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Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

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ABSTRACT

Objectives: Limited social connectedness in older adults is a risk factor for poor physical and mental health. Older adults who are socially isolated, lonely and disconnected have a higher risk of chronic illness, depression and premature death. Current literature suggests that improved social connectedness reduces these risks. Intergenerational programs are an effective way to improve health outcomes. Despite this, there is yet to be a review using realist review methods that seeks to identify the circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents.

Method: A realist review methodology was chosen to account for the complexity of intergenerational interventions. Nine studies were included. In line with realist review methodology, iterative data extraction and analysis was conducted to identify the specific contexts, mechanisms, and outcomes of the programs. Specific circumstances were identified to develop theories relating to improved social connectedness in older adults.

Results: The nine included studies were set in different contexts, including community organisations, schools and aged care facilities and used an array of interventions including reminiscence therapy, craft, or space for conversation. Despite study heterogeneity, the parallels in psychosocial development between older adults and adolescents were shown to be a likely driver for improved social health outcomes. Programs most likely to improve social health outcomes were those that acknowledged psychosocial development, were delivered in community settings, leveraged pedagogic frameworks, used trained facilitators, and supported participants to build relationships through shared purpose.

Conclusions: This review contributes a logic model to support the design and development of intergenerational programs involving adolescents to improve social connectedness in older adults. Future research to test the logic model in practice is needed.

Strengths and limitations of this study

- This is the first realist review to investigate the circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents
- Comprehensive searches were undertaken with the aim of identifying all relevant published and grey literature.
- A logic model has been developed to support the design and development of intergenerational programs involving adolescents to improve social connectedness in older adults.
- The evidence base is limited for participants living in rural locations and participants with cognitive impairment.

INTRODUCTION

Limited social connectedness is a risk for poor health and wellbeing in older adults[1-4]. Older adults (over 65 years) are at particular risk of social disconnectedness and loneliness because of frailty and chronic illness, which may limit opportunities for social interaction[5, 6]. In addition, modern society has altered family structures, geographically dispersed the family unit and made maintaining intergenerational and family connections challenging, adding to social health vulnerability in older people[7-10]. Many older adults move into residential aged care facilities, away from familiar community supports, often following a medical incident[11].

Social disconnectedness, loneliness and social isolation can be as damaging to health and wellbeing as smoking and obesity[4, 7, 12, 13]. Poor health due to acute or chronic conditions, cognitive decline or frailty influences an older person's ability to carry out personal, domestic, social or community activities and in turn increases their risk of social disconnectedness[1, 14, 15]. Older adults who remain socially connected without episodes of isolation or loneliness have lower rates of mental and chronic illnesses such as depression and cardiovascular disease[7, 11, 12, 16, 17].

Support for older adults, particularly post retirement or when faced with cognitive or physical impairment, is essential in maintaining individual social identity and social connectedness with family, friends and the community[4, 12]. The World Health Organization has challenged communities to provide age friendly communities. This global movement is demonstrating the power of building social capital and engaging older adults through community programs and social and environmental infrastructure to support community access[18]. Intergenerational programs have emerged as a popular and beneficial option for bolstering community connections and improving the health and wellbeing of older people[12, 19, 20].

Intergenerational programs are programs where two generations experience mutual benefit through shared experiences[19, 21] and are a known mechanism for improving social connectedness[19] and providing a sense of inclusion and empowerment in older adults[22]. Intergenerational programs bring together and benefit both generational groups[22-26] and have been adopted in a variety of contexts and age groups. These include the use of pedagogic frameworks with school age children[22], service learning interventions with university students[27, 28] and in familial groups[25].

Intergenerational programs involving older adults and preschool or young children have been widely reported[15, 21, 22, 28], however those that pair adolescents (individuals aged 13-19) and older adults are less known[29]. Pairing older adults and adolescents through intergenerational

programs is modelled on Erikson's theory of psychosocial development[30, 31]. According to Erikson's theory, adolescents and older adults are both facing a period in their psychosocial development focused on identity. Adolescents, emerging from childhood are looking to their peers to 'fit in' and to understand society through the eyes of others. Older adults, particularly the recently retired, are trying to maintain their identity, with a desire to contribute to society[32]. This motivation to pass on wisdom to the next generation is termed generativity[30, 31] and is important for the wellbeing of older adults as well as broader social health[4]. Intergenerational interactions through family or a formal program support the development of generativity[30, 31, 33]. The likely benefits of this generational pairing in an intergenerational program context are yet to be reviewed in depth.

This realist review aims to identify the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. The question underpinning the review is – which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescents.

METHODOLOGY

A realist review methodology was undertaken in line with the RAMESES publication standards[34]. Realist review provides a framework for understanding complex interventions and *why* they deliver the outcomes they do[35]. A protocol for the review was developed following the stages outlined by Pawson[36] and included (1) locating existing theories, (2) searching for evidence, (3) selecting articles, (4) extracting and organising data, and (5) synthesising the evidence and drawing conclusions.

A realist review is an approach used for systematic evidence review that utilises secondary data to understand the reasons why a particular set of contexts, mechanisms and outcomes lead to a particular result. Contexts are the circumstances in which the program is delivered and how these interact with the program mechanisms. Mechanisms are the program resources, and the way participants interact with them. The result of context and mechanism interaction is what drives a particular outcome to occur. Realist review utilises generative understanding to iteratively build *a priori* theories that are then tested and refined. The *a priori* theories are initially drawn from available literature and through stakeholder consultation. Realist review uses the lenses of context, mechanism and outcome to appraise, synthesise and then test the recommendations that are constructed through the analysis process[34, 35].

Step one: a priori theory development

The development of *a priori* theories was an iterative, two-part process[34, 35, 37] and was undertaken by JS and DA. This included stakeholder engagement and a detailed search of the peer-reviewed and grey literature on the subject, followed by *a priori* theory development that were tested against the literature and information from initial stakeholder meetings. Search terms and strategy can be found in Box 1.

Patient and public involvement

No patients or members of the public were involved in this research.

Stakeholder engagement

The idea for this review came from a collaboration involving the authors, a municipality in regional Victoria, Australia, and a high school located within that municipality. Originally, the collaboration was centred on the development and evaluation of a pilot intergenerational digital literacy program involving adolescent school pupils and older community-dwelling individuals. However, during the initial stages of designing the program, the authors identified there was an absence of review-level evidence regarding intergenerational programs involving adolescents and older people. A decision was made to undertake a realist review on this topic. Municipal and high school

collaborator stakeholders were involved in the process of generating *a priori* theories by contributing information on the need and opportunity for intergenerational programs in the school environment.

Box 1: Search terms and search strategy

A literature search was undertaken between May and July 2019 by JS and DA. An updated search was completed in June 2020.

Databases

MEDLINE, PsychINFO, CINAHL were searched using English language limitation. Google Scholar was used to supplement the search using a simplified search terms list.

Grey literature was accessed via websites, including relevant government and non-government websites including Australian Federal and State Government agencies, Not-for profits and the World Health Organization. Reference list searching was also used.

Search terms

Search terms included; (Aged OR "older adult" OR senior OR elder* OR geriatric OR "old* person*") AND ("intergenerational relation*" OR "intergenerational program*" OR "intergenerational activit*" OR "intergenerational practice" OR "intergenerational learning" OR "intergenerational service learning" OR “intergenerational relations” OR intergenerational) AND ("social connect*" OR "social isolation" OR "social interact*" OR loneliness OR "social participation") AND (“adolescent”)

Study selection

The inclusion and exclusion criteria (Table 1) were applied by JS and DA to ensure the included studies met the aim of the review. Included participants were aged 65 and over (older adults) and between 13 and 19 years (adolescents) as these age ranges are agreed as defining older adults and adolescents[30].

Table 1: Inclusion and Exclusion criteria

Included	Excluded
Study reporting on intergenerational programs. Study can be quantitative, qualitative or mixed-methods	Reported on non-intergenerational programs
Participants from non-familial generations	Studies involving the study of grandparents / grandparenting or family intergenerational relationships
Aged 13-19	Aged <13
Aged 65 and above	Aged 20-64
Published 2000-2020	Published before 2000
Published in English	Not published in English

a priori theory development

JS and DA developed six *a priori* theories and tested these against the literature before conducting a final literature search to check for new evidence.

Step two: data extraction and evidence synthesis

In step two, data extraction and evidence synthesis from the nine included studies was undertaken.

Data extraction

A bespoke data extraction form (supplementary file 1) was developed by DA and JS and included the *a priori* theories identified in step one. The data extraction form covered several domains including bibliographic information, aims and methods, participant details, intervention details, results and findings. The form also provided for *a priori* theory testing including extraction of evidence that proved, disproved or refined the theory. The data extraction process was completed by JS and DA.

Quality appraisal

A realist review method supports the inclusion of qualitative, quantitative and mixed methods studies[34, 38]. To understand the quality of included articles, we consulted critical appraisal

literature[39, 40]. A bespoke set of eight quality assessment criteria were developed focusing on the methodological quality and reporting quality of the included studies (supplementary file 2).

Synthesis

All authors were involved in the evidence synthesis process using extracted data to illuminate the contexts, mechanisms and outcomes that underpinned reviewed programs. The process then involved identifying evidence combinations and testing them against the *a priori* theories to develop context mechanism outcome configurations (CMOC). The development of the CMOC presented a variety of emergent issues that were continually tested against the *a priori* theories and the known evidence. This process identified new theories and the CMOC were further refined. Ethics approval was not required for this study.

RESULTS

Data from the included studies were synthesised to generate eight theories relating to characteristics of intergenerational programs likely to optimise social connectedness for older adults. The components of these theories are combined to form context mechanism outcome configurations (CMOC) and a logic model to support answering the question – which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescents? Figure 1 below provides the results of the literature search. Nine studies were included in the review.

***Insert here_Figure 1: Flow Diagram**

Table 2: Included study characteristics

Included Study	Study details	Study aim	Sample characteristics	Summary of findings	Use of a facilitator	Pre-program training	Data collection and analysis
de Souza[41]	Qualitative; School (Brazil); Older adult participants shared life experiences with students in a classroom environment.	Intergenerational program evaluation from participant viewpoint.	84 randomly selected students; Age 13-19 years; 26 older people; Age 60 years +; Male and female groups.	The intergenerational activity based on reminiscence improved social interaction and community wellbeing for older adults.	Unclear	No	Focus group interviews followed by thematic analysis
Kessler and Staudinger[33]	Quantitative; Laboratory (Germany); Interaction between an Older Person and Younger Person, Two Older People or Two Younger people addressing a "life problem" or a "media problem".	To understand if intergenerational interactions have the potential to facilitate psychological functioning in both adolescent and old age.	Older women aged 70-74 n=90 and girls aged 14-15 n=90	Improved cognitive performance, reduced negative age-related stereotypes and triggered generative behaviours.	No	No	Data collected by a series of survey, psychometric and cognitive tests. Analysis completed using planned comparisons
Hernandez and Gonzalez[42]	Quantitative; Local council social centre (Spain); Weekly recreational activities (talks, excursions, cultural events). 32 interactive session "movement program".	To investigate the effect of an intergenerational program on stereotyped attitudes towards elderly people and the wellbeing of older adults.	101 elderly people; across two groups, age M= 74 (SD=7.7) and M=75 (SD= 5.21); 179 university students; Age M=19 (SD= 0.93); Both male and female participants.	Improved outcomes in depression measures in older adults who participated in an intergenerational exercise group.	Yes	Yes – adolescents only	Pre and post sessions that included questionnaires and geriatric depression scale. Analysis via repeated measure analysis of variance (ANOVA)
Wilson, Cordier[43]	Qualitative; Men's shed (Australia); 10 week intergenerational mentoring program over with older male mentors offering support to younger at risk males	To explore the experiences and perceptions of mentors involved in an occupation skill focussed program with teenage boys.	9 teenage boys; Age ~15 years; 6 older male mentors; Age 60-75; a project facilitator and a; youth worker. All participants were male.	Intergenerational programs involving older adults with a strong sense of generativity were shown to be a valuable resource to communities.	Yes	Yes- both groups	Pre and post Individual interviews and focus groups with both groups however only reported on data from older adult participants using constant comparative method of grounded theory

Biggs and Knox[44]	Qualitative; Residential care/ assisted living (USA (Texas)); Girl scout meetings held in assisted living facility	To identify impact of an intergenerational program for girl scouts (young people) and residents (older people) on quality of life, social interaction and personal attitudes.	Focus groups comprised of parents = 8, residents = 5, staff = 10, children (scouts and daisies) 5-12 years = 9; Content essay participants ages 6-16: n= 18; All participants female.	Intergenerational programs using social workers and community volunteers strengthened intergenerational relationships.	Yes	No	Focus group interviews with both groups and submitted essays from the younger participants followed by hematic analysis
Knight, Skouteris[31]	Mixed Methods; Residential aged care setting (Australia); Development of a life story review book by adolescent students partnered with an older adult.	To pilot and test the feasibility of an intergenerational program "My Life Story".	Adolescents n= 24; Age M= 14.56 (SD=0.5); Older adults n= 12; Age M=90.58 (SD=3.59); Gender of participants not stated	Improved social connectedness and community engagement resulted from an intergenerational program using reminiscence.	Yes	Yes- both groups	Qualitative data collected (post) using semi-structured interviews and quantitative data collected (pre and post) using a series of items followed by thematic analysis and paired t-tests.
Ostensen, Gjevjon[11]	Qualitative; Residential care facility or private home (Norway) Sessions over a 12-month period with volunteer adolescents supporting older adults to learn use of a tablet device.	To explore a new model of care that supports older people to participate by introducing technology and mobilising volunteer services.	Older adults n= 15 (5 withdrew due to illness, death and hospitalisation); Adolescents n=not stated; Age 54-94 years; Both male and female participants.	Reduction in anxiety and increase in social activity for older adults followed an intergenerational program supporting older adults to use an iPad.	Yes	Yes- adolescents only	Individual semi structured interviews repeated over a 12 month period with the older adults only followed by thematic analysis
Santini, Tombolesi[45]	Qualitative; Residential aged care facility (Italy); Intergenerational activity based meetings with aged care residents, older adult community volunteers and adolescents.	To understand if creating community space and planning activities where adolescents, older adults, and active older volunteers meet and interact will improve health outcomes for older adults.	14-year-old students n=25 (18 males and 7 females) and three teachers; 16 older residents; Age M=83; three social workers; 16 older volunteers; Age M=70	The intergenerational program improved the wellbeing of institutionalised older adults.	Yes	Yes- both groups	Individual and focus groups Interviews with students; individual interview with older adults; focus groups with volunteers before, during and after the intervention followed by content analysis
Wilson, Cordier[29]	Mixed methods; Men's shed (Australia); Intergenerational mentoring program with older adults and young adults with intellectual disability.	To examine the feasibility of a novel Men's Shed intergenerational mentoring intervention for young adults with intellectual disability.	5 mentees (average age 16); Older adult mentors n=12; Age M=69.5 (SD=8.53); All participants were male.	Intergenerational mentoring interventions for youth with intellectual disability at community Men's Sheds were shown to be feasible and appropriate.	Yes	Yes- older adults only	Quantitative data via pre-and post-intervention outcome measures and descriptive data of mentees' functional skills. Qualitative data collected at end of project via individual interviews with mentees and mentors. Used realist evaluation method

The characteristics of the included studies are provided in Table 2. In phase two of the review, data was analysed to 1) confirm the degree to which the a priori theories identified in phase one (see Table 3) were supported and 2) generate the contexts, mechanisms and outcomes from the included interventions.

Quality Assessment

In line with recommendations for realist reviews[36] no studies were excluded following quality assessment, rather each study was ultimately assessed for its contribution to theory development and context mechanism outcome configurations. The quality assessment of each included study concluded with an overall estimate of how valuable the study was to the review (Low, Medium or High), a criterion based on Question 10 of the Critical Appraisal Skills Programme qualitative quality assessment tool[46]. The assessment concluded that majority of studies (7/9) were found to be of high value to the review[11, 29, 31, 33, 41, 43, 45]. These studies were rated as highly valuable due to the age range of participants fitting directly with the aims of this review and because they reported on intergenerational programs in detail and provided ample evidence to support their findings, facilitating the analytical process for this review. The Biggs et al.[47] and Hernandez and Gomez[42] studies were rated as being of medium value to the review. Biggs et al.[47] was assessed as lacking on detail with regard to the reporting of the findings, whereas Hernandez and Gomez[42] had limited age group relevance to the review aims as the younger age group had an average age of 19.

Table 3: *a priori* theories identified after step one

Intergenerational programs involving adolescents and older adults improve social connectedness in the older adult group.
Intergenerational programs conducted in educational contexts result in positive outcomes in social connectedness for one/both groups.
Because they are at a similar point in psychosocial development, adolescents and older people are likely to be mutual beneficiaries of intergenerational programs.
Intergenerational programs help support meaningful connections for older people who may be socially disconnected within the community, with individuals outside of their normal age and social demographic.
Greater generativity is formed through participation in intergenerational programs.
Intergenerational programs conducted in educational contexts build community connections between generations and across structural community assets like schools.

When coupled with the *a priori* theories generated from phase one, context mechanism outcome configurations (CMOC) were developed. The CMOC are eight circumstances deemed

optimal for the delivery of intergenerational programs involving older adults and adolescents and are hypothesised to improve outcomes in social connectedness. These are summarised in Table 4 below.

Table 4: Summary of Context Mechanism Outcome Configurations

CMOC label and summary-level description	References of included studies
CMOC 1 Understand the participants psychosocial development phase and attitudes towards each other to foster generativity Adolescents and older adults are at a similar crossroads in the formation and maintenance of their identity[30] (context). Understanding the developmental phase and held attitudes of the participants (context) supports the design of program training activities (mechanism) and 'ice breakers' (mechanisms) that foster reciprocity (mechanism) and are more likely to trigger generativity (outcome) between the generational groups and improve social connectedness (outcome).	**All included studies**
CMOC 2 Use a pedagogic framework to trigger generativity, intercommunity connections and deliver social health outcomes Pedagogic frameworks (context) motivate the adolescent to participate in intergenerational programs and achieve a result[31, 41, 44]. Similarly, the older adult is motivated to transfer skills and wisdom and provide support to the adolescent so as they can achieve their goal (mechanism). As a result, social connectedness and attitudes (outcomes) towards the other generational group improve.	**All included studies**
CMOC 3 Design the program to be frequent and have a clear structure to support participation and improved social connectedness Pedagogic frameworks (context) provide structure. Programs that are co-designed and scheduled frequently allow relationships to form through shared goals and activities (mechanisms). Frequent and carefully structured programs allow for improved social connectedness, and sustainable health and community benefits (outcomes).	**All included studies**
CMOC 4 Conduct the program in community settings to support social health outcomes and build social capital Community settings including educational institutions, care homes or existing community groups provide a foundation for engagement (context) when delivering intergenerational programs. Programs that showed a strong connection to the community through their facilitators (mechanism) or the physical environment (mechanism) showed improved sustainability and generalisability for the participants and the broader social capital of the community (outcome).	**[11, 29, 31, 41-43, 45]**
CMOC 5 Deliver pre-program training and support participants to 'break the ice' Utilising existing community settings and knowledge of psychosocial development, (contexts), pre-program training (mechanism) and activities that support participants to connect on a more informal level (mechanism) work together to bridge gaps between the generations (outcome).	**[11, 29, 31, 41-43, 45]**
CMOC 6 Identify shared goals between program participants to build reciprocity and support program engagement Through use of pedagogic frameworks and existing community links (contexts), the identification of shared goals builds reciprocity (mechanism) between the participants and in turn may trigger benefits including a greater sense of generativity (outcome), improved wellbeing (outcome) and social connectedness (outcome).	**[11, 29, 31, 41-43, 45]**
CMOC 7 Include a trained facilitator to promote program participation In a variety of contexts, the inclusion of a program facilitator (mechanism) may support improved social connectedness (outcome). The other key function of a facilitator is to ensure that the	**[29, 31, 41-43, 45]**

participants have had the opportunity to 'break the ice' (mechanism) through pre-program training and informal opportunities such as morning tea times.	
CMOC 8 Plan inclusive activities that trigger generativity and improve physical, cognitive, psychological and social outcomes When programs use existing community connections, include relationship-based activities with a shared goal (mechanisms) and are grounded in a pedagogic framework (contexts), there is improvement in health and social wellbeing (outcome) and a sense of generativity for the older adult group (outcome).	**[11, 29, 31, 33, 41-43, 45]**

CMOC 1 Understand the participant's psychosocial development phase and attitudes towards each other to foster generativity and connection

In the included studies, pre-program psychometric measurement[29, 31, 33, 42], focus groups or interviews[43] and informal gatherings at the beginning of the program[11, 29, 31, 42, 43, 45] were used to understand the demographic and psychosocial characteristics of participants. Psychometric scales that measured attitudes towards ageing, social connectedness, loneliness, generativity and presence of depression were completed pre and post intervention[29, 31, 33, 42]. Pre-program focus groups and interviews were used with both groups[29, 43, 45] to understand participant skills and motivations. This information was used to align participants based on skills and expectations, understand participant relationships with other generations, their attitudes towards ageing and their perceptions of self[45]. Understanding baseline attitudes helped structure programs to promote alternate views of an older person's capability, foster dialogue and enhance learning between generations.

Evidence from the included studies indicates that using pre-program measures to understand participant demographics, including their psychosocial phase and cognitive and physical abilities leads to a more likely match in participant capability and outcomes that improve social connectedness and generativity.

CMOC 2 Use a pedagogic framework to trigger generativity, intercommunity connections and deliver social health outcomes

Pedagogic or service-learning frameworks support participants to learn together in a real-world context[5, 48] and featured in six of the included studies[29, 31, 42-45]. Studies that involved school students were aged between 13-19 years with 15 years the average age across studies[29, 31, 41, 43, 45]. Two studies[31, 45] involved students completing a report or a community presentation, whilst others involved students completing a small woodwork project[29, 43]. These tasks were curriculum linked[31], motivating adolescent participants to complete the task. Older adults reported they felt needed when they were contributing to adolescent's learning and acknowledged the adolescent's contribution to their own learning - *"they can teach us the computer and their new language"[45]*

Through the use of a pedagogic framework, results showed improved understanding and respect for the other generation[43, 44] and older adults gained a sense of pride in being able to pass on their knowledge and wisdom. These findings provide evidence that in pedagogic contexts, where reciprocity is formed, it is likely that an improvement in perceived social connectedness and wellbeing will occur for the older adult.

CMOC 3 Design the program to be frequent and have a clear structure to support participation and improved social connectedness

Frequency and duration of sessions

Programs that used a pedagogic framework were usually linked to a school term or semester[29, 41-43, 45]. These programs ranged from six to twelve - week blocks, often repeating over school terms. Programs that were held weekly[11, 29, 31, 42, 43], fortnightly[41, 45] or bi-monthly[44]. Biggs and Knox[44] reported less frequent sessions were chosen to avoid overwhelming the participants, compared to other participants who requested more frequent and extended program sessions so they could spend more time together[29, 41, 43, 45].

Structure of sessions

A clear program structure that included pre-training and time for "breaking the ice"[29, 43] was reported as beneficial. Typically, studies used the session to engage and introduce participants or complete training and the following weeks to cover different topics or questions relating to the aim of the study. In the Ostensen[11] study, older adults raised learning goals that formed the structure for the week ahead. Overall, evidence suggests that having a structured program that allows frequent interaction between generational participants is more likely to result in improved social connectedness and optimised health and wellbeing.

CMOC 4 Conduct the program in community settings to support social health outcomes and build social capital

Intergenerational programs that occur in community settings provide a platform for building social capital[4, 9, 26]. Four studies conducted programs in residential care facilities using existing community connections[11, 31, 44, 45] and two others[29, 42, 43] leveraged local community programs. Evidence suggested that community-based programs had greater potential in enhancing social health outcomes for older adults and generating social capital in the broader community. In the Biggs and Knox[44] study, older adult participants began attending church with the families of the adolescents, demonstrating connections beyond the program. Similar results were reported in the de Souza[41] study with older participants reflecting improved mood, physical wellbeing and a '*feeling of freedom*' (*p. 467)*, through their opportunities to get out of the facility and spend time with the adolescents in the community. The location, existing relationships between community organisations and activities that support participants to observe the other

generation playing a role in the community are all positive predictors of a likely improvement in individual and community social connectedness and wellbeing.

CMOC 5 Deliver pre-program training and support participants to 'break the ice'

Pre-program training was provided in six of the nine included studies. Training was offered to older adults and the adolescents[29, 31, 45], to older adults only[29] or to adolescents only[11, 42]. Training included program orientation or the opportunity to learn about the other generation.

Where training was provided to both the adolescents and older adults, this appeared to foster social connections. For example, the adolescents shook the hands of the older gentleman at the beginning and end of each session. This positive social behaviour was felt by the older men to be respectful and demonstrated social connectedness between the groups[43]. However, in the Santini[45] study, despite the pre-program introductory material, students reported that they required support from teachers and older adult volunteers to overcome their emotions when they met with the older adults for the first time.

The Wilson et al[29] program provided training to the older adult mentors only. This training provided the mentors with disability awareness training via videos. Despite this, it was highlighted by the older adults that they would have liked to have been more prepared for working with the adolescents with intellectual disability. Two studies provided training to adolescents only[11, 42] however did not report on the impact of this training.

