N	Y	Y
Simmons et al. (2011)	Y	Y	Y	Y	Y	Y	Y	Y
Simmons et al. (2007)	Y	Y	Y	Y	Y	Y	Y	Y
Dellafore et al. (2022)	Y	Y	Y	Y	Y	Y	Y	Y
Yuan et al. (2018)	Y	Y	U	Y	Y	Y	Y	Y
Zhang et al. (2026)	Y	Y	Y	Y	Y	Y	Y	Y
Park et al. (2018)	Y	Y	U	Y	U	U	Y	Y
Zhang Y et al. (2019)	Y	Y	Y	Y	Y	Y	Y	Y
Tian et al. (2026)	Y	Y	Y	Y	Y	Y	Y	Y
Krouse et al. (2009)	Y	Y	Y	Y	Y	Y	Y	Y
Nasiriziba et al. (2020)	Y	Y	Y	Y	U	N	Y	Y

Item	Criterion
Q1	Were the criteria for inclusion in the sample clearly defined?

Q2	Were the study subjects and setting described in detail?
Q3	Was the exposure measured in a valid and reliable way?
Q4	Were objective, standard criteria used for measurement of the condition?
Q5	Were confounding factors identified?
Q6	Were strategies to deal with confounding factors stated?
Q7	Were the outcomes measured in a valid and reliable way?
Q8	Was appropriate statistical analysis used?

Table C2. JBI critical appraisal of cohort/longitudinal studies

Key: Y = Yes; N = No; U = Unclear; N/A = Not applicable

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Xu et al. (2023)	Y	Y	Y	Y	Y	U	Y	U	U	N	Y
Jin et al. (2019)	N/A	N/A	Y	Y	Y	N	Y	Y	Y	N	Y
Lau et al. (2025)	Y	Y	Y	Y	Y	N/A	Y	Y	N	U	Y

Note. Jin et al. (2019) used a single-group longitudinal design; therefore, Q1 and Q2 were not applicable.

Item	Criterion
Q1	Were the two groups similar and recruited from the same population?
Q2	Were the exposures measured similarly to assign people to exposed and unexposed groups?

Q3	Was the exposure measured in a valid and reliable way?
Q4	Were confounding factors identified?
Q5	Were strategies to deal with confounding factors stated?
Q6	Were the participants free of the outcome at the start of the study?
Q7	Were the outcomes measured in a valid and reliable way?
Q8	Was follow-up time reported and sufficient for the outcomes to occur?
Q9	Was follow-up complete and, if not, were reasons for loss to follow-up described and explored?
Q10	Were strategies to address incomplete follow-up utilised?
Q11	Was appropriate statistical analysis used?

Table C3. JBI critical appraisal of qualitative studies

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Smith et al. (2017)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Villa et al. (2018)	Y	Y	Y	Y	Y	U	U	Y	Y	Y
Son & Kang (2021)	U	Y	Y	Y	Y	N	U	Y	Y	Y
Whiteley et al. (2025)	U	Y	Y	Y	Y	U	Y	Y	Y	Y

Item	Criterion
Q1	Is there congruity between the stated philosophical perspective and the research methodology?
Q2	Is there congruity between the research methodology and the research question or objectives?
Q3	Is there congruity between the research methodology and the methods used to collect data?
Q4	Is there congruity between the research methodology and the representation and analysis of data?
Q5	Is there congruity between the research methodology and the interpretation of results?
Q6	Is there a statement locating the researcher culturally or theoretically?
Q7	Is the influence of the researcher on the research, and vice versa, addressed?
Q8	Are participants and their voices adequately represented?
Q9	Is the research ethical according to current criteria, with evidence of ethical approval?
Q10	Do the conclusions flow from the analysis or interpretation of the data?