In studies where no formal pre-program training was provided, results were mixed in relation to the impact on the program. In the Kessler and Staudinger[33] study, the randomised control trial methodology required pre-program blinding. In the Biggs and Knox[44] study, the participants were already involved in an existing Scouts program, so it is assumed that pre-program education was included in Scout club activities, however, this was not reported by the authors. Parents of the adolescents in the Biggs and Knox[44] raised concern about their children's reactions to residents with dementia or if a resident died. There were also reports from the residents and parents that boundaries and behaviours were not respected by the adolescent participants. These examples indicate a role for pre-program training to reduce fears and provide education. Where training or opportunities to interact were sub-optimal or missing, participants highlighted limited opportunities to 'get to know' each other or feel prepared for the program[29, 41]. If comfort or confidence in the program is not established, participants may not participate[41] or be reluctant to participate again[29]. This has broader implications for the sustainability of program outcomes, particularly those that aim to enhance social capital or galvanise links between community groups.

CMOC 6 Identify shared goals between program participants to build reciprocity and support program engagement

By understanding the shared aims of participants, reciprocity is nurtured, participants are more motivated and generativity is triggered. Where participants were involved in program design[42, 45] as well as iteratively throughout the course of the program[11, 44] the program was more person centred, enhanced reciprocal behaviours and improved outcomes.

The Santini[45] study used an action participatory research approach with active older adult volunteers, social workers and teachers and Hernandez and Gonzalez[42] used a co-design approach through adolescent students designing an exercise program for older adults that was delivered with support from lecturers and trained facilitators over 32 sessions. Both generations benefited in these programs, with results indicating a positive shift in age related stereotypes when older adults and adolescents interacted as part of the program.

In programs where there was a shared goal from the outset there was greater improvement in social connectedness[29, 31, 43, 44], reduced markers for depression[42] and stereotypical attitudes towards the older generation[44]. The included studies demonstrate that creating reciprocity drives generative behaviour. Reciprocity and generativity combined leads to improved social connectedness and health and wellbeing outcomes for the individual and the community broadly.

CMOC 7 Include a trained facilitator to promote participation

Facilitation is the act of supporting and enabling a group to meet its objectives (and release its full potential) by fostering conditions that respects and encourages contributions by all members of the group[49]. Facilitation was used in seven of the included studies. The facilitators were trained professionals including teachers[31, 45], university staff[42], fitness instructors[42], health professionals[11, 29, 44], community leaders[44] and youth workers[43]. In the Santini[45] study, active older volunteers also played a facilitation role. Studies that included a facilitator resulted in greater participant interaction and improved program outcomes[29, 43, 45]. In the Wilson et al study, the youth worker that facilitated the program was described as responsible for *"keeping us on track"*[43] and was pivotal in prompting participation between the groups, for example at afternoon tea breaks.

In the study involving girl Scout groups[44], the troop leaders were trained social workers. Whilst their individual experiences were not reported in the findings, the role they played in bringing together individuals connected to existing community settings in girl Scouts, residential aged care and volunteer groups was fundamental in the program longevity and results. In four studies, active adult[29, 43, 45] and adolescent[11] volunteers were recruited from local community volunteer

groups and provided additional program facilitation support that likely enhanced positive outcomes in community engagement and social connectedness.

Conversely, in studies where the facilitation was reported as being sub-optimal[29] or absent[41], the participants and the authors highlighted that greater support from the teachers, researchers or 'monitors' would have enhanced interactions between the generational groups. If facilitation is absent or lacking, participants may feel frustrated or unsupported, in turn causing participant disengagement, attrition or an unintended triggering of age-based stereotypes or perceived loneliness[45]. Trained facilitation supports improved connectedness between participants and when delivered within community and pedagogic contexts, favourable outcomes in generativity, social connectedness, and social capital.

CMOC 8 Plan inclusive activities that trigger generativity and improve physical, cognitive, psychosocial, and social outcomes

Included studies reported on programs that provided relationship-based inclusion[31, 41, 44, 45] and activity-based inclusion[11, 29, 42, 43] opportunities for participants.

Relationship-based inclusion:

If there is limited opportunity for relationship-based inclusion, adolescents and older adults are at risk of not experiencing meaningful social connection[31]. Feeling included by peers and the broader community promotes generativity and in turn improves wellbeing in both age groups[23, 31]. Several programs[31, 41, 44, 45] used relationship- based inclusion activities such as reminiscence (sharing old photos or learning about what jobs older people used to do) to create reciprocity between older adults and adolescents. This was also a mechanism to improve physical, cognitive, and psychological health, and in turn social connectedness. A marker of sustained relationships was demonstrated by the adolescents continuing to connect with older adults after the program[31, 45], including volunteering at a local community organisation with older people.

Activity-based inclusion:

Studies that used activity-based inclusion such as exercise programs[42], digital literacy training with an iPad[11] or woodwork construction[29, 43] also reported improved outcomes in physical, cognitive, psychological and social domains, including social connectedness. In the studies set in Men's Shed's the young adults were mentored by the older men in occupational activities, with both groups reporting the activities provided the opportunity to connect, whilst learning new skills and doing *"something with our hands"[43].* Young adults with intellectual disability commented that the Men's Shed was a unique learning environment - *"they made me feel like part of the group"* and that they *"felt accepted"*[29]. Older adults supported to use a

tablet device[11] demonstrated improved social outcomes as they were able to connect with family in other locations or the outside community through news applications or by tracking weather. Nurses in the care facility reported a change in social behaviour in the participants using iPads, taking more initiative, presenting as less anxious and being more socially active. In the Hernandez and Gonzalez[42] study, the interaction between adolescents and older people showed statistically significant improvement in depression scores and stereotypical attitudes in the older adult group. A comparison group led by the adult trainer resulted in a less significant change in depression scores in the older adults (Group 1 with adolescents= $p<.001$; Group 2 led by adult trainer = $p<.008$). The control group (who attended the local social centre but did not interact with the adolescents or participate in exercise sessions) showed a statistically significant increase in depressive symptoms ($p<.001$). The evidence supports activities that provide the participating generations with the opportunity to share time, reminisce and develop relationships are powerful mechanisms for triggering generativity and social connectedness.

Logic model

The aim of this review is to identify the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. The logic model below represents the relationships between program activities and improved social connectedness for older adults. As demonstrated through the CMOC, the act of two generations coming together in familiar community-based contexts with a shared purpose, resulted in strengthened relationships and community connections. This notion of coming together around a task, or activity is not dissimilar to sharing a meal or celebrating an occasion; something which is entwined in human history and behaviour, and indeed punctuates our psychosocial development. Several participants in the included studies spoke about the benefit of having an opportunity to 'meet and greet' or to share an afternoon tea as part of the program[29, 31, 43-45].

This logic model (presented in Figure 2 below) uses a layered cake to represent an optimal intergenerational program to improve social connectedness in older adults. It is positioned on a plate (context), with each layer of cake representing the mechanisms that 'glue' the cake together and result in optimised social connectedness. The program outcomes are represented by the candles atop the cake, which would not light up without the strong foundations of contexts and mechanisms. Complex program design and baking a cake both require a variety of conditions and methods to achieve the desired outcome.

***Insert here_Figure 2: Logic model**

DISCUSSION

Evidence from the included studies reveals how intergenerational programs involving adolescents can address issues of social disconnectedness in older adults. This review identifies how and why intergenerational programs work, for whom and in what circumstances. Broadly, the CMOC cover four main themes - 1) psychosocial and mental health, 2) physical and cognitive health, 3) program design and structure and 4) community engagement and social capital.

Psychosocial and mental health

Providing opportunities for older adults to participate, without being infantized or inequitably treated is highlighted by the included studies and others as a mechanism for improving reciprocity and generativity[20, 33, 50]. The opportunity to participate in an intergenerational program saw older adults improve their own self-image and stereotypical view of old age and prove to themselves that they still had something to offer the community and the younger generation[41, 42, 45]. Included programs that created opportunities for informal, relationship based activities which triggered generativity, for example promoting conversation between the generational groups, were of greatest benefit to psycho-social health[31, 41, 45].

Physical and cognitive health

The impact of intergenerational programs on broader health outcomes, including cognitive health has been previously reported[15, 51]. The connections between social, cognitive and physical health are well known, particularly in high risk populations like older adults[52-54]. In this review, interventions that promoted the older adult as wise or expert[29, 31, 33, 43, 44] showed improvement in both perceived and measured cognitive performance. Kessler and Staudinger[33] showed improvement in speed of processing and word fluency when older adults were paired with an adolescent and asked to solve a 'life problem'. Qualitative evidence from included studies reported improved physical health in older adults as a result of their involvement in the intergenerational program, including increased energy[29] reduced pain[45] and increased movement[41].

Program design and structure

A range of designs and structures are reported in the intergenerational program literature. Intergenerational programs embedded within pedagogic contexts are supported by existing literature[26, 55, 56] and were featured in many of the included studies. Several studies support the need for in depth, sustainable and accessible intergenerational programs to address social health issues[19, 57]. As highlighted by Cattan et al.,[58] programs that engage adults in the planning and design of the interaction are most effective. This was seen in the Ostensen[11] study and the Wilson et al.,[29] study that highlighted the use of co-design to optimise outcomes.

Martins et al.,[59] in a review of intergenrational programs also highlighted the benefit of weekly or fortnightly intergenerational meetings to create bonds between participants.

Several of the included studies highlighted the importance of informal and formal program structures to build a foundation for connection. Several interventions leveraged existing local community connections and pre – program training was shown to support participation[29, 41, 45]. However where complex demographics exist, additional program support may be required[29, 41, 45].

Community engagement and social capital

Programs set in the community that leveraged existing community connections were more likely to promote social connectedness. Individuals already engaged with the community in a volunteer capacity were participants, and in some cases facilitators of the program. Other reviews[21] support the inclusion of volunteers as it is a cost effective way to deliver programs and promote volunteerism- a key element for enhancing social capital. Volunteers were used in the included studies to support program delivery and participant recruitment via community organisations like Rotary or Scouts[11, 29, 43-45]. Adolescents also witnessed volunteer 'models' and were interested in volunteerism beyond the program[11, 31, 45].

Implications for practice and future research

This review has provided a logic model that is ready to use by clinicians, program managers and policy makers in the design and implementation of community based intergenerational interventions. This review has implications for targeting physical, social, and mental health in older adults, as well as exploring opportunities for the role of intergenerational programs in adolescent health. Furthermore, the program theory provides a suggested approach for designing programs with a broader system lens. Previous literature has also supported the use of intergenerational programs, in particular those with a social health focus, to counter loneliness[60], influence age related health outcomes[17] and reduce costs associated with increased care needs in older age[11, 61].

The review also provides support for the inclusion of intergenerational programs into the curriculum to influence adolescent career choices and to improve attitudes towards older people[31, 41, 45]. Included studies also called for intergenerational programs to be a "systematic component of care provision"[45] for older adults living in residential aged care, including additional resources, changes to models of care and staff training[11].

Future research where intergenerational interventions are 1) designed using the program theory as articulated within the logic model and 2) tested with stakeholders, may support further understanding what works for whom, and in what circumstances. Realist evaluation or other

published frameworks like the 6-SQUID model[62, 63] are methodological options for future projects. This style of participatory research generates community will and engagement and supports sustainability without major resource investment, as the community itself 'owns' and is committed to the intervention they have designed. Future research would also benefit from addressing the same theory in comparative or specific settings[35], such as in aged care settings or community groups like Men's sheds.

CONCLUSION

This review has identified the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. Findings have provided a logic model outlining how intergenerational programs involving adolescents are likely to improve social connectedness for older adults and builds on the evidence that social connectedness and social networks are protective for immunity, reduced depression rates and a reduced risk of frailty[16, 52, 64].

In addition to the psychosocial development theory, this review has uncovered the optimal circumstances that promote social connectedness for older adults. These include setting programs in the community, including a trained facilitator, leveraging a pedagogic framework and finding shared goals between participants. Structural elements such as pre-program training and frequency of sessions was shown to be important in delivering relationship bonds between older adults and adolescents, that trigger generative behaviours and greater perceived social connectedness. Intergenerational programs involving adolescents are a possible solution for enhancing social connectedness and health outcomes for older adults.

Authors' contributions

JS, HV and DA conceived of the project and contributed to the development of the manuscript. JS led the review, HV and DA were the co-reviewers. HV and DA supervised the work and provided guidance in the support of realist methodology. All authors read and approved the final manuscript.

Conflict of interest declaration

The authors declare no conflict of interest and take sole responsibility for the content of this article.

Data sharing statement

All evidence cited in this review is available in the public domain.

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Ethics Approval

This study did not require ethical approval

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Figure 1: Flow diagram

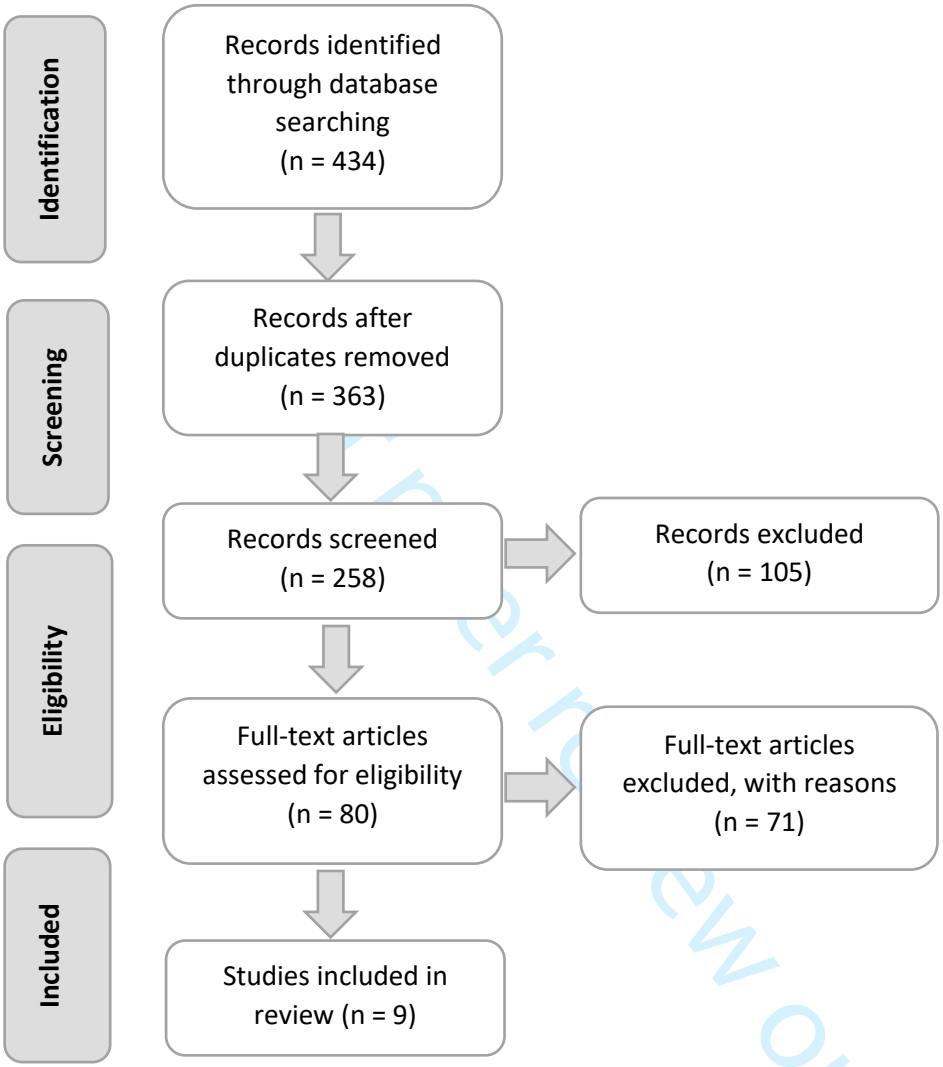
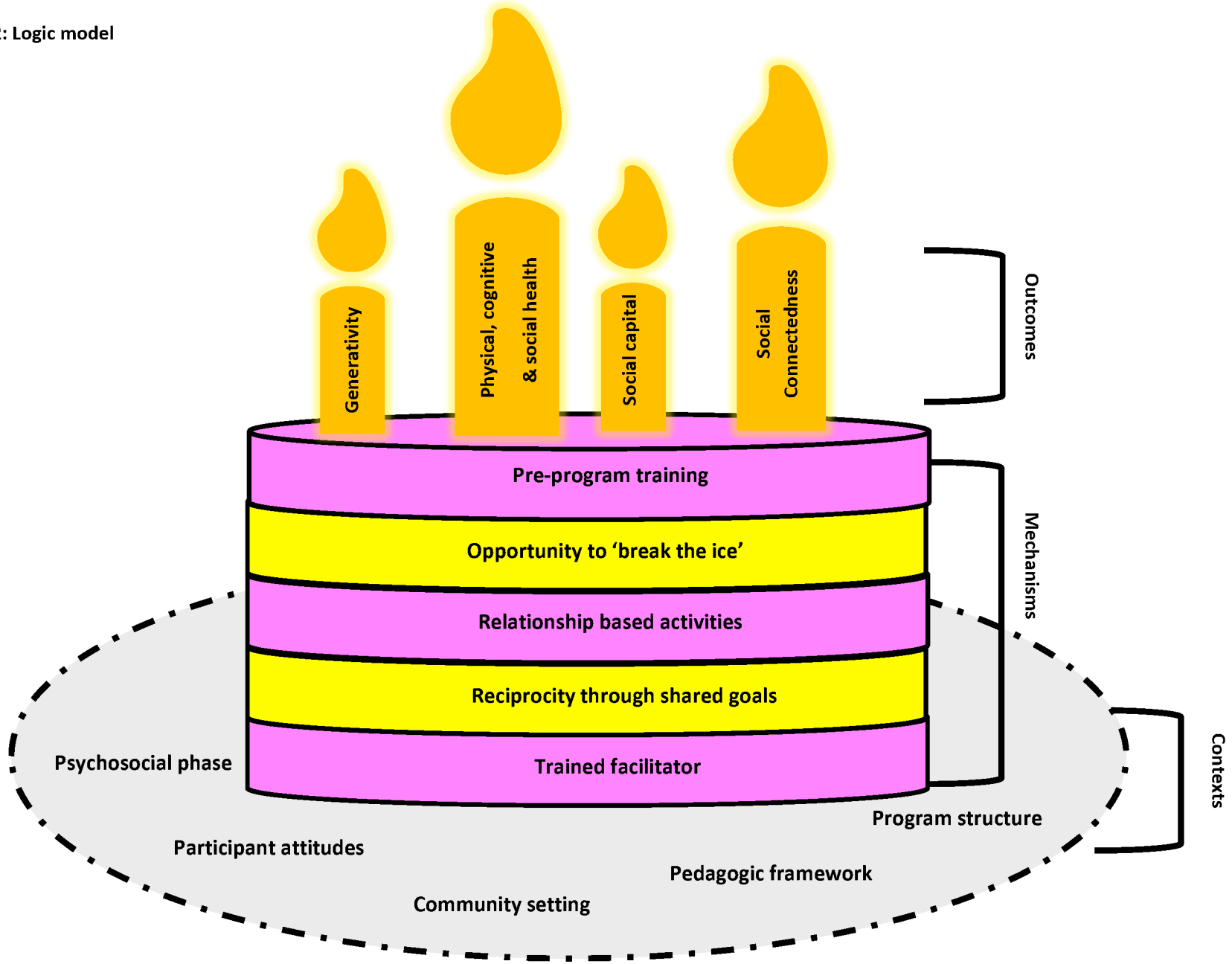


Figure 2: Logic model



SUPPLEMENTARY FILE 1: DATA EXTRACTION FORM

1. Bibliographic details	
Article number:	
Article reference:	
Extracted by:	
Checked by:	
Researcher details (discipline or professional background)	
What are the geographic details of the study?	
2. Aims and Methods	
What is the study type?	
What methods were used?	
Are the aims/ objectives clearly stated in the study? Detail	
Is the research question/s stated explicitly or within the text? Detail	
What materials were used to collect the data?	
How was the data analysed?	
Does the intervention use a particular theory to inform its design?	
3. Participants	
What was the sample size?	
What were the sample characteristics?	
How were participants recruited?	
What were the inclusion and exclusion criteria?	
4. Intervention details	
What was the intervention?	
How was the intervention delivered?	
Who is delivering the intervention?	
In what setting was the intervention delivered? Why was this setting / context chosen?	
Was this setting appropriate to examine the research question?	
Was the intervention designed with the participants (one or both age groups)?	
How were adolescents involved in the intervention?	

How were older people involved in the intervention?	
5. Findings/ Results	
What was the reported experiences of the participants?	
What was the reported experience of the facilitators?	
Did the intervention focus on/ impact on social connectedness?	
Did the adolescents report (or was it reported by others) greater understanding of older people?	
Did the older people report (or was it reported by others) impact upon social connectedness?	
Did the older people report (or was it reported by others) impact upon overall health and wellbeing?	
Did the older people report (or was it reported by others) greater understanding of the younger generation?	
Did the age range of the participants impact upon the success of the intervention? Were there structural barriers here e.g. transport, health issues?	
What themes (qualitative) / headline findings (quantitative) were generated by the study? (around intergenerational programs, adolescents, older people, context in which delivered/ undertaken)	
Are the findings interpreted within the contexts of other studies and theory?	
6. Were the *a priori* theories supported/ confirmed?	
That intergenerational programs involving adolescents and older adults improve social connectedness in the older adult group	
That intergenerational programs conducted in educational contexts result in positive outcomes in social connectedness for one/both groups	
Adolescents and older people are at a similar psychological milestone and therefore are mutual beneficiaries of intergenerational programs	
Older people may be socially disconnected in the absence of loneliness- intergenerational programs help support meaningful connections within the community, with individuals outside of their normal age and social demographic	
Greater generativity is formed through participation in intergenerational programs	
Intergenerational programs conducted in educational contexts build community connections between generations and across structural community assets like schools.	
What new theories were generated by this study?	

SUPPLEMENTARY FILE 2: QUALITY ASSESSMENT

Quality Assessment Criteria	
1	Is there adequate rationale for using this design to address the research aim/ question?
2	Did the authors justify the sample size used?
3	Is adequate evidence provided to support the findings?
4	Quantitative Studies: When comparing / analysing the groups (if more than one), did the authors consider the - Comparability - Confounding variables and controlling for these?
5	Qualitative Studies: Did the researchers consider their own position, assumptions and possible biases?
6	Were the strengths and limitations stated?
7	Was ethical committee approval obtained?
8	How valuable is this research to the review? High, Medium or Low

BMJ Open

Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

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Secondary Subject Heading:	Sociology
Keywords:	PUBLIC HEALTH, SOCIAL MEDICINE, PREVENTIVE MEDICINE

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Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

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ABSTRACT

Objectives: Limited social connectedness in older adults is a risk factor for poor physical and mental health. Older adults who are socially isolated, lonely and disconnected have a higher risk of chronic illness, depression and premature death. Current literature suggests that improved social connectedness reduces these risks. Intergenerational programs are an effective way to improve health outcomes. Despite this, there is yet to be a review using realist review methods that seeks to identify the circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents.

Method: A realist review methodology was chosen to account for the complexity of intergenerational interventions. Nine studies were included. In line with realist review methodology, iterative data extraction and analysis was conducted to identify the specific contexts, mechanisms, and outcomes of the programs. Specific circumstances were identified to develop theories relating to improved social connectedness in older adults.

Results: The nine included studies were set in different contexts, including community organisations, schools and aged care facilities and used an array of interventions including reminiscence therapy, craft, or space for conversation. Despite study heterogeneity, the parallels in psychosocial development between older adults and adolescents were shown to be a likely driver for improved social health outcomes. Programs most likely to improve social health outcomes were those that acknowledged psychosocial development, were delivered in community settings, leveraged pedagogic frameworks, used trained facilitators, and supported participants to build relationships through shared purpose.

Conclusions: This review contributes a logic model to support the design and development of intergenerational programs involving adolescents to improve social connectedness in older adults. Future research to test the logic model in practice is needed.

Strengths and limitations of this study

- This is the first realist review to investigate the circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents
- Comprehensive searches were undertaken with the aim of identifying all relevant published and grey literature.
- A logic model has been developed to support the design and development of intergenerational programs involving adolescents to improve social connectedness in older adults.
- The evidence base is limited for participants living in rural locations and participants with cognitive impairment.

INTRODUCTION

Limited social connectedness is a risk for poor health and wellbeing in older adults[1-4]. Older adults (over 65 years) are at particular risk of social disconnectedness and loneliness because of frailty and chronic illness, which may limit opportunities for social interaction[5, 6]. In addition, modern society has altered family structures, geographically dispersed the family unit and made maintaining intergenerational and family connections challenging, adding to social health vulnerability in older people[7-10]. Many older adults move into residential aged care facilities, away from familiar community supports which may impact social connectedness.

Social disconnectedness, loneliness and social isolation can be as damaging to health and wellbeing as smoking and obesity[4, 7, 11, 12]. Poor health due to acute or chronic conditions, cognitive decline or frailty influences an older person's ability to carry out personal, domestic, social or community activities and in turn increases their risk of social disconnectedness[1, 13, 14]. Older adults who remain socially connected without episodes of isolation or loneliness have lower rates of mental and chronic illnesses such as depression and cardiovascular disease[7, 11, 15-17].

Support for older adults, particularly post retirement or when faced with cognitive or physical impairment, is essential in maintaining individual social identity and social connectedness with family, friends and the community[4, 11]. The World Health Organization has challenged communities to provide age friendly communities. This global movement is demonstrating the power of building social capital and engaging older adults through community programs and social and environmental infrastructure to support community access[18]. Intergenerational programs have emerged as a popular and beneficial option for bolstering community connections and improving the health and wellbeing of older people[11, 19, 20].

Intergenerational programs are programs where two generations experience mutual benefit through shared experiences[19, 21] and are a known mechanism for improving social connectedness[19] and providing a sense of inclusion and empowerment in older adults[22]. Intergenerational programs bring together and benefit both generational groups[22-26] and have been adopted in a variety of contexts and age groups. These include the use of pedagogic frameworks with school age children[22], service-learning interventions with university students[27, 28] and in familial groups[25].

Several previous reviews have been undertaken on intergenerational programming. For example, systematic reviews by Gualano et al.[19] and Zhong et al.[29] focused on quantitative studies of older adults aged 50 and over and younger people 30 and below undertaken in educational settings. Gualano et al.[19] found that intergenerational programs benefit older people in terms

of keeping active and fighting social isolation, whilst Zhong et al. [29] found that intergenerational programs with young children may bring the greatest health benefits to older people across physical, mental and social domains. Further systematic reviews by Giraudeau and Bailly[30] and Martins et al.[31] included primary research studies of any type focusing on adults over 60[30] and 65[31] undertaken in a variety of community, assisted living, education, and nursing home settings. Giraudeau and Bailly[30] found that intergenerational programs bring mental health benefits for older people, whilst Martins et al.[31] reported that intergenerational programs can lead to reaffirmation of value, greater life satisfaction and improved self-esteem for older adults[31].

In terms of impacts on children, both Martins et al.[31] and Giraudeau and Bailly[30] focused on pre-school and primary school children and found that intergenerational programs improved children's perceptions of older people. In addition, Martins et al.[31] further found that for children, intergenerational programs led to higher self-esteem, better academic performance, improved social skills and a greater motivation to learn. Gualano et al.[19] also found that intergenerational programs improved younger people's perceptions of older people. Of these systematic reviews only Giraudeau and Bailly[30] outlined circumstances that may lead to a successful intergenerational program model, stating that to be successful, intergenerational programs should provide all the participants with a sense of being useful and competent and take time to prepare younger and older people by encouraging communication between the groups before the program begins.

A further relevant review undertaken in this area is a recently published realist review by Phang et al.[32]. This work focused on digital intergenerational programs explicitly geared towards reducing loneliness or social isolation in older adults undertaken in residential or community settings. The review identified four circumstances by which digital intergenerational program may reduce loneliness and social isolation for older adults. For community-dwelling older adults, training in digital technology and support from nurses helped to reduce loneliness. Phang et al.[32] further found that a video call with a student or family reduced loneliness among older adults residing in long-term residential care facilities, whilst videoconferencing with a lay coach may also reduce loneliness in adults who are lonely.

The above shows that whilst there is substantial evidence supporting intergenerational programs as an effective strategy to achieve improved physical and social health and wellbeing in older adults, there is yet to be a review of programs that involve adolescents specifically. Intergenerational programs involving older adults and preschool or young children have been reported in the primary research literature [14, 21, 22, 28], however those that pair adolescents (individuals aged 13-19) and older adults are less known[33]. Pairing older adults and adolescents

through intergenerational programs is modelled on Erikson's theory of psychosocial development[34, 35]. According to Erikson's theory, adolescents and older adults are both facing a period in their psychosocial development focused on identity. Adolescents, emerging from childhood are looking to their peers to 'fit in' and to understand society through the eyes of others. Older adults, particularly the recently retired, are trying to maintain their identity, with a desire to contribute to society[36]. This motivation to pass on wisdom to the next generation is termed generativity[34, 35] and is important for the wellbeing of older adults as well as broader social health[4]. Intergenerational interactions through family or a formal program support the development of generativity[34, 35, 37]. The likely benefits of this generational pairing in an intergenerational program context are yet to be reviewed in depth.

This realist review aims to identify the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. The question underpinning the review is – which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescents.

METHODOLOGY

A realist review methodology was undertaken in line with the RAMESES publication standards[38]. The RAMESES checklist for this study is available in Supplementary file 1. Realist review provides a framework for understanding complex interventions and *why* they deliver the outcomes they do[39]. A protocol for the review was developed following the stages outlined by Pawson[40] and included (1) locating existing theories, (2) searching for evidence, (3) selecting articles, (4) extracting and organising data, and (5) synthesising the evidence and drawing conclusions. This is available in Supplementary file 2.

A realist review is an approach used for systematic evidence review that utilises secondary data to understand the reasons why a particular set of contexts, mechanisms and outcomes lead to a particular result. Contexts are the circumstances in which the program is delivered and how these interact with the program mechanisms. Mechanisms are the program resources, and the way participants interact with them. The result of context and mechanism interaction is what drives a particular outcome to occur. Realist review utilises generative understanding to iteratively build *a priori* theories that are then tested and refined. The *a priori* theories are initially drawn from available literature and through stakeholder consultation. Realist review uses the lenses of context, mechanism and outcome to appraise, synthesise and then test the recommendations that are constructed through the analysis process[38, 39].

Step one: a priori theory development

The development of *a priori* theories was an iterative, two-part process[38, 39, 41] and was undertaken by JS and DA. This included stakeholder engagement and a scoping search of the peer-reviewed and grey literature on the subject, followed by *a priori* theory development that were tested against the literature and information from initial stakeholder meetings.

Search strategy

A literature search was undertaken between May and July 2019 by JS and DA. An updated search was completed in June 2020. The search strategy was developed with the support of a La Trobe University librarian. MEDLINE, PsychINFO, CINAHL were searched using English language limitation.

The search terms were (Aged OR "older adult" OR senior OR elder* OR geriatric OR "old* person*") AND ("intergenerational relation*" OR "intergenerational program*" OR "intergenerational activit*" OR "intergenerational practice" OR "intergenerational learning" OR "intergenerational service learning" OR “intergenerational relations” OR intergenerational) AND ("social connect*" OR "social isolation" OR "social interact*" OR loneliness OR "social

participation") AND ("adolescent"). MeSH terms used were "Aged" OR "Aged, 80 and over) and "Intergenerational relations".

Google Scholar was used to supplement the search using a simplified search terms list. Grey literature used the same search terms and was accessed via websites, including relevant government and non-government websites including Australian Federal and State Government agencies, Not-for profits and the World Health Organization. Reference list searching was also used. The full search strategy is available in supplementary file 3.

Patient and public involvement

No patients or members of the public were involved in this research.

Stakeholder engagement

The idea for this review came from a collaboration involving the authors, a municipality in regional Victoria, Australia, and a high school located within that municipality. Originally, the collaboration was centred on the development and evaluation of a pilot intergenerational digital literacy program involving adolescent school pupils and older community-dwelling individuals. However, during the initial stages of designing the program, the authors identified there was an absence of review-level evidence regarding intergenerational programs involving adolescents and older people. A decision was made to undertake a realist review on this topic. Municipal and high school collaborator stakeholders, namely senior teachers, municipal project officers and positive ageing ambassadors, were involved in the process of generating *a priori* theories by contributing information on the need and opportunity for intergenerational programs in the school

Study selection

The inclusion and exclusion criteria were applied by JS and DA to ensure the included studies met the aim of the review. Included participants were aged 65 and over (older adults) and between 13 and 19 years (adolescents) as these age ranges are agreed as defining older adults and adolescents[34] in early theories from Erikson on psychological development. Other studies addressing intergenerational programs use Erikson theory, so this was chosen to align with the current literature [31]. To be included in the review studies had to report on intergenerational programs with participants from non-familial generations. Studies had to be published in English between 2000 and 2020 and could be quantitative, qualitative or mixed-methods primary research studies. The full inclusion and exclusion criteria can be viewed in supplementary file 4.

a priori theory *development*

JS and DA developed six *a priori* theories and tested these against the literature before conducting a final literature search to check for new evidence.

Step two: data extraction and evidence synthesis

In step two, data extraction and evidence synthesis from the nine included studies was undertaken.

Data extraction

A data extraction form (supplementary file 5) was developed by DA and JS and included the *a priori* theories identified in step one. The data extraction form covered several domains including bibliographic information, aims and methods, participant details, intervention details, results and findings. The form also provided for *a priori* theory testing including extraction of evidence that proved, disproved or refined the theory. The data extraction process was completed by JS and DA.

Quality appraisal

A realist review method supports the inclusion of qualitative, quantitative and mixed methods studies[38, 42]. To understand the quality of included articles, we consulted critical appraisal literature[43, 44]. A tool comprising eight quality assessment criteria were developed focusing on the methodological quality and reporting quality of the included studies (supplementary file 6). Quality appraisal was conducted by JS and DA with any conflicts managed via team discussion.

Synthesis

All authors were involved in the evidence synthesis process using extracted data to illuminate the contexts, mechanisms and outcomes that underpinned reviewed programs. The process then involved identifying evidence combinations and testing them against the *a priori* theories to develop context mechanism outcome configurations (CMOC). The development of the CMOC presented a variety of emergent issues that were continually tested against the *a priori* theories and the known evidence. This process identified new theories and the CMOC were further refined. Ethics approval was not required for this study.

RESULTS

Data from the included studies were synthesised to generate eight theories relating to characteristics of intergenerational programs likely to optimise social connectedness for older adults. The components of these theories are combined to form context mechanism outcome configurations (CMOC) and a logic model to support answering the question – which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescents? Figure 1 below provides the results of the literature search. Nine studies were included in the review.

***Insert here_Figure 1: Flow Diagram**

Table 1: Included study characteristics

Included Study	Study details	Study aim	Sample characteristics	Summary of findings	Use of a facilitator	Pre-program training	Data collection and analysis
de Souza[45]	Qualitative; School (Brazil); Older adult participants shared life experiences with students in a classroom environment.	Intergenerational program evaluation from participant viewpoint.	84 randomly selected students; Age 13-19 years; 26 older people; Age 60 years +; Male and female groups.	The intergenerational activity based on reminiscence improved social interaction and community wellbeing for older adults.	Unclear	No	Focus group interviews followed by thematic analysis
Kessler and Staudinger[37]	Quantitative; Laboratory (Germany); Interaction between an Older Person and Younger Person, Two Older People or Two Younger people addressing a "life problem" or a "media problem".	To understand if intergenerational interactions have the potential to facilitate psychological functioning in both adolescent and old age.	Older women aged 70-74 n=90 and girls aged 14-15 n=90	Improved cognitive performance, reduced negative age-related stereotypes and triggered generative behaviours.	No	No	Data collected by a series of survey, psychometric and cognitive tests. Analysis completed using planned comparisons
Hernandez and Gonzalez[46]	Quantitative; Local council social centre (Spain); Weekly recreational activities (talks, excursions, cultural events). 32 interactive session "movement program".	To investigate the effect of an intergenerational program on stereotyped attitudes towards elderly people and the wellbeing of older adults.	101 elderly people; across two groups, age M= 74 (SD=7.7) and M=75 (SD= 5.21); 179 university students; Age M=19 (SD= 0.93); Both male and female participants.	Improved outcomes in depression measures in older adults who participated in an intergenerational exercise group.	Yes	Yes – adolescents only	Pre and post sessions that included questionnaires and geriatric depression scale. Analysis via repeated measure analysis of variance (ANOVA)
Wilson, Cordier[47]	Qualitative; Men's shed (Australia); 10 week intergenerational mentoring program over with older male mentors offering support to younger at risk males	To explore the experiences and perceptions of mentors involved in an occupation skill focussed program with teenage boys.	9 teenage boys; Age ~15 years; 6 older male mentors; Age 60-75; a project facilitator and a; youth worker. All participants were male.	Intergenerational programs involving older adults with a strong sense of generativity were shown to be a valuable resource to communities.	Yes	Yes- both groups	Pre and post Individual interviews and focus groups with both groups however only reported on data from older adult participants using constant comparative method of grounded theory

Biggs and Knox[48]	Qualitative; Residential care/ assisted living (USA (Texas)); Girl scout meetings held in assisted living facility	To identify impact of an intergenerational program for girl scouts (young people) and residents (older people) on quality of life, social interaction and personal attitudes.	Focus groups comprised of parents = 8, residents = 5, staff = 10, children (scouts and daisies) 5-12 years = 9; Content essay participants ages 6-16: n= 18; All participants female.	Intergenerational programs using social workers and community volunteers strengthened intergenerational relationships.	Yes	No	Focus group interviews with both groups and submitted essays from the younger participants followed by hematic analysis
Knight, Skouteris[35]	Mixed Methods; Residential aged care setting (Australia); Development of a life story review book by adolescent students partnered with an older adult.	To pilot and test the feasibility of an intergenerational program "My Life Story".	Adolescents n= 24; Age M= 14.56 (SD=0.5); Older adults n= 12; Age M=90.58 (SD=3.59); Gender of participants not stated	Improved social connectedness and community engagement resulted from an intergenerational program using reminiscence.	Yes	Yes- both groups	Qualitative data collected (post) using semi-structured interviews and quantitative data collected (pre and post) using a series of items followed by thematic analysis and paired t-tests.
Ostensen, Gjevjon[15]	Qualitative; Residential care facility or private home (Norway) Sessions over a 12-month period with volunteer adolescents supporting older adults to learn use of a tablet device.	To explore a new model of care that supports older people to participate by introducing technology and mobilising volunteer services.	Older adults n= 15 (5 withdrew due to illness, death and hospitalisation); Adolescents n=not stated; Age 54-94 years; Both male and female participants.	Reduction in anxiety and increase in social activity for older adults followed an intergenerational program supporting older adults to use an iPad.	Yes	Yes- adolescents only	Individual semi structured interviews repeated over a 12 month period with the older adults only followed by thematic analysis
Santini, Tombolesi[49]	Qualitative; Residential aged care facility (Italy); Intergenerational activity based meetings with aged care residents, older adult community volunteers and adolescents.	To understand if creating community space and planning activities where adolescents, older adults, and active older volunteers meet and interact will improve health outcomes for older adults.	14-year-old students n=25 (18 males and 7 females) and three teachers; 16 older residents; Age M=83; three social workers; 16 older volunteers; Age M=70	The intergenerational program improved the wellbeing of institutionalised older adults.	Yes	Yes- both groups	Individual and focus groups Interviews with students; individual interview with older adults; focus groups with volunteers before, during and after the intervention followed by content analysis
Wilson, Cordier[33]	Mixed methods; Men's shed (Australia); Intergenerational mentoring program with older adults and young adults with intellectual disability.	To examine the feasibility of a novel Men's Shed intergenerational mentoring intervention for young adults with intellectual disability.	5 mentees (average age 16); Older adult mentors n=12; Age M=69.5 (SD=8.53); All participants were male.	Intergenerational mentoring interventions for youth with intellectual disability at community Men's Sheds were shown to be feasible and appropriate.	Yes	Yes- older adults only	Quantitative data via pre-and post-intervention outcome measures and descriptive data of mentees' functional skills. Qualitative data collected at end of project via individual interviews with mentees and mentors. Used realist evaluation method

The characteristics of the included studies are provided in Table 1. In phase two of the review, data was analysed to 1) confirm the degree to which the a priori theories identified in phase one (see Table 2) were supported and 2) generate the contexts, mechanisms and outcomes from the included interventions.

Quality Assessment

In line with recommendations for realist reviews[40] no studies were excluded following quality assessment, rather each study was ultimately assessed for its contribution to theory development and context mechanism outcome configurations. The quality assessment of each included study concluded with an overall estimate of how valuable the study was to the review (Low, Medium or High), a criterion based on Question 10 of the Critical Appraisal Skills Programme qualitative quality assessment tool[50]. The assessment concluded that majority of studies (7/9) were found to be of high value to the review[15, 33, 35, 37, 45, 47, 49]. These studies were rated as highly valuable due to the age range of participants fitting directly with the aims of this review and because they reported on intergenerational programs in detail and provided ample evidence to support their findings, facilitating the analytical process for this review. The Biggs et al.[51] and Hernandez and Gomez[46] studies were rated as being of medium value to the review. Biggs et al.[51] was assessed as lacking on detail with regard to the reporting of the findings, whereas Hernandez and Gomez[46] had limited age group relevance to the review aims as the younger age group had an average age of 19.

Table 2: *a priori* theories identified after step one

Intergenerational programs involving adolescents and older adults improve social connectedness in the older adult group.
Intergenerational programs conducted in educational contexts result in positive outcomes in social connectedness for one/both groups.
Because they are at a similar point in psychosocial development, adolescents and older people are likely to be mutual beneficiaries of intergenerational programs.
Intergenerational programs help support meaningful connections for older people who may be socially disconnected within the community, with individuals outside of their normal age and social demographic.
Greater generativity is formed through participation in intergenerational programs.
Intergenerational programs conducted in educational contexts build community connections between generations and across structural community assets like schools.

When coupled with the *a priori* theories generated from phase one, context mechanism outcome configurations (CMOC) were developed. The CMOC are eight circumstances deemed optimal for the delivery of intergenerational programs involving older adults and adolescents and are hypothesised to improve outcomes in social connectedness. These are summarised in Table 3 below.

Table 3: Summary of Context Mechanism Outcome Configurations

CMOC label and summary-level description	References of included studies
CMOC 1 Understand the participants psychosocial development phase and attitudes towards each other to foster generativity Adolescents and older adults are at a similar crossroads in the formation and maintenance of their identity[34] (context). Understanding the developmental phase and held attitudes of the participants (context) supports the design of program training activities (mechanism) and 'ice breakers' (mechanisms) that foster reciprocity (mechanism) and are more likely to trigger generativity (outcome) between the generational groups and improve social connectedness (outcome).	**All included studies**
CMOC 2 Use a pedagogic framework to trigger generativity, intercommunity connections and deliver social health outcomes Pedagogic frameworks (context) motivate the adolescent to participate in intergenerational programs and achieve a result[35, 45, 48]. Similarly, the older adult is motivated to transfer skills and wisdom and provide support to the adolescent so as they can achieve their goal (mechanism). As a result, social connectedness and attitudes (outcomes) towards the other generational group improve.	**All included studies**
CMOC 3 Design the program to be frequent and have a clear structure to support participation and improved social connectedness Pedagogic frameworks (context) provide structure. Programs that are co-designed and scheduled frequently allow relationships to form through shared goals and activities (mechanisms). Frequent and carefully structured programs allow for improved social connectedness, and sustainable health and community benefits (outcomes).	**All included studies**
CMOC 4 Conduct the program in community settings to support social health outcomes and build social capital Community settings including educational institutions, care homes or existing community groups provide a foundation for engagement (context) when delivering intergenerational programs. Programs that showed a strong connection to the community through their facilitators (mechanism) or the physical environment (mechanism) showed improved sustainability and generalisability for the participants and the broader social capital of the community (outcome).	**[15, 33, 35, 45-47, 49]**
CMOC 5 Deliver pre-program training and support participants to 'break the ice' Utilising existing community settings and knowledge of psychosocial development, (contexts), pre-program training (mechanism) and activities that support participants to connect on a more informal level (mechanism) work together to bridge gaps between the generations (outcome).	**[15, 33, 35, 45-47, 49]**
CMOC 6 Identify shared goals between program participants to build reciprocity and support program engagement Through use of pedagogic frameworks and existing community links (contexts), the identification of shared goals builds reciprocity (mechanism) between the participants and in turn may trigger benefits including a greater sense of generativity (outcome), improved wellbeing (outcome) and social connectedness (outcome).	**[15, 33, 35, 45-47, 49]**
CMOC 7 Include a trained facilitator to promote program participation	**[33, 35, 45-47, 49]**

In a variety of contexts, the inclusion of a program facilitator (mechanism) may support improved social connectedness (outcome). The other key function of a facilitator is to ensure that the participants have had the opportunity to 'break the ice' (mechanism) through pre-program training and informal opportunities such as morning tea times.	
CMOC 8 Plan inclusive activities that trigger generativity and improve physical, cognitive, psychological and social outcomes When programs use existing community connections, include relationship-based activities with a shared goal (mechanisms) and are grounded in a pedagogic framework (contexts), there is improvement in health and social wellbeing (outcome) and a sense of generativity for the older adult group (outcome).	**[15, 33, 35, 37, 45-47, 49]**

CMOC 1 Understand the participant's psychosocial development phase and attitudes towards each other to foster generativity and connection

In the included studies, pre-program psychometric measurement[33, 35, 37, 46], focus groups or interviews[47] and informal gatherings at the beginning of the program[15, 33, 35, 46, 47, 49] were used to understand the demographic and psychosocial characteristics of participants. Psychometric scales that measured attitudes towards ageing, social connectedness, loneliness, generativity and presence of depression were completed pre and post intervention[33, 35, 37, 46]. Pre-program focus groups and interviews were used with both groups[33, 47, 49] to understand participant skills and motivations. This information was used to align participants based on skills and expectations, understand participant relationships with other generations, their attitudes towards ageing and their perceptions of self [49]. Understanding baseline attitudes helped structure programs to promote alternate views of an older person's capability, foster dialogue and enhance learning between generations.

Evidence from the included studies indicates that using pre-program measures to understand participant demographics, including their psychosocial phase and cognitive and physical abilities leads to a more likely match in participant capability and outcomes that improve social connectedness and generativity.

CMOC 2 Use a pedagogic framework to trigger generativity, intercommunity connections and deliver social health outcomes

Pedagogic or service-learning frameworks support participants to learn together in a real-world context[5, 52] and featured in six of the included studies[33, 35, 46-49]. Studies that involved school students were aged between 13-19 years with 15 years the average age across studies[33, 35, 45, 47, 49]. Two studies[35, 49] involved students completing a report or a community presentation, whilst others involved students completing a small woodwork project[33, 47]. These tasks were curriculum linked[35], motivating adolescent participants to complete the task. Older adults reported they felt needed when they were contributing to adolescent's learning and

acknowledged the adolescent's contribution to their own learning - *"they can teach us the computer and their new language"[49]*

Through the use of a pedagogic framework, results showed improved understanding and respect for the other generation[47, 48] and older adults gained a sense of pride in being able to pass on their knowledge and wisdom. These findings provide evidence that in pedagogic contexts, where reciprocity is formed, it is likely that an improvement in perceived social connectedness and wellbeing will occur for the older adult.

CMOC 3 Design the program to be frequent and have a clear structure to support participation and improved social connectedness

Frequency and duration of sessions

Programs that used a pedagogic framework were usually linked to a school term or semester[33, 45-47, 49]. These programs ranged from six to twelve - week blocks, often repeating over school terms. Programs that were held weekly[15, 33, 35, 46, 47], fortnightly[45, 49] or bi-monthly[48]. Biggs and Knox[48] reported less frequent sessions were chosen to avoid overwhelming the participants, compared to other participants who requested more frequent and extended program sessions so they could spend more time together[33, 45, 47, 49].

Structure of sessions

A clear program structure that included pre-training and time for "breaking the ice"[33, 47] was reported as beneficial. Typically, studies used the session to engage and introduce participants or complete training and the following weeks to cover different topics or questions relating to the aim of the study. In the Ostensen[15] study, older adults raised learning goals that formed the structure for the week ahead. Overall, evidence suggests that having a structured program that allows frequent interaction between generational participants is more likely to result in improved social connectedness and optimised health and wellbeing.

CMOC 4 Conduct the program in community settings to support social health outcomes and build social capital

Intergenerational programs that occur in community settings provide a platform for building social capital[4, 9, 26]. Four studies conducted programs in residential care facilities using existing community connections such as local youth clubs and schools that were geographically close by [15, 35, 48, 49] and two others[33, 46, 47] leveraged local community programs (volunteer groups). Evidence suggested that community-based programs had greater potential in enhancing social health outcomes for older adults and generating social capital in the broader community. In the Biggs and Knox[48] study, older adult participants began attending church with the families of the adolescents, demonstrating connections beyond the program. Similar results were reported

in the de Souza[45] study with older participants reflecting improved mood, physical wellbeing and a '*feeling of freedom'* (*p. 467)*, through their opportunities to get out of the facility and spend time with the adolescents in the community. The location, existing relationships between community organisations and activities that support participants to observe the other generation playing a role in the community are all positive predictors of a likely improvement in individual and community social connectedness and wellbeing.

CMOC 5 Deliver pre-program training and support participants to 'break the ice'

Pre-program training was provided in six of the nine included studies. Training was offered to older adults and the adolescents[33, 35, 49], to older adults only[33] or to adolescents only[15, 46]. Training included program orientation or the opportunity to learn about the other generation.

Where training was provided to both the adolescents and older adults, this appeared to foster social connections. For example, the adolescents shook the hands of the older gentleman at the beginning and end of each session. This positive social behaviour was felt by the older men to be respectful and demonstrated social connectedness between the groups[47]. However, in the Santini[49] study, despite the pre-program introductory material, students reported that they required support from teachers and older adult volunteers to overcome their emotions when they met with the older adults for the first time.

The Wilson et al[33] program provided training to the older adult mentors only. This training provided the mentors with disability awareness training via videos. Despite this, it was highlighted by the older adults that they would have liked to have been more prepared for working with the adolescents with intellectual disability. Two studies provided training to adolescents only[15, 46] however did not report on the impact of this training.

In studies where no formal pre-program training was provided, results were mixed in relation to the impact on the program. In the Kessler and Staudinger[37] study, the randomised control trial methodology required pre-program blinding. In the Biggs and Knox[48] study, the participants were already involved in an existing Scouts program, so it is assumed that pre-program education was included in Scout club activities, however, this was not reported by the authors. Parents of the adolescents in the Biggs and Knox[48] raised concern about their children's reactions to residents with dementia or if a resident died. There were also reports from the residents and parents that boundaries and behaviours were not respected by the adolescent participants. These examples indicate a role for pre-program training to reduce fears and provide education. Where training or opportunities to interact were sub-optimal or missing, participants highlighted limited opportunities to 'get to know' each other or feel prepared for the program[33, 45]. If comfort or confidence in the program is not established, participants may not participate[45] or be reluctant

to participate again[33]. This has broader implications for the sustainability of program outcomes, particularly those that aim to enhance social capital or galvanise links between community groups.

CMOC 6 Identify shared goals between program participants to build reciprocity and support program engagement

By understanding the shared aims of participants, reciprocity is nurtured, participants are more motivated, and generativity is triggered. Where participants were involved in program design[46, 49] as well as iteratively throughout the course of the program[15, 48] the program was more person centred, enhanced reciprocal behaviours and improved outcomes.

The Santini[49] study used an action participatory research approach with active older adult volunteers, social workers and teachers and Hernandez and Gonzalez[46] used a co-design approach through adolescent students designing an exercise program for older adults that was delivered with support from lecturers and trained facilitators over 32 sessions. Both generations benefited in these programs, with results indicating a positive shift in age related stereotypes when older adults and adolescents interacted as part of the program.

In programs where there was a shared goal from the outset there was greater improvement in social connectedness[33, 35, 47, 48], reduced markers for depression[46] and stereotypical attitudes towards the older generation[48]. The included studies demonstrate that creating reciprocity drives generative behaviour. Reciprocity and generativity combined leads to improved social connectedness and health and wellbeing outcomes for the individual and the community broadly.

CMOC 7 Include a trained facilitator to promote participation

Facilitation is the act of supporting and enabling a group to meet its objectives (and release its full potential) by fostering conditions that respects and encourages contributions by all members of the group[53]. Facilitation was used in seven of the included studies. The facilitators were trained professionals including teachers[35, 49], university staff[46], fitness instructors[46], health professionals[15, 33, 48], community leaders[48] and youth workers[47]. In the Santini[49] study, active older volunteers also played a facilitation role. Studies that included a facilitator resulted in greater participant interaction and improved program outcomes[33, 47, 49]. In the Wilson et al study, the youth worker that facilitated the program was described as responsible for *"keeping us on track"*[47] and was pivotal in prompting participation between the groups, for example at afternoon tea breaks.

In the study involving girl Scout groups[48], the troop leaders were trained social workers. Whilst their individual experiences were not reported in the findings, the role they played in bringing together individuals connected to existing community settings in girl Scouts, residential aged care

and volunteer groups was fundamental in the program longevity and results. In four studies, active adult[33, 47, 49] and adolescent[15] volunteers were recruited from local community volunteer groups and provided additional program facilitation support that likely enhanced positive outcomes in community engagement and social connectedness.

Conversely, in studies where the facilitation was reported as being sub-optimal[33] or absent[45], the participants and the authors highlighted that greater support from the teachers, researchers or 'monitors' would have enhanced interactions between the generational groups. If facilitation is absent or lacking, participants may feel frustrated or unsupported, in turn causing participant disengagement, attrition or an unintended triggering of age-based stereotypes or perceived loneliness[49]. Trained facilitation supports improved connectedness between participants and when delivered within community and pedagogic contexts, favourable outcomes in generativity, social connectedness, and social capital.

CMOC 8 Plan inclusive activities that trigger generativity and improve physical, cognitive, psychosocial, and social outcomes

Included studies reported on programs that provided relationship-based inclusion[35, 45, 48, 49] and activity-based inclusion[15, 33, 46, 47] opportunities for participants.

Relationship-based inclusion:

If there is limited opportunity for relationship-based inclusion, adolescents and older adults are at risk of not experiencing meaningful social connection[35]. Feeling included by peers and the broader community promotes generativity and in turn improves wellbeing in both age groups[23, 35]. Several programs[35, 45, 48, 49] used relationship- based inclusion activities such as reminiscence (sharing old photos or learning about what jobs older people used to do) to create reciprocity between older adults and adolescents. This was also a mechanism to improve physical, cognitive, and psychological health, and in turn social connectedness. A marker of sustained relationships was demonstrated by the adolescents continuing to connect with older adults after the program[35, 49], including volunteering at a local community organisation with older people.

Activity-based inclusion:

Studies that used activity-based inclusion such as exercise programs[46], digital literacy training with an iPad[15] or woodwork construction[33, 47] also reported improved outcomes in physical, cognitive, psychological and social domains, including social connectedness. In the studies set in Men's Shed's the young adults were mentored by the older men in occupational activities, with both groups reporting the activities provided the opportunity to connect, whilst learning new skills and doing *"something with our hands"[47].* Young adults with intellectual

disability commented that the Men's Shed was a unique learning environment - *"they made me feel like part of the group"* and that they *"felt accepted"*[33]. Older adults supported to use a tablet device[15] demonstrated improved social outcomes as they were able to connect with family in other locations or the outside community through news applications or by tracking weather. Nurses in the care facility reported a change in social behaviour in the participants using iPads, taking more initiative, presenting as less anxious and being more socially active. In the Hernandez and Gonzalez[46] study, the interaction between adolescents and older people showed statistically significant improvement in depression scores and stereotypical attitudes in the older adult group. A comparison group led by the adult trainer resulted in a less significant change in depression scores in the older adults (Group 1 with adolescents= $p<.001$; Group 2 led by adult trainer = $p<.008$). The control group (who attended the local social centre but did not interact with the adolescents or participate in exercise sessions) showed a statistically significant increase in depressive symptoms ($p<.001$). The evidence supports activities that provide the participating generations with the opportunity to share time, reminisce and develop relationships are powerful mechanisms for triggering generativity and social connectedness.

Logic model

The aim of this review is to identify the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. The logic model below represents the relationships between program activities and improved social connectedness for older adults. As demonstrated through the CMOC, the act of two generations coming together in familiar community-based contexts with a shared purpose, resulted in strengthened relationships and community connections. Several participants in the included studies spoke about the benefit of having an opportunity to 'meet and greet' for example by sharing an afternoon tea as part of the program[33, 35, 47-49].

This logic model (presented in Figure 2 below) uses a nested visual to represent an optimal intergenerational program to improve social connectedness in older adults. The circumstances being the outer circle, with the mechanisms within that, driving the outcomes at the core.

***Insert here_Figure 2: Logic model**

DISCUSSION

Evidence from the included studies reveals how intergenerational programs involving adolescents can address issues of social disconnectedness in older adults. This review identifies how and why intergenerational programs work, for whom and in what circumstances. Broadly, the CMOC cover four main themes - 1) psychosocial and mental health, 2) physical and cognitive health, 3) program design and structure and 4) community engagement and social capital.

Psychosocial and mental health

Providing opportunities for older adults to participate, without being infantized or inequitably treated is highlighted by the included studies and others as a mechanism for improving reciprocity and generativity[20, 37, 54]. The opportunity to participate in an intergenerational program saw older adults improve their own self-image and stereotypical view of old age and prove to themselves that they still had something to offer the community and the younger generation[45, 46, 49]. Included programs that created opportunities for informal, relationship-based activities which triggered generativity, for example promoting conversation between the generational groups, were of greatest benefit to psycho-social health[35, 45, 49].

Physical and cognitive health

The impact of intergenerational programs on broader health outcomes, including cognitive health has been previously reported[14, 55]. The connections between social, cognitive and physical health are well known, particularly in high-risk populations like older adults[56-58]. In this review, interventions that promoted the older adult as wise or expert[33, 35, 37, 47, 48] showed improvement in both perceived and measured cognitive performance. Kessler and Staudinger[37] showed improvement in speed of processing and word fluency when older adults were paired with an adolescent and asked to solve a 'life problem'. Qualitative evidence from included studies reported improved physical health in older adults as a result of their involvement in the intergenerational program, including increased energy[33] reduced pain[49] and increased movement[45].

Program design and structure

A range of designs and structures are reported in the intergenerational program literature. Intergenerational programs embedded within pedagogic contexts are supported by existing literature[26, 59, 60] and were featured in many of the included studies. Several studies support the need for in depth, sustainable and accessible intergenerational programs to address social health issues[19, 61]. As highlighted by Cattan et al.,[62] programs that engage adults in the planning and design of the interaction are most effective. This was seen in the Ostensen[15] study and the Wilson et al.,[33] study that highlighted the use of co-design to optimise outcomes.

Martins et al.,[31] in a review of intergenrational programs also highlighted the benefit of weekly or fortnightly intergenerational meetings to create bonds between participants.

Several of the included studies highlighted the importance of informal and formal program structures to build a foundation for connection. Several interventions leveraged existing local community connections and pre – program training was shown to support participation[33, 45, 49]. However, where complex demographics exist, additional program support may be required[33, 45, 49].

Community engagement and social capital

Programs set in the community that leveraged existing community connections were more likely to promote social connectedness. Individuals already engaged with the community in a volunteer capacity were participants, and in some cases facilitators of the program. Other reviews[21] support the inclusion of volunteers as it is a cost effective way to deliver programs and promote volunteerism- a key element for enhancing social capital. Volunteers were used in the included studies to support program delivery and participant recruitment via community organisations like Rotary or Scouts[15, 33, 47-49]. Adolescents also witnessed volunteer 'models' and were interested in volunteerism beyond the program[15, 35, 49].

Strengths and limitations of this review

This realist review explored intergenerational programs that specifically involved adolescents and their impact on social connectedness in older adults and developed inclusion and exclusion criteria to reflect this aim. Whilst these criteria generated a targeted group of studies for review, there may have been additional studies missed. The included studies showed some collective limitations including a lack of participant diversity in regard to gender and rurality. From the information reported, most studies were conducted in metropolitan environments. The importance of building capacity in rural communities to protect the social health of older adults is supported by Hodgkin et al.[6] and this lacking insight is one limitation of this review. In regards to gender, three studies specifically recruited based on gender given they were located in Men's sheds[33, 47] or focused on girls scouts[48], however in other studies where gender did not appear to be a structural factor, there was a greater proportion of women over men who participated. This is a possible limitation of the review along with the limited participation of older adults with cognitive impairment, particularly in quantitative measurement[15, 35, 48]. There were also noted limitations in the quality of some studies with a paucity of evidence from the intervention, however these studies remained included in the review given their value to the overall review question and the commitment in realist methodology not to exclude solely based on quality of evidence[38].

This review is however strengthened by its specific focus and that it is the first realist review to explore the impact of intergenerational programs specifically involving adolescents on social connectedness in older adults. In addition, the review included a variety of study methods including one randomised control trial. The inclusion of evidence developed using a variety of methods is supported by the realist review methodological standards as it provides a broad view of existing literature and evidence is included based on its value and contribution to the review aim, rather than singularly on methodological type. As a result, the included studies report on a variety of different programs from several major continents. Whilst this heterogeneity may be viewed as a limitation, the realist method supports using a wide range of evidence to understand the circumstances in which complex interventions deliver an intended outcome. The review may have been further strengthened by the opportunity to test the program theories and logic with stakeholder groups.

Implications for practice and future research

This review has provided a logic model that is ready to use by clinicians, program managers and policy makers in the design and implementation of community based intergenerational interventions. This review has implications for targeting physical, social, and mental health in older adults, as well as exploring opportunities for the role of intergenerational programs in adolescent health. Furthermore, the program theory provides a suggested approach for designing programs with a broader system lens. Previous literature has also supported the use of intergenerational programs[63], in particular those with a social health focus, to counter loneliness[64], influence age related health outcomes[17] and reduce costs associated with increased care needs in older age[15, 65].

The review also provides support for the inclusion of intergenerational programs into the curriculum to influence adolescent career choices and to improve attitudes towards older people[35, 45, 49]. Included studies also called for intergenerational programs to be a “systematic component of care provision”[49] for older adults living in residential aged care, including additional resources, changes to models of care and staff training[15].

Future research where intergenerational interventions are 1) designed using the program theory as articulated within the logic model and 2) tested with stakeholders, may support further understanding what works for whom, and in what circumstances. Realist evaluation or other published frameworks like the 6-SQUID model[66, 67] are methodological options for future projects. This style of participatory research generates community will and engagement and supports sustainability without major resource investment, as the community itself ‘owns’ and is committed to the intervention they have designed. Future research would also benefit from

addressing the same theory in comparative or specific settings[39], such as in aged care settings or community groups like Men's sheds.

CONCLUSION

This review has identified the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. Findings have provided a logic model outlining how intergenerational programs involving adolescents are likely to improve social connectedness for older adults and builds on the evidence that social connectedness and social networks are protective for immunity, reduced depression rates and a reduced risk of frailty[16, 56, 68].

In addition to the psychosocial development theory, this review has uncovered the optimal circumstances that promote social connectedness for older adults. These include setting programs in the community, including a trained facilitator, leveraging a pedagogic framework and finding shared goals between participants. Structural elements such as pre-program training and frequency of sessions was shown to be important in delivering relationship bonds between older adults and adolescents, that trigger generative behaviours and greater perceived social connectedness. Intergenerational programs involving adolescents are a possible solution for enhancing social connectedness and health outcomes for older adults.

Authors' contributions

JS, HV and DA conceived of the project and contributed to the development of the manuscript. JS led the review, HV and DA were the co-reviewers. HV and DA supervised the work and provided guidance in the support of realist methodology. All authors read and approved the final manuscript.

Conflict of interest declaration

The authors declare no conflict of interest and take sole responsibility for the content of this article.

Data sharing statement

All included articles are available publicly. The data extracted from these articles can be made available upon request.

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Ethics Approval

This study did not require ethical approval

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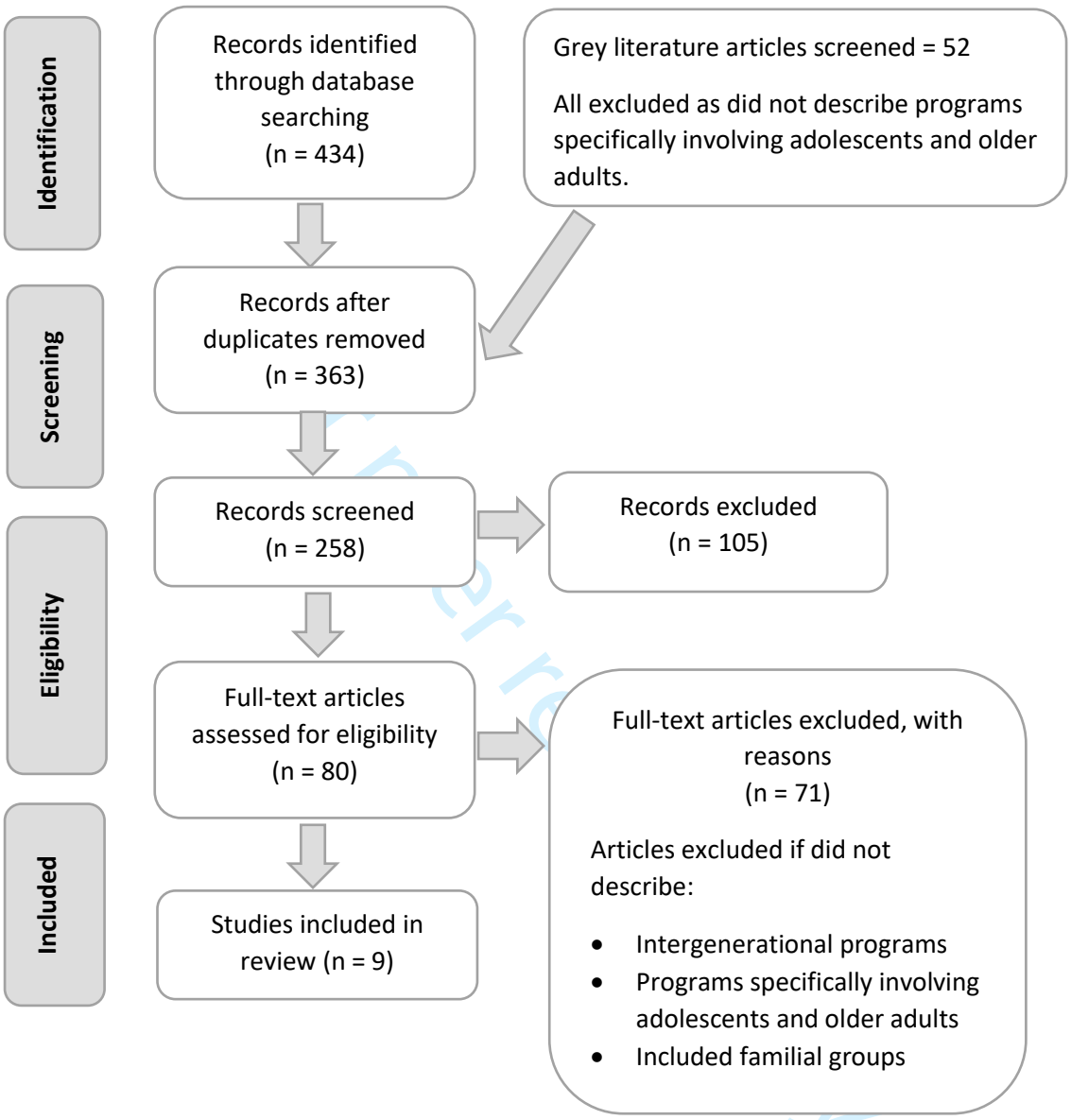
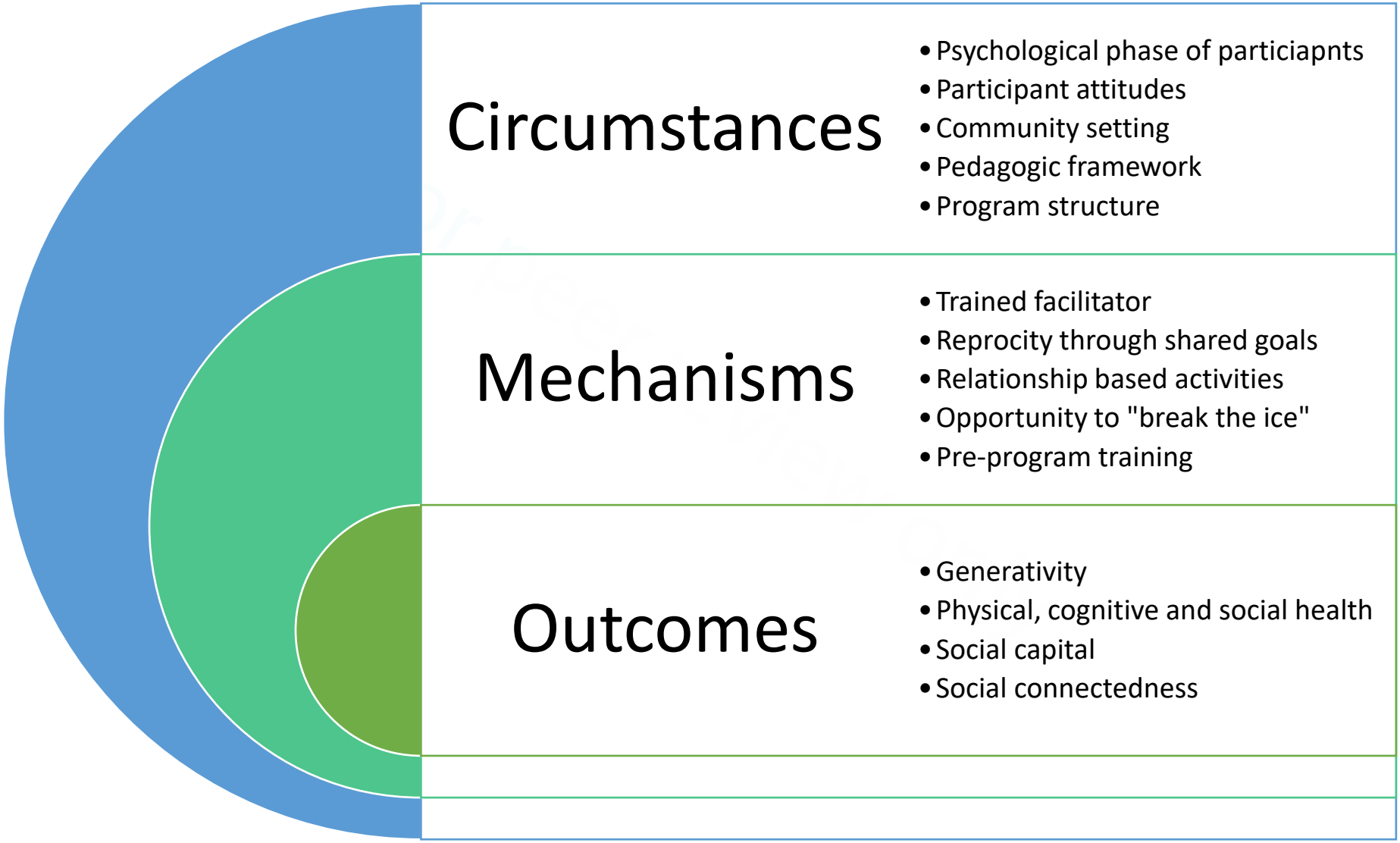
Figure 1: Flow diagram




Circumstances
• Psychological phase of particiapnts
• Participant attitudes
• Community setting
• Pedagogic framework
• Program structure
Mechanisms
• Trained facilitator
• Reprocity through shared goals
• Relationship based activities
• Opportunity to "break the ice"
• Pre-program training
Outcomes
• Generativity
• Physical, cognitive and social health
• Social capital
• Social connectedness

RAMESES checklist for reporting a realist synthesis

From Wong et al.: RAMESES publication standards: realist syntheses. BMC Medicine 2013 11:21. doi: 10.1186/1741-7015-11-21
https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-11-21

TITLE			**Reported in document Y/N/Unclear**	**Page number**
		In the title, identify the document as a realist synthesis or review	Y	1
ABSTRACT				
		While acknowledging publication requirements and house style, abstracts should ideally contain brief details of: the study's background, review question or objectives; search strategy; methods of selection, appraisal, analysis and synthesis of sources; main results; and implications for practice.	Y	2
INTRODUCTION				
	Rationale for review	Explain why the review is needed and what it is likely to contribute to existing understanding of the topic area.	Y	6
	Objectives and focus of review	State the objective(s) of the review and/or the review question(s). Define and provide a rationale for the focus of the review.	Y	6
	Ethical approval	State whether the project required and obtained ethical approval from the relevant authorities, with details.	Y	10
METHODS				
	Changes in the review process	Any changes made to the review process that was initially planned should be briefly described and justified.	N (no changes made)	n/a
	Rationale for using realist synthesis	Explain why realist synthesis was considered the most appropriate method to use.	Y	6 to 7
	Scoping the literature	Describe and justify the initial process of exploratory scoping of the literature.	Y	7
	Searching processes	While considering specific requirements of the journal or other publication outlet, state and provide a rationale for how the iterative searching was done. Provide details on all the sources accessed for information in the review. Where searching in electronic databases has taken place, the details should include, for example, name of database, search terms, dates of coverage and date last searched. If	Y	9

		individuals familiar with the relevant literature and/or topic area were contacted, indicate how they were identified and selected.		
9	Selection and appraisal of documents	Explain how judgements were made about including and excluding data from documents, and justify these.	Y	8 to 9
10	Data extraction	Describe and explain which data or information were extracted from the included documents and justify this selection.	Y	6
11	Analysis and synthesis processes	Describe the analysis and synthesis processes in detail. This section should include information on the constructs analyzed and describe the analytic process.	Y	10
RESULTS				
12	Document flow diagram	Provide details on the number of documents assessed for eligibility and included in the review with reasons for exclusion at each stage as well as an indication of their source of origin (for example, from searching databases, reference lists and so on). You may consider using the example templates (which are likely to need modification to suit the data) that are provided.	Y	Figure 1
13	Document characteristics	Provide information on the characteristics of the documents included in the review.	Y	Table 2
14	Main findings	Present the key findings with a specific focus on theory building and testing.	Y	Page 15 to 24
DISCUSSION				
15	Summary of findings	Summarize the main findings, taking into account the review's objective(s), research question(s), focus and intended audience(s).	Y	25
16	Strengths, limitations and future research directions	Discuss both the strengths of the review and its limitations. These should include (but need not be restricted to) (a) consideration of all the steps in the review process and (b) comment on the overall strength of evidence supporting the explanatory insights which emerged. The limitations identified may point to areas where further work is needed.	Y	26-28
17	Comparison with existing literature	Where applicable, compare and contrast the review's findings with the existing literature (for example, other reviews) on the same topic.	Y	25 to 26
18	Conclusion and recommendations	List the main implications of the findings and place these in the context of other relevant literature. If appropriate, offer recommendations for policy and practice.	Y	27
19	Funding	Provide details of funding source (if any) for the review, the role played by the funder (if any) and any conflicts of interests of the reviewers.	Y	29

Supplementary file 2: Realist Review Protocol

Title: Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

Introduction

Intergenerational programs are programs that involve two unrelated generational groups and result in a mutually beneficial outcome for the participants. Erikson's theory of psychosocial development highlights that adolescents (for the purpose of this review aged 13-19) and older adults (for the purpose of this review 65 and older) are at comparable stages, facing questions around identity and integrity and dealing with life transitions of puberty and retirements respectively.

Social connectedness is highlighted as a major factor in wellbeing and health, particularly for older adults. The perceived or real lack of opportunities to be connected socially and with society can have negative impacts on a person's physical, social and mental health.

For the purpose of this review, the impact of intergenerational programs, that involve both adolescents and older adults, on social connectedness outcomes in the older adult group will be explored. The contexts and mechanism by which the program was delivered will also be explored as key parts of the interventions with the result of the review aiming to determine what contexts and mechanisms lead to the most beneficial outcomes for social connectedness. The objective of this realist review is to develop a program theory that guides the development of intergenerational programs involving adolescents and older adults, that impact upon social connectedness in older adults. There is a current gap in the literature addressing programs that involve specifically adolescents and their impact on the domain of social connectedness.

Review Question

The SPIDER framework was used to develop the review question, which is based on describing the Sample (S), Phenomenon of Interest (PI), Design (D), Evaluation (E), and Research type (R) (Cook et al. 2012).

Sample: Adults aged 65 and over and adolescents aged 13-19 that are unrelated and engaged in engaged in intergenerational programs

Phenomenon of interest: Any type of Intergenerational programs that involve two non-familial generational groups - adults aged 65 and over and adolescents aged 13-19. Inclusive of intergenerational programs that take place in community settings, including educational and aged care settings.

Design: Realist review

Evaluation: We will focus on characteristics, views and experiences from qualitative literature. From quantitative literature we will focus on the assessment of outcomes such as social connectedness, social isolation, social loneliness, social support, social participation and social interaction.

Research type: Quantitative studies, qualitative studies, mixed methods.

Final review question: *Which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescent?*

Plan for generation of *a priori* theories:

A priori theories will be developed utilising an iterative, two-part process. This will include an initial scoping search of Medline using the search terms outlined in the *Search Strategy* section below. We will also undertake initial engagement with relevant stakeholder sot develop the *a priori* theories. The idea for this review came from a collaboration involving the authors, a municipality in regional Victoria, Australia, and a high school located within that municipality. Originally, the collaboration was centred on the development and evaluation of a pilot intergenerational digital literacy program involving adolescent school pupils and older community-dwelling individuals. However, during the initial stages of designing the program, the authors identified there was an absence of review-level evidence regarding intergenerational programs involving adolescents and older people. A decision was made to undertake a realist review on this topic. Municipal and high school collaborator stakeholders, namely senior teachers, municipal project officers and positive ageing ambassadors, will be involved in the process of generating *a priori* theories by contributing information on the need and opportunity for intergenerational programs in the school environment.

Search Strategy

The following electronic databases will be searched using English language limitation: MEDLINE, PsychINFO, CINAHL. Google Scholar will be used to supplement the search using a simplified search terms list from below.

Search terms included; (Aged OR "older adult" OR senior OR elder* OR geriatric OR "old* person*") AND ("intergenerational relation*" OR "intergenerational program*" OR "intergenerational activit*" OR "intergenerational practice" OR "intergenerational learning" OR "intergenerational service learning" OR “intergenerational relations” OR intergenerational) AND ("social connect*" OR "social isolation" OR "social interact*" OR loneliness OR "social participation") AND (“adolescent”)

Inclusion and Exclusion Criteria

Qualitative, Quantitative and Mixed method studies will be eligible for inclusion

Included	Excluded
Study reported on intergenerational programs	Reported on non-intergenerational programs
Participants from non-familial generations	Studies involving the study of grandparents / grandparenting or family intergenerational relationships
Aged 13-19	Aged <13
Aged 65 and above	Aged 20-64
Published 2000-2020	Published before 2000
Published in English	Not published in English

Where studies include part of the age range and are determined to contribute to the development of the program theory, they will be included. Two reviewers will determine such studies inclusion.

Study Selection

Two reviewers will determine included studies. Inclusion criteria as above will be applied to the studies retrieved from the search.

Data extraction and Quality Assessment

Data will be extracted using a bespoke data extraction form. A bespoke quality assessment tool will be developed. Both data extraction and quality assessment will be undertaken by two reviewers.

Data synthesis

The aim of the synthesis is to identify potential context-mechanism-outcome configurations (CMOCs) to develop a programme theory about the circumstances that can promote social connectedness in older adults participating in intergenerational programs with adolescent.

REFERENCES

Cooke A, Smith D and Booth A (2012) Beyond PICO: The SPIDER Tool for Qualitative Evidence Synthesis. Qualitative Health Research 22(10) 1435-1443

Number	combined	Search term - Medline	MeSH	Keyword	total
3 or 7	2963804	(MH "Aged") OR (MH "Aged, 80 and Over")	yes		3076650
	OR				
	355786	"older adult" OR		yes	
		senior OR		yes	
		elder* OR		yes	
		geriatric OR		yes	
		"old* person*" OR		yes	
1 or 2 or 4	**AND**				7854
	6242	"intergenerational relation*" OR		yes	
		"intergenerational program*" OR		yes	
		"intergenerational activit*" OR		yes	
		"intergenerational practice" OR		yes	
		"intergenerational learning"		yes	
	OR				
	3734	intergenerational relations	yes		
	OR				
	6242	intergenerational		yes	
5	**AND**				44986
	44986	"social connect*" OR		yes	
		"social isolation" OR		yes	
		"social interact*" OR		yes	
		loneliness OR		yes	
		"social participation"		yes	
5 and 6 and 8				**TOTAL**	**105**
				Limited to english language	**93**

Number	combined	Search term -CINAHL	MeSH	Keyword	total
S1 OR S5	720418	(MH "Aged") OR (MH "Aged, 80 and Over")	yes		772260
	OR				
	162145	"older adult" OR		yes	
		senior OR		yes	
		elder* OR		yes	
		geriatric OR		yes	
		"old* person*" OR		yes	
S2 OR S3	**AND**				
	6242	"intergenerational relation*" OR		yes	6242
		"intergenerational program*" OR		yes	
		"intergenerational activit*" OR		yes	
		"intergenerational practice" OR		yes	
		"intergenerational learning"		yes	
	OR				
	6242	intergenerational		yes	
S6	**AND**				
	22543	"social connect*" OR		yes	22543
		"social isolation" OR		yes	
		"social interact*" OR		yes	
		loneliness OR		yes	
		"social participation"		yes	
S6 AND S12 AND S14	**TOTAL**				**143**
	Limited to age and english language				**139**

Number	combined	Search term -PsycINFO	MeSH	Keyword	total
1 or 6		(MH "Aged") OR (MH "Aged, 80 and Over")		yes	
	OR				
		"older adult" OR		yes	
		senior OR		yes	
		elder* OR		yes	
		geriatric OR		yes	
		"old* person*"		yes	
2 or 3 or 4	**AND**				
		"intergenerational relation*" OR		yes	
		"intergenerational program*" OR		yes	
		"intergenerational activit*" OR		yes	
		"intergenerational practice" OR		yes	
		"intergenerational learning"		yes	
	OR				
		intergenerational relations	yes		
	OR				
		intergenerational		yes	
5	**AND**				
		"social connect*" OR		yes	
		"social isolation" OR		yes	
		"social interact*" OR		yes	
		loneliness OR		yes	
		"social participation"		yes	
5 and 6 and 7				**TOTAL**	**144**
				Limited to english language	**133**

Google Scholar	
older people or aged or senior AND "intergenerational program*" or intergenerational AND "social connectedness"	**73**

Search two	Added "adolescent" to each search

Supplementary File 4: Inclusion and Exclusion Criteria

Included	Excluded
Study reporting on intergenerational programs. Study can be quantitative, qualitative or mixed-methods	Reported on non-intergenerational programs
Participants from non-familial generations	Studies involving the study of grandparents / grandparenting or family intergenerational relationships
Aged 13-19	Aged <13
Aged 65 and above	Aged 20-64
Published 2000-2020	Published before 2000
Published in English	Not published in English

SUPPLEMENTARY FILE 5: DATA EXTRACTION FORM

1. Bibliographic details	
Article number:	
Article reference:	
Extracted by:	
Checked by:	
Researcher details (discipline or professional background)	
What are the geographic details of the study?	
2. Aims and Methods	
What is the study type?	
What methods were used?	
Are the aims/ objectives clearly stated in the study? Detail	
Is the research question/s stated explicitly or within the text? Detail	
What materials were used to collect the data?	
How was the data analysed?	
Does the intervention use a particular theory to inform its design?	
3. Participants	
What was the sample size?	
What were the sample characteristics?	
How were participants recruited?	
What were the inclusion and exclusion criteria?	
4. Intervention details	
What was the intervention?	
How was the intervention delivered?	
Who is delivering the intervention?	
In what setting was the intervention delivered? Why was this setting / context chosen?	
Was this setting appropriate to examine the research question?	
Was the intervention designed with the participants (one or both age groups)?	
How were adolescents involved in the intervention?	

How were older people involved in the intervention?	
5. Findings/ Results	
What was the reported experiences of the participants?	
What was the reported experience of the facilitators?	
Did the intervention focus on/ impact on social connectedness?	
Did the adolescents report (or was it reported by others) greater understanding of older people?	
Did the older people report (or was it reported by others) impact upon social connectedness?	
Did the older people report (or was it reported by others) impact upon overall health and wellbeing?	
Did the older people report (or was it reported by others) greater understanding of the younger generation?	
Did the age range of the participants impact upon the success of the intervention? Were there structural barriers here e.g. transport, health issues?	
What themes (qualitative) / headline findings (quantitative) were generated by the study? (around intergenerational programs, adolescents, older people, context in which delivered/ undertaken)	
Are the findings interpreted within the contexts of other studies and theory?	
6. Were the *a priori* theories supported/ confirmed?	
That intergenerational programs involving adolescents and older adults improve social connectedness in the older adult group	
That intergenerational programs conducted in educational contexts result in positive outcomes in social connectedness for one/both groups	
Adolescents and older people are at a similar psychological milestone and therefore are mutual beneficiaries of intergenerational programs	
Older people may be socially disconnected in the absence of loneliness- intergenerational programs help support meaningful connections within the community, with individuals outside of their normal age and social demographic	
Greater generativity is formed through participation in intergenerational programs	
Intergenerational programs conducted in educational contexts build community connections between generations and across structural community assets like schools.	
What new theories were generated by this study?	

SUPPLEMENTARY FILE 6: QUALITY ASSESSMENT

Quality Assessment Criteria	
1	Is there adequate rationale for using this design to address the research aim/ question?
2	Did the authors justify the sample size used?
3	Is adequate evidence provided to support the findings?
4	Quantitative Studies: When comparing / analysing the groups (if more than one), did the authors consider the - Comparability - Confounding variables and controlling for these?
5	Qualitative Studies: Did the researchers consider their own position, assumptions and possible biases?
6	Were the strengths and limitations stated?
7	Was ethical committee approval obtained?
8	How valuable is this research to the review? High, Medium or Low

*Items 1,2,3,5,7,8 from CASP qualitative checklist (CASP 2018a). Items 5, 1 and 7 also from Long (2005). Item 4 from CASP Cohort Study Checklist (CASP 2018b)

REFERENCES

Long A (2005). Evaluative tool for mixed method studies. University of Leeds, School of Healthcare[online]. 24:2017.

Critical Appraisal Skills Programme (2018). CASP (Qualitative) Checklist. [online] Available at: https://casp-uk.net/images/checklist/documents/CASP-Qualitative-Studies-Checklist/CASP-Qualitative-Checklist-2018_fillable_form.pdf. Date Accessed: 17/2/20

Critical Appraisal Skills Programme (2018). CASP (Cohort Study) Checklist. [online] Available at: https://casp-uk.net/images/checklist/documents/CASP-Cohort-Study-Checklist/CASP-Cohort-Study-Checklist-2018_fillable_form.pdf. Accessed: Date Accessed: 17/2/20

Quality Assessment Criteria		de Souza[45]	Kessler and Staudinger[37]	Hernandez and Gonzalez[46]	Wilson, Cordier[47]	Biggs and Knox[48]	Knight, Skouteris[35]	Ostensen, Gjevjon[15]	Santini, Tombolesi[49]	Wilson, Cordier[33]
1	Is there adequate rationale for using this design to address the research aim/ question?	✔	✔	✔	✔	✔	✔	✔	✔	✔
2	Did the authors justify the sample size used?	UNCLEAR	✔	✔	✔	✔	✔	✔	✔	✔
3	Is adequate evidence provided to support the findings?	✔	✔	✔	✔	UNCLEAR	✔	✔	✔	✔
4	Quantitative Studies: When comparing / analysing the groups (if more than one), did the authors consider the - Comparability - Confounding variables and controlling for these?	N/A	✔	✔	N/A	✔	N/A	N/A	N/A	✔
5	Qualitative Studies: Did the researchers consider their own position, assumptions and possible biases?	UNCLEAR	N/A	N/A	✔	N/A	✔	UNCLEAR	✔	UNCLEAR
6	Were the strengths and limitations stated?	✔	✔	✔	✔	✔	✔	✔	✔	✔
7	Was ethical committee approval obtained?	UNCLEAR	UNCLEAR	✔	✔	✔	✔	✔	UNCLEAR	✔
8	How valuable is this research to the review? High, Medium or Low	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	HIGH	HIGH	HIGH	HIGH

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Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

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Primary Subject Heading:	Public health
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Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

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Key words: Intergenerational Program, Older adults, Adolescents, Social Connectedness, Realist Review

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ABSTRACT

Objectives: Limited social connectedness in older adults is a risk factor for poor physical and mental health. Older adults who are socially isolated, lonely and disconnected have a higher risk of chronic illness, depression and premature death. Current literature suggests that improved social connectedness reduces these risks. Intergenerational programs are an effective way to improve health outcomes. Despite this, there is yet to be a review using realist review methods that seeks to identify the circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents.

Design: A realist review methodology was chosen to account for the complexity of intergenerational interventions. Nine studies were included. In line with realist review methodology, iterative data extraction and analysis was conducted to identify the specific contexts, mechanisms, and outcomes of the programs. Specific circumstances were identified to develop theories relating to improved social connectedness in older adults.

Data sources: MEDLINE, PsychINFO, CINAHL were searched using English language limitation.

Eligibility criteria: Included participants were aged 65 and over (older adults) and between 13 and 19 years (adolescents) participating in intergenerational programs from non-familial generations. Studies had to be published in English between 2000 and 2020 and could be quantitative, qualitative or mixed-methods primary research studies.

Data extraction and synthesis: Two independent reviewers used a bespoke data extraction form. All authors were involved in the synthesis process which used the extracted data to illuminate the contexts, mechanisms and outcomes that underpinned reviewed programs.

Results: The nine included studies were set in different contexts, including community organisations, schools and aged care facilities and used an array of interventions including reminiscence therapy, craft, or space for conversation. Despite study heterogeneity, the parallels in psychosocial development between older adults and adolescents were shown to be a likely driver for improved social health outcomes. Programs most likely to improve social health outcomes were those that acknowledged psychosocial development, were delivered in community settings, leveraged pedagogic frameworks, used trained facilitators, and supported participants to build relationships through shared purpose.

Conclusions: This review contributes a logic model to support the design and development of intergenerational programs involving adolescents to improve social connectedness in older adults. Future research to test the logic model in practice is needed.

Strengths and limitations of this study

- This is the first realist review to investigate the circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents
- Comprehensive searches were undertaken with the aim of identifying all relevant published and grey literature.
- A logic model has been developed to support the design and development of intergenerational programs involving adolescents to improve social connectedness in older adults.
- The evidence base is limited for participants living in rural locations and participants with cognitive impairment.

INTRODUCTION

Limited social connectedness is a risk for poor health and wellbeing in older adults[1-4]. Older adults (over 65 years) are at particular risk of social disconnectedness and loneliness because of frailty and chronic illness, which may limit opportunities for social interaction[5, 6]. In addition, modern society has altered family structures, geographically dispersed the family unit and made maintaining intergenerational and family connections challenging, adding to social health vulnerability in older people[7-10]. Many older adults move into residential aged care facilities, away from familiar community supports which may impact social connectedness.

Social disconnectedness, loneliness and social isolation can be as damaging to health and wellbeing as smoking and obesity[4, 7, 11, 12]. Poor health due to acute or chronic conditions, cognitive decline or frailty influences an older person's ability to carry out personal, domestic, social or community activities and in turn increases their risk of social disconnectedness[1, 13, 14]. Older adults who remain socially connected without episodes of isolation or loneliness have lower rates of mental and chronic illnesses such as depression and cardiovascular disease[7, 11, 15-17].

Support for older adults, particularly post-retirement or when faced with cognitive or physical impairment, is essential in maintaining individual social identity and social connectedness with family, friends and the community[4, 11]. The World Health Organization has challenged communities to provide age friendly communities. This global movement is demonstrating the power of building social capital and engaging older adults through community programs and social and environmental infrastructure to support community access[18]. Intergenerational programs have emerged as a popular and beneficial option for bolstering community connections and improving the health and wellbeing of older people[11, 19, 20].

Intergenerational programs are programs where two generations experience mutual benefit through shared experiences[19, 21] and are a known mechanism for improving social connectedness[19] and providing a sense of inclusion and empowerment in older adults[22]. Intergenerational programs bring together and benefit both generational groups[22-26] and have been adopted in a variety of contexts and age groups. These include the use of pedagogic frameworks with school age children[22], service-learning interventions with university students[27, 28] and in familial groups[25].

Several previous reviews have been undertaken on intergenerational programming. For example, systematic reviews by Gualano et al.[19] and Zhong et al.[29] focused on quantitative studies of older adults aged 50 and over and younger people 30 and below undertaken in educational settings. Gualano et al.[19] found that intergenerational programs benefit older people in terms

of keeping active and fighting social isolation, whilst Zhong et al. [29] found that intergenerational programs with young children may bring the greatest health benefits to older people across physical, mental and social domains. Further systematic reviews by Giraudeau and Bailly[30] and Martins et al.[31] included primary research studies of any type focusing on adults over 60[30] and 65[31] undertaken in a variety of community, assisted living, education, and nursing home settings. Giraudeau and Bailly[30] found that intergenerational programs bring mental health benefits for older people, whilst Martins et al.[31] reported that intergenerational programs can lead to reaffirmation of value, greater life satisfaction and improved self-esteem for older adults[31].

In terms of impacts on children, both Martins et al.[31] and Giraudeau and Bailly[30] focused on pre-school and primary school children and found that intergenerational programs improved children's perceptions of older people. In addition, Martins et al.[31] further found that for children, intergenerational programs led to higher self-esteem, better academic performance, improved social skills and a greater motivation to learn. Gualano et al.[19] also found that intergenerational programs improved younger people's perceptions of older people. Of these systematic reviews only Giraudeau and Bailly[30] outlined circumstances that may lead to a successful intergenerational program model, stating that to be successful, intergenerational programs should provide all the participants with a sense of being useful and competent and take time to prepare younger and older people by encouraging communication between the groups before the program begins.

A further relevant review undertaken in this area is a recently published realist review by Phang et al.[32]. This work focused on digital intergenerational programs explicitly geared towards reducing loneliness or social isolation in older adults undertaken in residential or community settings. The review identified four circumstances by which digital intergenerational program may reduce loneliness and social isolation for older adults. For community-dwelling older adults, training in digital technology and support from nurses helped to reduce loneliness. Phang et al.[32] further found that a video call with a student or family reduced loneliness among older adults residing in long-term residential care facilities, whilst videoconferencing with a lay coach may also reduce loneliness in adults who are lonely.

The above shows that whilst there is substantial evidence supporting intergenerational programs as an effective strategy to achieve improved physical and social health and wellbeing in older adults, there is yet to be a review of programs that involve adolescents specifically. Intergenerational programs involving older adults and preschool or young children have been reported in the primary research literature [14, 21, 22, 28], however those that pair adolescents (individuals aged 13-19) and older adults are less known[33]. Pairing older adults and adolescents

through intergenerational programs is modelled on Erikson's theory of psychosocial development[34, 35]. According to Erikson's theory, adolescents and older adults are both facing a period in their psychosocial development focused on identity. Adolescents, emerging from childhood are looking to their peers to 'fit in' and to understand society through the eyes of others. Older adults, particularly the recently retired, are trying to maintain their identity, with a desire to contribute to society[36]. This motivation to pass on wisdom to the next generation is termed generativity[34, 35] and is important for the wellbeing of older adults as well as broader social health[4]. Intergenerational interactions through family or a formal program support the development of generativity[34, 35, 37]. The likely benefits of this generational pairing in an intergenerational program context are yet to be reviewed in depth.

This realist review aims to identify the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. The question underpinning the review is – which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescents.

METHODOLOGY

A realist review methodology was undertaken in line with the RAMESES publication standards[38]. The RAMESES checklist for this study is available in Supplementary file 1. Realist review provides a framework for understanding complex interventions and *why* they deliver the outcomes they do[39]. A protocol for the review was developed following the stages outlined by Pawson[40] and included (1) locating existing theories, (2) searching for evidence, (3) selecting articles, (4) extracting and organising data, and (5) synthesising the evidence and drawing conclusions. This is available in Supplementary file 2.

A realist review is an approach used for systematic evidence review that utilises secondary data to understand the reasons why a particular set of contexts, mechanisms and outcomes lead to a particular result. Contexts are the circumstances in which the program is delivered and how these interact with the program mechanisms. Mechanisms are the program resources, and the way participants interact with them. The result of context and mechanism interaction is what drives a particular outcome to occur. Realist review utilises generative understanding to iteratively build *a priori* theories that are then tested and refined. The *a priori* theories are initially drawn from available literature and through stakeholder consultation. Realist review uses the lenses of context, mechanism and outcome to appraise, synthesise and then test the recommendations that are constructed through the analysis process[38, 39].

Step one: a priori theory development

The development of *a priori* theories was an iterative, two-part process[38, 39, 41] and was undertaken by JS and DA. This included stakeholder engagement and a scoping search of the peer-reviewed and grey literature on the subject, followed by *a priori* theory development that were tested against the literature and information from initial stakeholder meetings.

Search strategy

A literature search was undertaken between May and July 2019 by JS and DA. An updated search was completed in June 2020. The search strategy was developed with the support of a La Trobe University librarian. MEDLINE, PsychINFO, CINAHL were searched using English language limitation.

The search terms were (Aged OR "older adult" OR senior OR elder* OR geriatric OR "old* person*") AND ("intergenerational relation*" OR "intergenerational program*" OR "intergenerational activit*" OR "intergenerational practice" OR "intergenerational learning" OR "intergenerational service learning" OR “intergenerational relations” OR intergenerational) AND ("social connect*" OR "social isolation" OR "social interact*" OR loneliness OR "social

participation") AND ("adolescent"). MeSH terms used were "Aged" OR "Aged, 80 and over) and "Intergenerational relations".

Google Scholar was used to supplement the search using a simplified search terms list. Grey literature used the same search terms and was accessed via websites, including relevant government and non-government websites including Australian Federal and State Government agencies, Not-for profits and the World Health Organization. Reference list searching was also used. The full search strategy is available in supplementary file 3.

Patient and public involvement

No patients or members of the public were involved in this research.

Stakeholder engagement

The idea for this review came from a collaboration involving the authors, a municipality in regional Victoria, Australia, and a high school located within that municipality. Originally, the collaboration was centred on the development and evaluation of a pilot intergenerational digital literacy program involving adolescent school pupils and older community-dwelling individuals. However, during the initial stages of designing the program, the authors identified there was an absence of review-level evidence regarding intergenerational programs involving adolescents and older people. A decision was made to undertake a realist review on this topic. Municipal and high school collaborator stakeholders, namely senior teachers, municipal project officers and positive ageing ambassadors, were involved in the process of generating *a priori* theories by contributing information on the need and opportunity for intergenerational programs in the school

Study selection

The inclusion and exclusion criteria were applied by JS and DA to ensure the included studies met the aim of the review. Included participants were aged 65 and over (older adults) and between 13 and 19 years (adolescents) as these age ranges are agreed as defining older adults and adolescents[34] in early theories from Erikson on psychological development. Other studies addressing intergenerational programs use Erikson theory, so this was chosen to align with the current literature [31]. To be included in the review studies had to report on intergenerational programs with participants from non-familial generations. Studies had to be published in English between 2000 and 2020 and could be quantitative, qualitative or mixed-methods primary research studies. The full inclusion and exclusion criteria can be viewed in supplementary file 4.

a priori theory *development*

JS and DA developed six *a priori* theories and tested these against the literature before conducting a final literature search to check for new evidence.

Step two: data extraction and evidence synthesis

In step two, data extraction and evidence synthesis from the nine included studies was undertaken.

Data extraction

A data extraction form (supplementary file 5) was developed by DA and JS and included the *a priori* theories identified in step one. The data extraction form covered several domains including bibliographic information, aims and methods, participant details, intervention details, results and findings. The form also provided for *a priori* theory testing including extraction of evidence that proved, disproved or refined the theory. The data extraction process was completed by JS and DA.

Quality appraisal

A realist review method supports the inclusion of qualitative, quantitative and mixed methods studies[38, 42]. To understand the quality of included articles, we consulted critical appraisal literature[43, 44]. A tool comprising eight quality assessment criteria were developed focusing on the methodological quality and reporting quality of the included studies (supplementary file 6). Quality appraisal was conducted by JS and DA with any conflicts managed via team discussion.

Synthesis

All authors were involved in the evidence synthesis process using extracted data to illuminate the contexts, mechanisms and outcomes that underpinned reviewed programs. The process then involved identifying evidence combinations and testing them against the *a priori* theories to develop context mechanism outcome configurations (CMOC). The development of the CMOC presented a variety of emergent issues that were continually tested against the *a priori* theories and the known evidence. This process identified new theories and the CMOC were further refined. Ethics approval was not required for this study.

RESULTS

Data from the included studies were synthesised to generate eight theories relating to characteristics of intergenerational programs likely to optimise social connectedness for older adults. The components of these theories are combined to form context mechanism outcome configurations (CMOC) and a logic model to support answering the question – which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescents? Figure 1 below provides the results of the literature search. Nine studies were included in the review. Five were qualitative, two quantitative and two mixed were methods. The overall participant characteristics were a mix of male and female older adults and adolescents, living in the community and participating in weekly or monthly programs over a set period. The settings in which the programs took place varied, including schools, aged care facilities and community group spaces such as Men's sheds.

***Insert here Figure 1: Flow Diagram**

Table 1: Included study characteristics.

Included Study	Study details	Study aim	Sample characteristics	Summary of findings	Use of a facilitator	Pre-program training	Data collection and analysis
de Souza[45]	Qualitative; School (Brazil); Older adult participants shared life experiences with students in a classroom environment.	Intergenerational program evaluation from participant viewpoint.	84 randomly selected students; Age 13-19 years; 26 older people; Age 60 years +; Male and female groups.	The intergenerational activity based on reminiscence improved social interaction and community wellbeing for older adults.	Unclear	No	Focus group interviews followed by thematic analysis
Kessler and Staudinger[37]	Quantitative; Laboratory (Germany); Interaction between an Older Person and Younger Person, Two Older People or Two Younger people addressing a "life problem" or a "media problem".	To understand if intergenerational interactions have the potential to facilitate psychological functioning in both adolescent and old age.	Older women aged 70-74 n=90 and girls aged 14-15 n=90	Improved cognitive performance, reduced negative age-related stereotypes and triggered generative behaviours.	No	No	Data collected by a series of survey, psychometric and cognitive tests. Analysis completed using planned comparisons
Hernandez and Gonzalez[46]	Quantitative; Local council social centre (Spain); Weekly recreational activities (talks, excursions, cultural events). 32 interactive session "movement program".	To investigate the effect of an intergenerational program on stereotyped attitudes towards elderly people and the wellbeing of older adults.	101 elderly people; across two groups, age M= 74 (SD=7.7) and M=75 (SD= 5.21); 179 university students; Age M=19 (SD= 0.93); Both male and female participants.	Improved outcomes in depression measures in older adults who participated in an intergenerational exercise group.	Yes	Yes – adolescents only	Pre and post sessions that included questionnaires and geriatric depression scale. Analysis via repeated measure analysis of variance (ANOVA)
Wilson, Cordier[47]	Qualitative; Men's shed (Australia); 10 week intergenerational mentoring program over with older male mentors offering support to younger at risk males	To explore the experiences and perceptions of mentors involved in an occupation skill focussed program with teenage boys.	9 teenage boys; Age ~15 years; 6 older male mentors; Age 60-75; a project facilitator and a; youth worker. All participants were male.	Intergenerational programs involving older adults with a strong sense of generativity were shown to be a valuable resource to communities.	Yes	Yes- both groups	Pre and post Individual interviews and focus groups with both groups however only reported on data from older adult participants using constant comparative method of grounded theory

Biggs and Knox[48]	Qualitative; Residential care/ assisted living (USA (Texas)); Girl scout meetings held in assisted living facility	To identify impact of an intergenerational program for girl scouts (young people) and residents (older people) on quality of life, social interaction and personal attitudes.	Focus groups comprised of parents = 8, residents = 5, staff = 10, children (scouts and daisies) 5-12 years = 9; Content essay participants ages 6-16: n= 18; All participants female.	Intergenerational programs using social workers and community volunteers strengthened intergenerational relationships.	Yes	No	Focus group interviews with both groups and submitted essays from the younger participants followed by hematic analysis
Knight, Skouteris[35]	Mixed Methods; Residential aged care setting (Australia); Development of a life story review book by adolescent students partnered with an older adult.	To pilot and test the feasibility of an intergenerational program "My Life Story".	Adolescents n= 24; Age M= 14.56 (SD=0.5); Older adults n= 12; Age M=90.58 (SD=3.59); Gender of participants not stated	Improved social connectedness and community engagement resulted from an intergenerational program using reminiscence.	Yes	Yes- both groups	Qualitative data collected (post) using semi-structured interviews and quantitative data collected (pre and post) using a series of items followed by thematic analysis and paired t-tests.
Ostensen, Gjevjon[15]	Qualitative; Residential care facility or private home (Norway) Sessions over a 12-month period with volunteer adolescents supporting older adults to learn use of a tablet device.	To explore a new model of care that supports older people to participate by introducing technology and mobilising volunteer services.	Older adults n= 15 (5 withdrew due to illness, death and hospitalisation); Adolescents n=not stated; Age 54-94 years; Both male and female participants.	Reduction in anxiety and increase in social activity for older adults followed an intergenerational program supporting older adults to use an iPad.	Yes	Yes- adolescents only	Individual semi structured interviews repeated over a 12 month period with the older adults only followed by thematic analysis
Santini, Tombolesi[49]	Qualitative; Residential aged care facility (Italy); Intergenerational activity based meetings with aged care residents, older adult community volunteers and adolescents.	To understand if creating community space and planning activities where adolescents, older adults, and active older volunteers meet and interact will improve health outcomes for older adults.	14-year-old students n=25 (18 males and 7 females) and three teachers; 16 older residents; Age M=83; three social workers; 16 older volunteers; Age M=70	The intergenerational program improved the wellbeing of institutionalised older adults.	Yes	Yes- both groups	Individual and focus groups Interviews with students; individual interview with older adults; focus groups with volunteers before, during and after the intervention followed by content analysis
Wilson, Cordier[33]	Mixed methods; Men's shed (Australia); Intergenerational mentoring program with older adults and young adults with intellectual disability.	To examine the feasibility of a novel Men's Shed intergenerational mentoring intervention for young adults with intellectual disability.	5 mentees (average age 16); Older adult mentors n=12; Age M=69.5 (SD=8.53); All participants were male.	Intergenerational mentoring interventions for youth with intellectual disability at community Men's Sheds were shown to be feasible and appropriate.	Yes	Yes- older adults only	Quantitative data via pre-and post-intervention outcome measures and descriptive data of mentees' functional skills. Qualitative data collected at end of project via individual interviews with mentees and mentors. Used realist evaluation method

The characteristics of the included studies are provided in Table 1. In phase two of the review, data was analysed to 1) confirm the degree to which the a priori theories identified in phase one (see Table 2) were supported and 2) generate the contexts, mechanisms and outcomes from the included interventions.

Quality Assessment

In line with recommendations for realist reviews[40] no studies were excluded following quality assessment, rather each study was ultimately assessed for its contribution to theory development and context mechanism outcome configurations. The quality assessment of each included study concluded with an overall estimate of how valuable the study was to the review (Low, Medium or High), a criterion based on Question 10 of the Critical Appraisal Skills Programme qualitative quality assessment tool[50]. The assessment concluded that majority of studies (7/9) were found to be of high value to the review[15, 33, 35, 37, 45, 47, 49]. These studies were rated as highly valuable due to the age range of participants fitting directly with the aims of this review and because they reported on intergenerational programs in detail and provided ample evidence to support their findings, facilitating the analytical process for this review. The Biggs et al.[51] and Hernandez and Gomez[46] studies were rated as being of medium value to the review. Biggs et al.[51] was assessed as lacking on detail with regard to the reporting of the findings, whereas Hernandez and Gomez[46] had limited age group relevance to the review aims as the younger age group had an average age of 19.

Table 2: *a priori* theories identified after step one

Intergenerational programs involving adolescents and older adults improve social connectedness in the older adult group.
Intergenerational programs conducted in educational contexts result in positive outcomes in social connectedness for one/both groups.
Because they are at a similar point in psychosocial development, adolescents and older people are likely to be mutual beneficiaries of intergenerational programs.
Intergenerational programs help support meaningful connections for older people who may be socially disconnected within the community, with individuals outside of their normal age and social demographic.
Greater generativity is formed through participation in intergenerational programs.
Intergenerational programs conducted in educational contexts build community connections between generations and across structural community assets like schools.

When coupled with the *a priori* theories generated from phase one, context mechanism outcome configurations (CMOC) were developed. The CMOC are eight circumstances deemed optimal for the delivery of intergenerational programs involving older adults and adolescents and are hypothesised to improve outcomes in social connectedness. These are summarised in Table 3 below.

Table 3: Summary of Context Mechanism Outcome Configurations

CMOC label and summary-level description	References of included studies
CMOC 1 Understand the participants psychosocial development phase and attitudes towards each other to foster generativity Adolescents and older adults are at a similar crossroads in the formation and maintenance of their identity[34] (context). Understanding the developmental phase and held attitudes of the participants (context) supports the design of program training activities (mechanism) and 'ice breakers' (mechanisms) that foster reciprocity (mechanism) and are more likely to trigger generativity (outcome) between the generational groups and improve social connectedness (outcome).	**All included studies**
CMOC 2 Use a pedagogic framework to trigger generativity, intercommunity connections and deliver social health outcomes Pedagogic frameworks (context) motivate the adolescent to participate in intergenerational programs and achieve a result[35, 45, 48]. Similarly, the older adult is motivated to transfer skills and wisdom and provide support to the adolescent so as they can achieve their goal (mechanism). As a result, social connectedness and attitudes (outcomes) towards the other generational group improve.	**All included studies**
CMOC 3 Design the program to be frequent and have a clear structure to support participation and improved social connectedness Pedagogic frameworks (context) provide structure. Programs that are co-designed and scheduled frequently allow relationships to form through shared goals and activities (mechanisms). Frequent and carefully structured programs allow for improved social connectedness, and sustainable health and community benefits (outcomes).	**All included studies**
CMOC 4 Conduct the program in community settings to support social health outcomes and build social capital Community settings including educational institutions, care homes or existing community groups provide a foundation for engagement (context) when delivering intergenerational programs. Programs that showed a strong connection to the community through their facilitators (mechanism) or the physical environment (mechanism) showed improved sustainability and generalisability for the participants and the broader social capital of the community (outcome).	**[15, 33, 35, 45-47, 49]**
CMOC 5 Deliver pre-program training and support participants to 'break the ice' Utilising existing community settings and knowledge of psychosocial development, (contexts), pre-program training (mechanism) and activities that support participants to connect on a more informal level (mechanism) work together to bridge gaps between the generations (outcome).	**[15, 33, 35, 45-47, 49]**
CMOC 6 Identify shared goals between program participants to build reciprocity and support program engagement Through use of pedagogic frameworks and existing community links (contexts), the identification of shared goals builds reciprocity (mechanism) between the participants and in turn may trigger benefits including a greater sense of generativity (outcome), improved wellbeing (outcome) and social connectedness (outcome).	**[15, 33, 35, 45-47, 49]**
CMOC 7 Include a trained facilitator to promote program participation	**[33, 35, 45-47, 49]**

In a variety of contexts, the inclusion of a program facilitator (mechanism) may support improved social connectedness (outcome). The other key function of a facilitator is to ensure that the participants have had the opportunity to 'break the ice' (mechanism) through pre-program training and informal opportunities such as morning tea times.	
CMOC 8 Plan inclusive activities that trigger generativity and improve physical, cognitive, psychological and social outcomes When programs use existing community connections, include relationship-based activities with a shared goal (mechanisms) and are grounded in a pedagogic framework (contexts), there is improvement in health and social wellbeing (outcome) and a sense of generativity for the older adult group (outcome).	**[15, 33, 35, 37, 45-47, 49]**

CMOC 1 Understand the participant's psychosocial development phase and attitudes towards each other to foster generativity and connection

In the included studies, pre-program psychometric measurement[33, 35, 37, 46], focus groups or interviews[47] and informal gatherings at the beginning of the program[15, 33, 35, 46, 47, 49] were used to understand the demographic and psychosocial characteristics of participants. Psychometric scales that measured attitudes towards ageing, social connectedness, loneliness, generativity and presence of depression were completed pre and post intervention[33, 35, 37, 46]. Pre-program focus groups and interviews were used with both groups[33, 47, 49] to understand participant skills and motivations. This information was used to align participants based on skills and expectations, understand participant relationships with other generations, their attitudes towards ageing and their perceptions of self [49]. Understanding baseline attitudes helped structure programs to promote alternate views of an older person's capability, foster dialogue and enhance learning between generations.

Evidence from the included studies indicates that using pre-program measures to understand participant demographics, including their psychosocial phase and cognitive and physical abilities leads to a more likely match in participant capability and outcomes that improve social connectedness and generativity.

CMOC 2 Use a pedagogic framework to trigger generativity, intercommunity connections and deliver social health outcomes

Pedagogic or service-learning frameworks support participants to learn together in a real-world context[5, 52] and featured in six of the included studies[33, 35, 46-49]. Studies that involved school students were aged between 13-19 years with 15 years the average age across studies[33, 35, 45, 47, 49]. Two studies[35, 49] involved students completing a report or a community presentation, whilst others involved students completing a small woodwork project[33, 47]. These tasks were curriculum linked[35], motivating adolescent participants to complete the task. Older adults reported they felt needed when they were contributing to adolescent's learning and

acknowledged the adolescent's contribution to their own learning - *"they can teach us the computer and their new language"[49]*

Through the use of a pedagogic framework, results showed improved understanding and respect for the other generation[47, 48] and older adults gained a sense of pride in being able to pass on their knowledge and wisdom. These findings provide evidence that in pedagogic contexts, where reciprocity is formed, it is likely that an improvement in perceived social connectedness and wellbeing will occur for the older adult.

CMOC 3 Design the program to be frequent and have a clear structure to support participation and improved social connectedness

Frequency and duration of sessions

Programs that used a pedagogic framework were usually linked to a school term or semester[33, 45-47, 49]. These programs ranged from six to twelve - week blocks, often repeating over school terms. Programs that were held weekly[15, 33, 35, 46, 47], fortnightly[45, 49] or bi-monthly[48]. Biggs and Knox[48] reported less frequent sessions were chosen to avoid overwhelming the participants, compared to other participants who requested more frequent and extended program sessions so they could spend more time together[33, 45, 47, 49].

Structure of sessions

A clear program structure that included pre-training and time for "breaking the ice"[33, 47] was reported as beneficial. Typically, studies used the session to engage and introduce participants or complete training and the following weeks to cover different topics or questions relating to the aim of the study. In the Ostensen[15] study, older adults raised learning goals that formed the structure for the week ahead. Overall, evidence suggests that having a structured program that allows frequent interaction between generational participants is more likely to result in improved social connectedness and optimised health and wellbeing.

CMOC 4 Conduct the program in community settings to support social health outcomes and build social capital

Intergenerational programs that occur in community settings provide a platform for building social capital[4, 9, 26]. Four studies conducted programs in residential care facilities using existing community connections such as local youth clubs and schools that were geographically close by [15, 35, 48, 49] and two others[33, 46, 47] leveraged local community programs (volunteer groups). Evidence suggested that community-based programs had greater potential in enhancing social health outcomes for older adults and generating social capital in the broader community. In the Biggs and Knox[48] study, older adult participants began attending church with the families of the adolescents, demonstrating connections beyond the program. Similar results were reported

in the de Souza[45] study with older participants reflecting improved mood, physical wellbeing and a '*feeling of freedom'* (*p. 467)*, through their opportunities to get out of the facility and spend time with the adolescents in the community. The location, existing relationships between community organisations and activities that support participants to observe the other generation playing a role in the community are all positive predictors of a likely improvement in individual and community social connectedness and wellbeing.

CMOC 5 Deliver pre-program training and support participants to 'break the ice'

Pre-program training was provided in six of the nine included studies. Training was offered to older adults and the adolescents[33, 35, 49], to older adults only[33] or to adolescents only[15, 46]. Training included program orientation or the opportunity to learn about the other generation.

Where training was provided to both the adolescents and older adults, this appeared to foster social connections. For example, the adolescents shook the hands of the older gentleman at the beginning and end of each session. This positive social behaviour was felt by the older men to be respectful and demonstrated social connectedness between the groups[47]. However, in the Santini[49] study, despite the pre-program introductory material, students reported that they required support from teachers and older adult volunteers to overcome their emotions when they met with the older adults for the first time.

The Wilson et al[33] program provided training to the older adult mentors only. This training provided the mentors with disability awareness training via videos. Despite this, it was highlighted by the older adults that they would have liked to have been more prepared for working with the adolescents with intellectual disability. Two studies provided training to adolescents only[15, 46] however did not report on the impact of this training.

In studies where no formal pre-program training was provided, results were mixed in relation to the impact on the program. In the Kessler and Staudinger[37] study, the randomised control trial methodology required pre-program blinding. In the Biggs and Knox[48] study, the participants were already involved in an existing Scouts program, so it is assumed that pre-program education was included in Scout club activities, however, this was not reported by the authors. Parents of the adolescents in the Biggs and Knox[48] raised concern about their children's reactions to residents with dementia or if a resident died. There were also reports from the residents and parents that boundaries and behaviours were not respected by the adolescent participants. These examples indicate a role for pre-program training to reduce fears and provide education. Where training or opportunities to interact were sub-optimal or missing, participants highlighted limited opportunities to 'get to know' each other or feel prepared for the program[33, 45]. If comfort or confidence in the program is not established, participants may not participate[45] or be reluctant

to participate again[33]. This has broader implications for the sustainability of program outcomes, particularly those that aim to enhance social capital or galvanise links between community groups.

CMOC 6 Identify shared goals between program participants to build reciprocity and support program engagement

By understanding the shared aims of participants, reciprocity is nurtured, participants are more motivated, and generativity is triggered. Where participants were involved in program design[46, 49] as well as iteratively throughout the course of the program[15, 48] the program was more person centred, enhanced reciprocal behaviours and improved outcomes.

The Santini[49] study used an action participatory research approach with active older adult volunteers, social workers and teachers and Hernandez and Gonzalez[46] used a co-design approach through adolescent students designing an exercise program for older adults that was delivered with support from lecturers and trained facilitators over 32 sessions. Both generations benefited in these programs, with results indicating a positive shift in age related stereotypes when older adults and adolescents interacted as part of the program.

In programs where there was a shared goal from the outset there was greater improvement in social connectedness[33, 35, 47, 48], reduced markers for depression[46] and stereotypical attitudes towards the older generation[48]. The included studies demonstrate that creating reciprocity drives generative behaviour. Reciprocity and generativity combined leads to improved social connectedness and health and wellbeing outcomes for the individual and the community broadly.

CMOC 7 Include a trained facilitator to promote participation

Facilitation is the act of supporting and enabling a group to meet its objectives (and release its full potential) by fostering conditions that respects and encourages contributions by all members of the group[53]. Facilitation was used in seven of the included studies. The facilitators were trained professionals including teachers[35, 49], university staff[46], fitness instructors[46], health professionals[15, 33, 48], community leaders[48] and youth workers[47]. In the Santini[49] study, active older volunteers also played a facilitation role. Studies that included a facilitator resulted in greater participant interaction and improved program outcomes[33, 47, 49]. In the Wilson et al study, the youth worker that facilitated the program was described as responsible for *"keeping us on track"*[47] and was pivotal in prompting participation between the groups, for example at afternoon tea breaks.

In the study involving girl Scout groups[48], the troop leaders were trained social workers. Whilst their individual experiences were not reported in the findings, the role they played in bringing together individuals connected to existing community settings in girl Scouts, residential aged care

and volunteer groups was fundamental in the program longevity and results. In four studies, active adult[33, 47, 49] and adolescent[15] volunteers were recruited from local community volunteer groups and provided additional program facilitation support that likely enhanced positive outcomes in community engagement and social connectedness.

Conversely, in studies where the facilitation was reported as being sub-optimal[33] or absent[45], the participants and the authors highlighted that greater support from the teachers, researchers or 'monitors' would have enhanced interactions between the generational groups. If facilitation is absent or lacking, participants may feel frustrated or unsupported, in turn causing participant disengagement, attrition or an unintended triggering of age-based stereotypes or perceived loneliness[49]. Trained facilitation supports improved connectedness between participants and when delivered within community and pedagogic contexts, favourable outcomes in generativity, social connectedness, and social capital.

CMOC 8 Plan inclusive activities that trigger generativity and improve physical, cognitive, psychosocial, and social outcomes

Included studies reported on programs that provided relationship-based inclusion[35, 45, 48, 49] and activity-based inclusion[15, 33, 46, 47] opportunities for participants.

Relationship-based inclusion:

If there is limited opportunity for relationship-based inclusion, adolescents and older adults are at risk of not experiencing meaningful social connection[35]. Feeling included by peers and the broader community promotes generativity and in turn improves wellbeing in both age groups[23, 35]. Several programs[35, 45, 48, 49] used relationship- based inclusion activities such as reminiscence (sharing old photos or learning about what jobs older people used to do) to create reciprocity between older adults and adolescents. This was also a mechanism to improve physical, cognitive, and psychological health, and in turn social connectedness. A marker of sustained relationships was demonstrated by the adolescents continuing to connect with older adults after the program[35, 49], including volunteering at a local community organisation with older people.

Activity-based inclusion:

Studies that used activity-based inclusion such as exercise programs[46], digital literacy training with an iPad[15] or woodwork construction[33, 47] also reported improved outcomes in physical, cognitive, psychological and social domains, including social connectedness. In the studies set in Men's Shed's the young adults were mentored by the older men in occupational activities, with both groups reporting the activities provided the opportunity to connect, whilst learning new skills and doing *"something with our hands"[47].* Young adults with intellectual

disability commented that the Men's Shed was a unique learning environment - *"they made me feel like part of the group"* and that they *"felt accepted"*[33]. Older adults supported to use a tablet device[15] demonstrated improved social outcomes as they were able to connect with family in other locations or the outside community through news applications or by tracking weather. Nurses in the care facility reported a change in social behaviour in the participants using iPads, taking more initiative, presenting as less anxious and being more socially active. In the Hernandez and Gonzalez[46] study, the interaction between adolescents and older people showed statistically significant improvement in depression scores and stereotypical attitudes in the older adult group. A comparison group led by the adult trainer resulted in a less significant change in depression scores in the older adults (Group 1 with adolescents= $p<.001$; Group 2 led by adult trainer = $p<.008$). The control group (who attended the local social centre but did not interact with the adolescents or participate in exercise sessions) showed a statistically significant increase in depressive symptoms ($p<.001$). The evidence supports activities that provide the participating generations with the opportunity to share time, reminisce and develop relationships are powerful mechanisms for triggering generativity and social connectedness.

Logic model

The aim of this review is to identify the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. The logic model below represents the relationships between program activities and improved social connectedness for older adults. As demonstrated through the CMOC, the act of two generations coming together in familiar community-based contexts with a shared purpose, resulted in strengthened relationships and community connections. Several participants in the included studies spoke about the benefit of having an opportunity to 'meet and greet' for example by sharing an afternoon tea as part of the program[33, 35, 47-49].

This logic model (presented in Figure 2 below) uses a nested visual to represent an optimal intergenerational program to improve social connectedness in older adults. The circumstances being the outer circle, with the mechanisms within that, driving the outcomes at the core.

***Insert here_Figure 2: Logic model**

DISCUSSION

Evidence from the included studies reveals how intergenerational programs involving adolescents can address issues of social disconnectedness in older adults. This review identifies how and why intergenerational programs work, for whom and in what circumstances. Broadly, the CMOC cover four main themes - 1) psychosocial and mental health, 2) physical and cognitive health, 3) program design and structure and 4) community engagement and social capital.

Psychosocial and mental health

Providing opportunities for older adults to participate, without being infantized or inequitably treated is highlighted by the included studies and others as a mechanism for improving reciprocity and generativity[20, 37, 54]. The opportunity to participate in an intergenerational program saw older adults improve their own self-image and stereotypical view of old age and prove to themselves that they still had something to offer the community and the younger generation[45, 46, 49]. Included programs that created opportunities for informal, relationship-based activities which triggered generativity, for example promoting conversation between the generational groups, were of greatest benefit to psycho-social health[35, 45, 49].

Physical and cognitive health

The impact of intergenerational programs on broader health outcomes, including cognitive health has been previously reported[14, 55]. The connections between social, cognitive and physical health are well known, particularly in high-risk populations like older adults[56-58]. In this review, interventions that promoted the older adult as wise or expert[33, 35, 37, 47, 48] showed improvement in both perceived and measured cognitive performance. Kessler and Staudinger[37] showed improvement in speed of processing and word fluency when older adults were paired with an adolescent and asked to solve a 'life problem'. Qualitative evidence from included studies reported improved physical health in older adults as a result of their involvement in the intergenerational program, including increased energy[33] reduced pain[49] and increased movement[45].

Program design and structure

A range of designs and structures are reported in the intergenerational program literature. Intergenerational programs embedded within pedagogic contexts are supported by existing literature[26, 59, 60] and were featured in many of the included studies. Several studies support the need for in depth, sustainable and accessible intergenerational programs to address social health issues[19, 61]. As highlighted by Cattan et al.,[62] programs that engage adults in the planning and design of the interaction are most effective. This was seen in the Ostensen[15] study and the Wilson et al.,[33] study that highlighted the use of co-design to optimise outcomes.

Martins et al.,[31] in a review of intergenrational programs also highlighted the benefit of weekly or fortnightly intergenerational meetings to create bonds between participants.

Several of the included studies highlighted the importance of informal and formal program structures to build a foundation for connection. Several interventions leveraged existing local community connections and pre – program training was shown to support participation[33, 45, 49]. However, where complex demographics exist, additional program support may be required[33, 45, 49].

Community engagement and social capital

Programs set in the community that leveraged existing community connections were more likely to promote social connectedness. Individuals already engaged with the community in a volunteer capacity were participants, and in some cases facilitators of the program. Other reviews[21] support the inclusion of volunteers as it is a cost effective way to deliver programs and promote volunteerism- a key element for enhancing social capital. Volunteers were used in the included studies to support program delivery and participant recruitment via community organisations like Rotary or Scouts[15, 33, 47-49]. Adolescents also witnessed volunteer 'models' and were interested in volunteerism beyond the program[15, 35, 49].

Strengths and limitations of this review

This realist review explored intergenerational programs that specifically involved adolescents and their impact on social connectedness in older adults and developed inclusion and exclusion criteria to reflect this aim. Whilst these criteria generated a targeted group of studies for review, there may have been additional studies missed. The included studies showed some collective limitations including a lack of participant diversity in regard to gender and rurality. From the information reported, most studies were conducted in metropolitan environments. The importance of building capacity in rural communities to protect the social health of older adults is supported by Hodgkin et al.[6] and this lacking insight is one limitation of this review. In regards to gender, three studies specifically recruited based on gender given they were located in Men's sheds[33, 47] or focused on girls scouts[48], however in other studies where gender did not appear to be a structural factor, there was a greater proportion of women over men who participated. This is a possible limitation of the review along with the limited participation of older adults with cognitive impairment, particularly in quantitative measurement[15, 35, 48]. There were also noted limitations in the quality of some studies with a paucity of evidence from the intervention, however these studies remained included in the review given their value to the overall review question and the commitment in realist methodology not to exclude solely based on quality of evidence[38]. An additional limitation is that only studies published in English were considered.

This review is however strengthened by its specific focus and that it is the first realist review to explore the impact of intergenerational programs specifically involving adolescents on social connectedness in older adults. In addition, the review included a variety of study methods including one randomised control trial. The inclusion of evidence developed using a variety of methods is supported by the realist review methodological standards as it provides a broad view of existing literature and evidence is included based on its value and contribution to the review aim, rather than singularly on methodological type. As a result, the included studies report on a variety of different programs from several major continents. Whilst this heterogeneity may be viewed as a limitation, the realist method supports using a wide range of evidence to understand the circumstances in which complex interventions deliver an intended outcome. The review may have been further strengthened by the opportunity to test the program theories and logic with stakeholder groups.

Implications for practice and future research

This review has provided a logic model that is ready to use by clinicians, program managers and policy makers in the design and implementation of community based intergenerational interventions. This review has implications for targeting physical, social, and mental health in older adults, as well as exploring opportunities for the role of intergenerational programs in adolescent health. Furthermore, the program theory provides a suggested approach for designing programs with a broader system lens. Previous literature has also supported the use of intergenerational programs[63], in particular those with a social health focus, to counter loneliness[64], influence age related health outcomes[17] and reduce costs associated with increased care needs in older age[15, 65].

The review also provides support for the inclusion of intergenerational programs into the curriculum to influence adolescent career choices and to improve attitudes towards older people[35, 45, 49]. Included studies also called for intergenerational programs to be a “systematic component of care provision”[49] for older adults living in residential aged care, including additional resources, changes to models of care and staff training[15].

Future research where intergenerational interventions are 1) designed using the program theory as articulated within the logic model and 2) tested with stakeholders, may support further understanding what works for whom, and in what circumstances. Realist evaluation or other published frameworks like the 6-SQUID model[66, 67] are methodological options for future projects. This style of participatory research generates community will and engagement and supports sustainability without major resource investment, as the community itself ‘owns’ and is

committed to the intervention they have designed. Future research would also benefit from addressing the same theory in comparative or specific settings[39], such as in aged care settings or community groups like Men's sheds.

CONCLUSION

This review has identified the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. Findings have provided a logic model outlining how intergenerational programs involving adolescents are likely to improve social connectedness for older adults and builds on the evidence that social connectedness and social networks are protective for immunity, reduced depression rates and a reduced risk of frailty[16, 56, 68].

In addition to the psychosocial development theory, this review has uncovered the optimal circumstances that promote social connectedness for older adults. These include setting programs in the community, including a trained facilitator, leveraging a pedagogic framework and finding shared goals between participants. Structural elements such as pre-program training and frequency of sessions was shown to be important in delivering relationship bonds between older adults and adolescents, that trigger generative behaviours and greater perceived social connectedness. Intergenerational programs involving adolescents are a possible solution for enhancing social connectedness and health outcomes for older adults.

Authors' contributions

JS, HV and DA conceived of the project and contributed to the development of the manuscript. JS led the review, HV and DA were the co-reviewers. All authors read and approved the final manuscript.

Conflict of interest declaration

The authors declare no conflict of interest and take sole responsibility for the content of this article.

Data sharing statement

All included articles are available publicly. The data extracted from these articles can be made available upon request.

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Ethics Approval

This study did not require ethical approval

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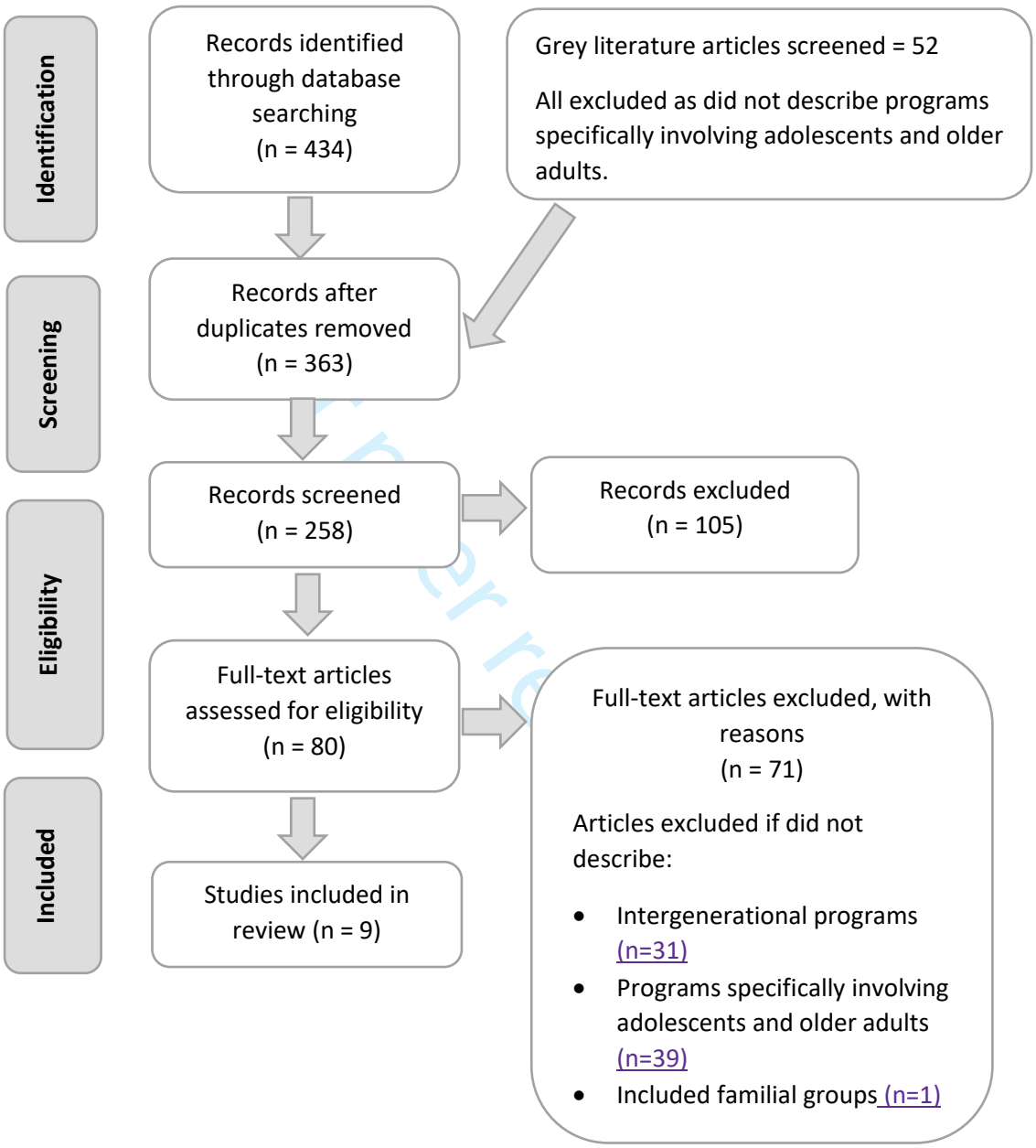
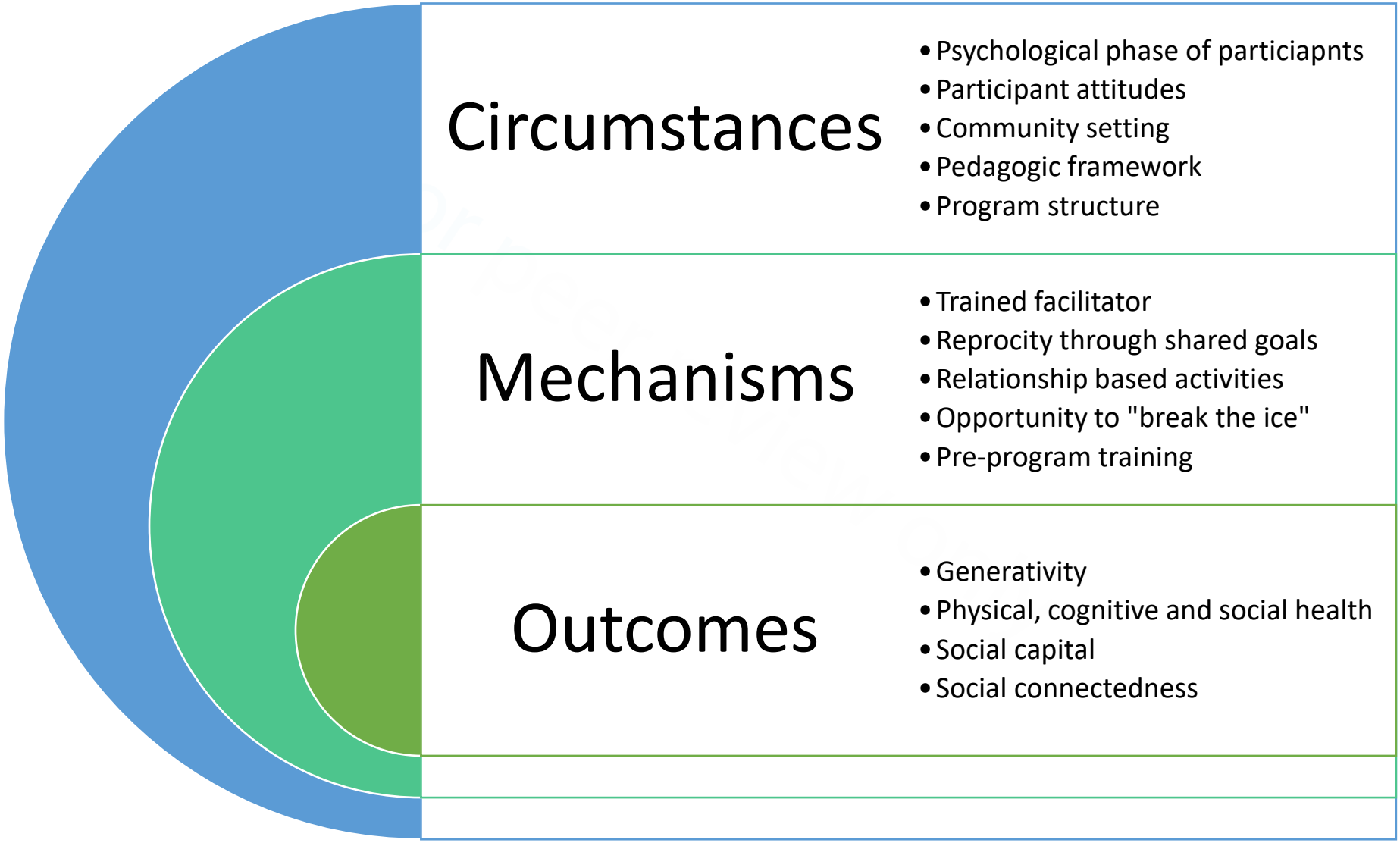
Figure 1: Flow diagram




Circumstances
• Psychological phase of particiapnts
• Participant attitudes
• Community setting
• Pedagogic framework
• Program structure
Mechanisms
• Trained facilitator
• Reprocity through shared goals
• Relationship based activities
• Opportunity to "break the ice"
• Pre-program training
Outcomes
• Generativity
• Physical, cognitive and social health
• Social capital
• Social connectedness

RAMESES checklist for reporting a realist synthesis

From Wong et al.: RAMESES publication standards: realist syntheses. BMC Medicine 2013 11:21. doi: 10.1186/1741-7015-11-21
https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-11-21

TITLE			**Reported in document Y/N/Unclear**	**Page number**
		In the title, identify the document as a realist synthesis or review	Y	1
ABSTRACT				
		While acknowledging publication requirements and house style, abstracts should ideally contain brief details of: the study's background, review question or objectives; search strategy; methods of selection, appraisal, analysis and synthesis of sources; main results; and implications for practice.	Y	2
INTRODUCTION				
	Rationale for review	Explain why the review is needed and what it is likely to contribute to existing understanding of the topic area.	Y	6
	Objectives and focus of review	State the objective(s) of the review and/or the review question(s). Define and provide a rationale for the focus of the review.	Y	6
	Ethical approval	State whether the project required and obtained ethical approval from the relevant authorities, with details.	Y	10
METHODS				
	Changes in the review process	Any changes made to the review process that was initially planned should be briefly described and justified.	N (no changes made)	n/a
	Rationale for using realist synthesis	Explain why realist synthesis was considered the most appropriate method to use.	Y	6 to 7
	Scoping the literature	Describe and justify the initial process of exploratory scoping of the literature.	Y	7
	Searching processes	While considering specific requirements of the journal or other publication outlet, state and provide a rationale for how the iterative searching was done. Provide details on all the sources accessed for information in the review. Where searching in electronic databases has taken place, the details should include, for example, name of database, search terms, dates of coverage and date last searched. If	Y	9

		individuals familiar with the relevant literature and/or topic area were contacted, indicate how they were identified and selected.		
9	Selection and appraisal of documents	Explain how judgements were made about including and excluding data from documents, and justify these.	Y	8 to 9
10	Data extraction	Describe and explain which data or information were extracted from the included documents and justify this selection.	Y	6
11	Analysis and synthesis processes	Describe the analysis and synthesis processes in detail. This section should include information on the constructs analyzed and describe the analytic process.	Y	10
RESULTS				
12	Document flow diagram	Provide details on the number of documents assessed for eligibility and included in the review with reasons for exclusion at each stage as well as an indication of their source of origin (for example, from searching databases, reference lists and so on). You may consider using the example templates (which are likely to need modification to suit the data) that are provided.	Y	Figure 1
13	Document characteristics	Provide information on the characteristics of the documents included in the review.	Y	Table 2
14	Main findings	Present the key findings with a specific focus on theory building and testing.	Y	Page 15 to 24
DISCUSSION				
15	Summary of findings	Summarize the main findings, taking into account the review's objective(s), research question(s), focus and intended audience(s).	Y	25
16	Strengths, limitations and future research directions	Discuss both the strengths of the review and its limitations. These should include (but need not be restricted to) (a) consideration of all the steps in the review process and (b) comment on the overall strength of evidence supporting the explanatory insights which emerged. The limitations identified may point to areas where further work is needed.	Y	26-28
17	Comparison with existing literature	Where applicable, compare and contrast the review's findings with the existing literature (for example, other reviews) on the same topic.	Y	25 to 26
18	Conclusion and recommendations	List the main implications of the findings and place these in the context of other relevant literature. If appropriate, offer recommendations for policy and practice.	Y	27
19	Funding	Provide details of funding source (if any) for the review, the role played by the funder (if any) and any conflicts of interests of the reviewers.	Y	29

Supplementary file 2: Realist Review Protocol

Title: Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

Introduction

Intergenerational programs are programs that involve two unrelated generational groups and result in a mutually beneficial outcome for the participants. Erikson's theory of psychosocial development highlights that adolescents (for the purpose of this review aged 13-19) and older adults (for the purpose of this review 65 and older) are at comparable stages, facing questions around identity and integrity and dealing with life transitions of puberty and retirements respectively.

Social connectedness is highlighted as a major factor in wellbeing and health, particularly for older adults. The perceived or real lack of opportunities to be connected socially and with society can have negative impacts on a person's physical, social and mental health.

For the purpose of this review, the impact of intergenerational programs, that involve both adolescents and older adults, on social connectedness outcomes in the older adult group will be explored. The contexts and mechanism by which the program was delivered will also be explored as key parts of the interventions with the result of the review aiming to determine what contexts and mechanisms lead to the most beneficial outcomes for social connectedness. The objective of this realist review is to develop a program theory that guides the development of intergenerational programs involving adolescents and older adults, that impact upon social connectedness in older adults. There is a current gap in the literature addressing programs that involve specifically adolescents and their impact on the domain of social connectedness.

Review Question

The SPIDER framework was used to develop the review question, which is based on describing the Sample (S), Phenomenon of Interest (PI), Design (D), Evaluation (E), and Research type (R) (Cook et al. 2012).

Sample: Adults aged 65 and over and adolescents aged 13-19 that are unrelated and engaged in engaged in intergenerational programs

Phenomenon of interest: Any type of Intergenerational programs that involve two non-familial generational groups - adults aged 65 and over and adolescents aged 13-19. Inclusive of intergenerational programs that take place in community settings, including educational and aged care settings.

Design: Realist review

Evaluation: We will focus on characteristics, views and experiences from qualitative literature. From quantitative literature we will focus on the assessment of outcomes such as social connectedness, social isolation, social loneliness, social support, social participation and social interaction.

Research type: Quantitative studies, qualitative studies, mixed methods.

Final review question: *Which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescent?*

Plan for generation of *a priori* theories:

A priori theories will be developed utilising an iterative, two-part process. This will include an initial scoping search of Medline using the search terms outlined in the *Search Strategy* section below. We will also undertake initial engagement with relevant stakeholder sot develop the *a priori* theories. The idea for this review came from a collaboration involving the authors, a municipality in regional Victoria, Australia, and a high school located within that municipality. Originally, the collaboration was centred on the development and evaluation of a pilot intergenerational digital literacy program involving adolescent school pupils and older community-dwelling individuals. However, during the initial stages of designing the program, the authors identified there was an absence of review-level evidence regarding intergenerational programs involving adolescents and older people. A decision was made to undertake a realist review on this topic. Municipal and high school collaborator stakeholders, namely senior teachers, municipal project officers and positive ageing ambassadors, will be involved in the process of generating *a priori* theories by contributing information on the need and opportunity for intergenerational programs in the school environment.

Search Strategy

The following electronic databases will be searched using English language limitation: MEDLINE, PsychINFO, CINAHL. Google Scholar will be used to supplement the search using a simplified search terms list from below.

Search terms included; (Aged OR "older adult" OR senior OR elder* OR geriatric OR "old* person*") AND ("intergenerational relation*" OR "intergenerational program*" OR "intergenerational activit*" OR "intergenerational practice" OR "intergenerational learning" OR "intergenerational service learning" OR “intergenerational relations” OR intergenerational) AND ("social connect*" OR "social isolation" OR "social interact*" OR loneliness OR "social participation") AND (“adolescent”)

Inclusion and Exclusion Criteria

Qualitative, Quantitative and Mixed method studies will be eligible for inclusion

Included	Excluded
Study reported on intergenerational programs	Reported on non-intergenerational programs
Participants from non-familial generations	Studies involving the study of grandparents / grandparenting or family intergenerational relationships
Aged 13-19	Aged <13
Aged 65 and above	Aged 20-64
Published 2000-2020	Published before 2000
Published in English	Not published in English

Where studies include part of the age range and are determined to contribute to the development of the program theory, they will be included. Two reviewers will determine such studies inclusion.

Study Selection

Two reviewers will determine included studies. Inclusion criteria as above will be applied to the studies retrieved from the search.

Data extraction and Quality Assessment

Data will be extracted using a bespoke data extraction form. A bespoke quality assessment tool will be developed. Both data extraction and quality assessment will be undertaken by two reviewers.

Data synthesis

The aim of the synthesis is to identify potential context-mechanism-outcome configurations (CMOCs) to develop a programme theory about the circumstances that can promote social connectedness in older adults participating in intergenerational programs with adolescent.

REFERENCES

Cooke A, Smith D and Booth A (2012) Beyond PICO: The SPIDER Tool for Qualitative Evidence Synthesis. Qualitative Health Research 22(10) 1435-1443

Number	combined	Search term - Medline	MeSH	Keyword	total
3 or 7	2963804	(MH "Aged") OR (MH "Aged, 80 and Over")	yes		3076650
	OR				
	355786	"older adult" OR		yes	
		senior OR		yes	
		elder* OR		yes	
		geriatric OR		yes	
		"old* person*" OR		yes	
1 or 2 or 4	**AND**				7854
	6242	"intergenerational relation*" OR		yes	
		"intergenerational program*" OR		yes	
		"intergenerational activit*" OR		yes	
		"intergenerational practice" OR		yes	
		"intergenerational learning"		yes	
	OR				
	3734	intergenerational relations	yes		
	OR				
	6242	intergenerational		yes	
5	**AND**				44986
	44986	"social connect*" OR		yes	
		"social isolation" OR		yes	
		"social interact*" OR		yes	
		loneliness OR		yes	
		"social participation"		yes	
5 and 6 and 8				**TOTAL**	**105**
				Limited to english language	**93**

Number	combined	Search term -CINAHL	MeSH	Keyword	total
S1 OR S5	720418	(MH "Aged") OR (MH "Aged, 80 and Over")	yes		772260
	OR				
	162145	"older adult" OR		yes	
		senior OR		yes	
		elder* OR		yes	
		geriatric OR		yes	
		"old* person*" OR		yes	
S2 OR S3	**AND**				
	6242	"intergenerational relation*" OR		yes	6242
		"intergenerational program*" OR		yes	
		"intergenerational activit*" OR		yes	
		"intergenerational practice" OR		yes	
		"intergenerational learning"		yes	
	OR				
	6242	intergenerational		yes	
S6	**AND**				
	22543	"social connect*" OR		yes	22543
		"social isolation" OR		yes	
		"social interact*" OR		yes	
		loneliness OR		yes	
		"social participation"		yes	
S6 AND S12 AND S14	**TOTAL**				**143**
	Limited to age and english language				**139**

Number	combined	Search term -PsycINFO	MeSH	Keyword	total
1 or 6		(MH "Aged") OR (MH "Aged, 80 and Over")		yes	
	OR				
		"older adult" OR		yes	
		senior OR		yes	
		elder* OR		yes	
		geriatric OR		yes	
		"old* person*"		yes	
2 or 3 or 4	**AND**				
		"intergenerational relation*" OR		yes	
		"intergenerational program*" OR		yes	
		"intergenerational activit*" OR		yes	
		"intergenerational practice" OR		yes	
		"intergenerational learning"		yes	
	OR				
		intergenerational relations	yes		
	OR				
		intergenerational		yes	
5	**AND**				
		"social connect*" OR		yes	
		"social isolation" OR		yes	
		"social interact*" OR		yes	
		loneliness OR		yes	
		"social participation"		yes	
5 and 6 and 7				**TOTAL**	**144**
				Limited to english language	**133**

Google Scholar	
older people or aged or senior AND "intergenerational program*" or intergenerational AND "social connectedness"	**73**

Search two	Added "adolescent" search term to each of the above search strategies in order to refine search by age limit of agreed 13-19 years

Supplementary File 4: Inclusion and Exclusion Criteria

Included	Excluded
Study reporting on intergenerational programs. Study can be quantitative, qualitative or mixed-methods	Reported on non-intergenerational programs
Participants from non-familial generations	Studies involving the study of grandparents / grandparenting or family intergenerational relationships
Aged 13-19	Aged <13
Aged 65 and above	Aged 20-64
Published 2000-2020	Published before 2000
Published in English	Not published in English

SUPPLEMENTARY FILE 5: DATA EXTRACTION FORM

1. Bibliographic details	
Article number:	
Article reference:	
Extracted by:	
Checked by:	
Researcher details (discipline or professional background)	
What are the geographic details of the study?	
2. Aims and Methods	
What is the study type?	
What methods were used?	
Are the aims/ objectives clearly stated in the study? Detail	
Is the research question/s stated explicitly or within the text? Detail	
What materials were used to collect the data?	
How was the data analysed?	
Does the intervention use a particular theory to inform its design?	
3. Participants	
What was the sample size?	
What were the sample characteristics?	
How were participants recruited?	
What were the inclusion and exclusion criteria?	
4. Intervention details	
What was the intervention?	
How was the intervention delivered?	
Who is delivering the intervention?	
In what setting was the intervention delivered? Why was this setting / context chosen?	
Was this setting appropriate to examine the research question?	
Was the intervention designed with the participants (one or both age groups)?	
How were adolescents involved in the intervention?	

How were older people involved in the intervention?	
5. Findings/ Results	
What was the reported experiences of the participants?	
What was the reported experience of the facilitators?	
Did the intervention focus on/ impact on social connectedness?	
Did the adolescents report (or was it reported by others) greater understanding of older people?	
Did the older people report (or was it reported by others) impact upon social connectedness?	
Did the older people report (or was it reported by others) impact upon overall health and wellbeing?	
Did the older people report (or was it reported by others) greater understanding of the younger generation?	
Did the age range of the participants impact upon the success of the intervention? Were there structural barriers here e.g. transport, health issues?	
What themes (qualitative) / headline findings (quantitative) were generated by the study? (around intergenerational programs, adolescents, older people, context in which delivered/ undertaken)	
Are the findings interpreted within the contexts of other studies and theory?	
6. Were the *a priori* theories supported/ confirmed?	
That intergenerational programs involving adolescents and older adults improve social connectedness in the older adult group	
That intergenerational programs conducted in educational contexts result in positive outcomes in social connectedness for one/both groups	
Adolescents and older people are at a similar psychological milestone and therefore are mutual beneficiaries of intergenerational programs	
Older people may be socially disconnected in the absence of loneliness- intergenerational programs help support meaningful connections within the community, with individuals outside of their normal age and social demographic	
Greater generativity is formed through participation in intergenerational programs	
Intergenerational programs conducted in educational contexts build community connections between generations and across structural community assets like schools.	
What new theories were generated by this study?	

SUPPLEMENTARY FILE 6: QUALITY ASSESSMENT

Quality Assessment Criteria	
1	Is there adequate rationale for using this design to address the research aim/ question?
2	Did the authors justify the sample size used?
3	Is adequate evidence provided to support the findings?
4	Quantitative Studies: When comparing / analysing the groups (if more than one), did the authors consider the - Comparability - Confounding variables and controlling for these?
5	Qualitative Studies: Did the researchers consider their own position, assumptions and possible biases?
6	Were the strengths and limitations stated?
7	Was ethical committee approval obtained?
8	How valuable is this research to the review? High, Medium or Low

*Items 1,2,3,5,7,8 from CASP qualitative checklist (CASP 2018a). Items 5, 1 and 7 also from Long (2005). Item 4 from CASP Cohort Study Checklist (CASP 2018b)

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Critical Appraisal Skills Programme (2018). CASP (Cohort Study) Checklist. [online] Available at: https://casp-uk.net/images/checklist/documents/CASP-Cohort-Study-Checklist/CASP-Cohort-Study-Checklist-2018_fillable_form.pdf. Accessed: Date Accessed: 17/2/20

Quality Assessment Criteria		de Souza[45]	Kessler and Staudinger[37]	Hernandez and Gonzalez[46]	Wilson, Cordier[47]	Biggs and Knox[48]	Knight, Skouteris[35]	Ostensen, Gjevjon[15]	Santini, Tombolesi[49]	Wilson, Cordier[33]
1	Is there adequate rationale for using this design to address the research aim/ question?	✔	✔	✔	✔	✔	✔	✔	✔	✔
2	Did the authors justify the sample size used?	UNCLEAR	✔	✔	✔	✔	✔	✔	✔	✔
3	Is adequate evidence provided to support the findings?	✔	✔	✔	✔	UNCLEAR	✔	✔	✔	✔
4	Quantitative Studies: When comparing / analysing the groups (if more than one), did the authors consider the - Comparability - Confounding variables and controlling for these?	N/A	✔	✔	N/A	✔	N/A	N/A	N/A	✔
5	Qualitative Studies: Did the researchers consider their own position, assumptions and possible biases?	UNCLEAR	N/A	N/A	✔	N/A	✔	UNCLEAR	✔	UNCLEAR
6	Were the strengths and limitations stated?	✔	✔	✔	✔	✔	✔	✔	✔	✔
7	Was ethical committee approval obtained?	UNCLEAR	UNCLEAR	✔	✔	✔	✔	✔	UNCLEAR	✔
8	How valuable is this research to the review? High, Medium or Low	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	HIGH	HIGH	HIGH	HIGH

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Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

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Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

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ABSTRACT

Objectives: Limited social connectedness in older adults is a risk factor for poor physical and mental health. Older adults who are socially isolated, lonely and disconnected have a higher risk of chronic illness, depression and premature death. Current literature suggests that improved social connectedness reduces these risks. Intergenerational programs are an effective way to improve health outcomes. Despite this, there is yet to be a review using realist review methods that seeks to identify the circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents.

Design: A realist review methodology was chosen to account for the complexity of intergenerational interventions. Nine studies were included. In line with realist review methodology, iterative data extraction and analysis was conducted to identify the specific contexts, mechanisms, and outcomes of the programs. Specific circumstances were identified to develop theories relating to improved social connectedness in older adults.

Data sources: MEDLINE, PsychINFO, CINAHL were searched using English language limitation.

Eligibility criteria: Included participants were aged 65 and over (older adults) and between 13 and 19 years (adolescents) participating in intergenerational programs from non-familial generations. Studies had to be published in English between 2000 and 2020 and could be quantitative, qualitative or mixed-methods primary research studies.

Data extraction and synthesis: Two independent reviewers used a bespoke data extraction form. All authors were involved in the synthesis process which used the extracted data to illuminate the contexts, mechanisms and outcomes that underpinned reviewed programs.

Results: The nine included studies were set in different contexts, including community organisations, schools and aged care facilities and used an array of interventions including reminiscence therapy, craft, or space for conversation. Despite study heterogeneity, the parallels in psychosocial development between older adults and adolescents were shown to be a likely driver for improved social health outcomes. Programs most likely to improve social health outcomes were those that acknowledged psychosocial development, were delivered in community settings, leveraged pedagogic frameworks, used trained facilitators, and supported participants to build relationships through shared purpose.

Conclusions: This review contributes a logic model to support the design and development of intergenerational programs involving adolescents to improve social connectedness in older adults. Future research to test the logic model in practice is needed.

Strengths and limitations of this study

- This is the first realist review to investigate the circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents
- Comprehensive searches were undertaken with the aim of identifying all relevant published and grey literature.
- A logic model has been developed to support the design and development of intergenerational programs involving adolescents to improve social connectedness in older adults.
- The evidence base is limited for participants living in rural locations and participants with cognitive impairment.

INTRODUCTION

Limited social connectedness is a risk for poor health and wellbeing in older adults[1-4]. Older adults (over 65 years) are at particular risk of social disconnectedness and loneliness because of frailty and chronic illness, which may limit opportunities for social interaction[5, 6]. In addition, modern society has altered family structures, geographically dispersed the family unit and made maintaining intergenerational and family connections challenging, adding to social health vulnerability in older people[7-10]. Many older adults move into residential aged care facilities, away from familiar community supports which may impact social connectedness.

Social disconnectedness, loneliness and social isolation can be as damaging to health and wellbeing as smoking and obesity[4, 7, 11, 12]. Poor health due to acute or chronic conditions, cognitive decline or frailty influences an older person's ability to carry out personal, domestic, social or community activities and in turn increases their risk of social disconnectedness[1, 13, 14]. Older adults who remain socially connected without episodes of isolation or loneliness have lower rates of mental and chronic illnesses such as depression and cardiovascular disease[7, 11, 15-17].

Support for older adults, particularly post retirement or when faced with cognitive or physical impairment, is essential in maintaining individual social identity and social connectedness with family, friends and the community[4, 11]. The World Health Organization has challenged communities to provide age friendly communities. This global movement is demonstrating the power of building social capital and engaging older adults through community programs and social and environmental infrastructure to support community access[18]. Intergenerational programs have emerged as a popular and beneficial option for bolstering community connections and improving the health and wellbeing of older people[11, 19, 20].

Intergenerational programs are programs where two generations experience mutual benefit through shared experiences[19, 21] and are a known mechanism for improving social connectedness[19] and providing a sense of inclusion and empowerment in older adults[22]. Intergenerational programs bring together and benefit both generational groups[22-26] and have been adopted in a variety of contexts and age groups. These include the use of pedagogic frameworks with school age children[22], service-learning interventions with university students[27, 28] and in familial groups[25].

Several previous reviews have been undertaken on intergenerational programming. For example, systematic reviews by Gualano et al.[19] and Zhong et al.[29] focused on quantitative studies of older adults aged 50 and over and younger people 30 and below undertaken in educational settings. Gualano et al.[19] found that intergenerational programs benefit older people in terms

of keeping active and fighting social isolation, whilst Zhong et al. [29] found that intergenerational programs with young children may bring the greatest health benefits to older people across physical, mental and social domains. Further systematic reviews by Giraudeau and Bailly[30] and Martins et al.[31] included primary research studies of any type focusing on adults over 60[30] and 65[31] undertaken in a variety of community, assisted living, education, and nursing home settings. Giraudeau and Bailly[30] found that intergenerational programs bring mental health benefits for older people, whilst Martins et al.[31] reported that intergenerational programs can lead to reaffirmation of value, greater life satisfaction and improved self-esteem for older adults[31].

In terms of impacts on children, both Martins et al.[31] and Giraudeau and Bailly[30] focused on pre-school and primary school children and found that intergenerational programs improved children's perceptions of older people. In addition, Martins et al.[31] further found that for children, intergenerational programs led to higher self-esteem, better academic performance, improved social skills and a greater motivation to learn. Gualano et al.[19] also found that intergenerational programs improved younger people's perceptions of older people. Of these systematic reviews only Giraudeau and Bailly[30] outlined circumstances that may lead to a successful intergenerational program model, stating that to be successful, intergenerational programs should provide all the participants with a sense of being useful and competent and take time to prepare younger and older people by encouraging communication between the groups before the program begins.

A further relevant review undertaken in this area is a recently published realist review by Phang et al.[32]. This work focused on digital intergenerational programs explicitly geared towards reducing loneliness or social isolation in older adults undertaken in residential or community settings. The review identified four circumstances by which digital intergenerational program may reduce loneliness and social isolation for older adults. For community-dwelling older adults, training in digital technology and support from nurses helped to reduce loneliness. Phang et al.[32] further found that a video call with a student or family reduced loneliness among older adults residing in long-term residential care facilities, whilst videoconferencing with a lay coach may also reduce loneliness in adults who are lonely.

The above shows that whilst there is substantial evidence supporting intergenerational programs as an effective strategy to achieve improved physical and social health and wellbeing in older adults, there is yet to be a review of programs that involve adolescents specifically. Intergenerational programs involving older adults and preschool or young children have been reported in the primary research literature [14, 21, 22, 28], however those that pair adolescents (individuals aged 13-19) and older adults are less known[33]. Pairing older adults and adolescents

through intergenerational programs is modelled on Erikson's theory of psychosocial development[34, 35]. According to Erikson's theory, adolescents and older adults are both facing a period in their psychosocial development focused on identity. Adolescents, emerging from childhood are looking to their peers to 'fit in' and to understand society through the eyes of others. Older adults, particularly the recently retired, are trying to maintain their identity, with a desire to contribute to society[36]. This motivation to pass on wisdom to the next generation is termed generativity[34, 35] and is important for the wellbeing of older adults as well as broader social health[4]. Intergenerational interactions through family or a formal program support the development of generativity[34, 35, 37]. The likely benefits of this generational pairing in an intergenerational program context are yet to be reviewed in depth.

This realist review aims to identify the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. The question underpinning the review is – which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescents.

METHODOLOGY

A realist review methodology was undertaken in line with the RAMESES publication standards[38]. The RAMESES checklist for this study is available in Supplementary file 1. Realist review provides a framework for understanding complex interventions and *why* they deliver the outcomes they do[39]. A protocol for the review was developed following the stages outlined by Pawson[40] and included (1) locating existing theories, (2) searching for evidence, (3) selecting articles, (4) extracting and organising data, and (5) synthesising the evidence and drawing conclusions. This is available in Supplementary file 2.

A realist review is an approach used for systematic evidence review that utilises secondary data to understand the reasons why a particular set of contexts, mechanisms and outcomes lead to a particular result. Contexts are the circumstances in which the program is delivered and how these interact with the program mechanisms. Mechanisms are the program resources, and the way participants interact with them. The result of context and mechanism interaction is what drives a particular outcome to occur. Realist review utilises generative understanding to iteratively build *a priori* theories that are then tested and refined. The *a priori* theories are initially drawn from available literature and through stakeholder consultation. Realist review uses the lenses of context, mechanism and outcome to appraise, synthesise and then test the recommendations that are constructed through the analysis process[38, 39].

Step one: a priori theory development

The development of *a priori* theories was an iterative, two-part process[38, 39, 41] and was undertaken by JS and DA. This included stakeholder engagement and a scoping search of the peer-reviewed and grey literature on the subject, followed by *a priori* theory development that were tested against the literature and information from initial stakeholder meetings.

Search strategy

A literature search was undertaken between May and July 2019 by JS and DA. An updated search was completed in June 2020. The search strategy was developed with the support of a La Trobe University librarian. MEDLINE, PsychINFO, CINAHL were searched using English language limitation.

The search terms were (Aged OR "older adult" OR senior OR elder* OR geriatric OR "old* person*") AND ("intergenerational relation*" OR "intergenerational program*" OR "intergenerational activit*" OR "intergenerational practice" OR "intergenerational learning" OR "intergenerational service learning" OR “intergenerational relations” OR intergenerational) AND

("social connect*" OR "social isolation" OR "social interact*" OR loneliness OR "social participation") AND ("adolescent"). MeSH terms used were "Aged" OR "Aged, 80 and over) and "Intergenerational relations".

Google Scholar was used to supplement the search using a simplified search terms list. Grey literature used the same search terms and was accessed via websites, including relevant government and non-government websites including Australian Federal and State Government agencies, Not-for profits and the World Health Organization. Reference list searching was also used. The full search strategy is available in supplementary file 3.

Patient and public involvement

No patients or members of the public were involved in this research.

Stakeholder engagement

The idea for this review came from a collaboration involving the authors, a municipality in regional Victoria, Australia, and a high school located within that municipality. Originally, the collaboration was centred on the development and evaluation of a pilot intergenerational digital literacy program involving adolescent school pupils and older community-dwelling individuals. However, during the initial stages of designing the program, the authors identified there was an absence of review-level evidence regarding intergenerational programs involving adolescents and older people. A decision was made to undertake a realist review on this topic. Municipal and high school collaborator stakeholders, namely senior teachers, municipal project officers and positive ageing ambassadors, were involved in the process of generating *a priori* theories by contributing information on the need and opportunity for intergenerational programs in the school

Study selection

Both study selection and critical appraisal were undertaken independently by two reviewers, JS and DA. The inclusion and exclusion criteria were applied by JS and DA to ensure the included studies met the aim of the review. Included participants were aged 65 and over (older adults) and between 13 and 19 years (adolescents) as these age ranges are agreed as defining older adults and adolescents[34] in early theories from Erikson on psychological development. Other studies addressing intergenerational programs use Erikson theory, so this was chosen to align with the current literature [31]. To be included in the review studies had to report on intergenerational programs with participants from non-familial generations. Studies had to be published in English between 2000 and 2020 and could be quantitative, qualitative or mixed-methods primary research studies. The full inclusion and exclusion criteria can be viewed in supplementary file 4.

a priori theory *development*

JS and DA developed six *a priori* theories and tested these against the literature before conducting a final literature search to check for new evidence.

Step two: data extraction and evidence synthesis

In step two, data extraction and evidence synthesis from the nine included studies was undertaken.

Data extraction

A data extraction form (supplementary file 5) was developed by DA and JS and included the *a priori* theories identified in step one. The data extraction form covered several domains including bibliographic information, aims and methods, participant details, intervention details, results and findings. The form also provided for *a priori* theory testing including extraction of evidence that proved, disproved or refined the theory. The data extraction process was completed by JS and DA.

Quality appraisal

A realist review method supports the inclusion of qualitative, quantitative and mixed methods studies[38, 42]. To understand the quality of included articles, we consulted critical appraisal literature[43, 44]. A tool comprising eight quality assessment criteria were developed focusing on the methodological quality and reporting quality of the included studies (supplementary file 6). Quality appraisal was conducted by JS and DA with any conflicts managed via team discussion.

Synthesis

All authors were involved in the evidence synthesis process using extracted data to illuminate the contexts, mechanisms and outcomes that underpinned reviewed programs. The process then involved identifying evidence combinations and testing them against the *a priori* theories to develop context mechanism outcome configurations (CMOC). The development of the CMOC presented a variety of emergent issues that were continually tested against the *a priori* theories and the known evidence. This process identified new theories and the CMOC were further refined. Ethics approval was not required for this study.

RESULTS

Four hundred and thirty four records were identified through database searching with eighty full text articles screened for eligibility. Subsequently, nine studies were included in the review. Data from the included studies were synthesised to generate eight theories relating to characteristics of intergenerational programs likely to optimise social connectedness for older adults. The components of these theories are combined to form context mechanism outcome configurations (CMOC) and a logic model to support answering the question – which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescents? Figure 1 below provides the results of the literature search. Nine studies were included in the review. Five were qualitative, two quantitative and two mixed were methods. The overall participant characteristics were a mix of male and female older adults and adolescents, living in the community and participating in weekly or monthly programs over a set period. The settings in which the programs took place varied, including schools, aged care facilities and community group spaces such as Men's sheds.

***Insert here Figure 1: Flow Diagram**

Table 1: Included study characteristics

Included Study	Study details	Study aim	Sample characteristics	Summary of findings	Use of a facilitator	Pre-program training	Data collection and analysis
de Souza[45]	Qualitative; School (Brazil); Older adult participants shared life experiences with students in a classroom environment.	Intergenerational program evaluation from participant viewpoint.	84 randomly selected students; Age 13-19 years; 26 older people; Age 60 years +; Male and female groups.	The intergenerational activity based on reminiscence improved social interaction and community wellbeing for older adults.	Unclear	No	Focus group interviews followed by thematic analysis
Kessler and Staudinger[37]	Quantitative; Laboratory (Germany); Interaction between an Older Person and Younger Person, Two Older People or Two Younger people addressing a "life problem" or a "media problem".	To understand if intergenerational interactions have the potential to facilitate psychological functioning in both adolescent and old age.	Older women aged 70-74 n=90 and girls aged 14-15 n=90	Improved cognitive performance, reduced negative age-related stereotypes and triggered generative behaviours.	No	No	Data collected by a series of survey, psychometric and cognitive tests. Analysis completed using planned comparisons
Hernandez and Gonzalez[46]	Quantitative; Local council social centre (Spain); Weekly recreational activities (talks, excursions, cultural events). 32 interactive session "movement program".	To investigate the effect of an intergenerational program on stereotyped attitudes towards elderly people and the wellbeing of older adults.	101 elderly people; across two groups, age M= 74 (SD=7.7) and M=75 (SD= 5.21); 179 university students; Age M=19 (SD= 0.93); Both male and female participants.	Improved outcomes in depression measures in older adults who participated in an intergenerational exercise group.	Yes	Yes – adolescents only	Pre and post sessions that included questionnaires and geriatric depression scale. Analysis via repeated measure analysis of variance (ANOVA)
Wilson, Cordier[47]	Qualitative; Men's shed (Australia); 10 week intergenerational mentoring program over with older male mentors offering support to younger at risk males	To explore the experiences and perceptions of mentors involved in an occupation skill focussed program with teenage boys.	9 teenage boys; Age ~15 years; 6 older male mentors; Age 60-75; a project facilitator and a; youth worker. All participants were male.	Intergenerational programs involving older adults with a strong sense of generativity were shown to be a valuable resource to communities.	Yes	Yes- both groups	Pre and post Individual interviews and focus groups with both groups however only reported on data from older adult participants using constant comparative method of grounded theory

Biggs and Knox[48]	Qualitative; Residential care/ assisted living (USA (Texas)); Girl scout meetings held in assisted living facility	To identify impact of an intergenerational program for girl scouts (young people) and residents (older people) on quality of life, social interaction and personal attitudes.	Focus groups comprised of parents = 8, residents = 5, staff = 10, children (scouts and daisies) 5-12 years = 9; Content essay participants ages 6-16: n= 18; All participants female.	Intergenerational programs using social workers and community volunteers strengthened intergenerational relationships.	Yes	No	Focus group interviews with both groups and submitted essays from the younger participants followed by hematic analysis
Knight, Skouteris[35]	Mixed Methods; Residential aged care setting (Australia); Development of a life story review book by adolescent students partnered with an older adult.	To pilot and test the feasibility of an intergenerational program "My Life Story".	Adolescents n= 24; Age M= 14.56 (SD=0.5); Older adults n= 12; Age M=90.58 (SD=3.59); Gender of participants not stated	Improved social connectedness and community engagement resulted from an intergenerational program using reminiscence.	Yes	Yes- both groups	Qualitative data collected (post) using semi-structured interviews and quantitative data collected (pre and post) using a series of items followed by thematic analysis and paired t-tests.
Ostensen, Gjevjon[15]	Qualitative; Residential care facility or private home (Norway) Sessions over a 12-month period with volunteer adolescents supporting older adults to learn use of a tablet device.	To explore a new model of care that supports older people to participate by introducing technology and mobilising volunteer services.	Older adults n= 15 (5 withdrew due to illness, death and hospitalisation); Adolescents n=not stated; Age 54-94 years; Both male and female participants.	Reduction in anxiety and increase in social activity for older adults followed an intergenerational program supporting older adults to use an iPad.	Yes	Yes- adolescents only	Individual semi structured interviews repeated over a 12 month period with the older adults only followed by thematic analysis
Santini, Tombolesi[49]	Qualitative; Residential aged care facility (Italy); Intergenerational activity based meetings with aged care residents, older adult community volunteers and adolescents.	To understand if creating community space and planning activities where adolescents, older adults, and active older volunteers meet and interact will improve health outcomes for older adults.	14-year-old students n=25 (18 males and 7 females) and three teachers; 16 older residents; Age M=83; three social workers; 16 older volunteers; Age M=70	The intergenerational program improved the wellbeing of institutionalised older adults.	Yes	Yes- both groups	Individual and focus groups Interviews with students; individual interview with older adults; focus groups with volunteers before, during and after the intervention followed by content analysis
Wilson, Cordier[33]	Mixed methods; Men's shed (Australia); Intergenerational mentoring program with older adults and young adults with intellectual disability.	To examine the feasibility of a novel Men's Shed intergenerational mentoring intervention for young adults with intellectual disability.	5 mentees (average age 16); Older adult mentors n=12; Age M=69.5 (SD=8.53); All participants were male.	Intergenerational mentoring interventions for youth with intellectual disability at community Men's Sheds were shown to be feasible and appropriate.	Yes	Yes- older adults only	Quantitative data via pre-and post-intervention outcome measures and descriptive data of mentees' functional skills. Qualitative data collected at end of project via individual interviews with mentees and mentors. Used realist evaluation method

The characteristics of the included studies are provided in Table 1. In phase two of the review, data was analysed to 1) confirm the degree to which the a priori theories identified in phase one (see Table 2) were supported and 2) generate the contexts, mechanisms and outcomes from the included interventions.

Quality Assessment

In line with recommendations for realist reviews[40] no studies were excluded following quality assessment, rather each study was ultimately assessed for its contribution to theory development and context mechanism outcome configurations. The quality assessment of each included study concluded with an overall estimate of how valuable the study was to the review (Low, Medium or High), a criterion based on Question 10 of the Critical Appraisal Skills Programme qualitative quality assessment tool[50]. The assessment concluded that majority of studies (7/9) were found to be of high value to the review[15, 33, 35, 37, 45, 47, 49]. These studies were rated as highly valuable due to the age range of participants fitting directly with the aims of this review and because they reported on intergenerational programs in detail and provided ample evidence to support their findings, facilitating the analytical process for this review. The Biggs et al.[51] and Hernandez and Gomez[46] studies were rated as being of medium value to the review. Biggs et al.[51] was assessed as lacking on detail with regard to the reporting of the findings, whereas Hernandez and Gomez[46] had limited age group relevance to the review aims as the younger age group had an average age of 19.

Table 2: *a priori* theories identified after step one

Intergenerational programs involving adolescents and older adults improve social connectedness in the older adult group.
Intergenerational programs conducted in educational contexts result in positive outcomes in social connectedness for one/both groups.
Because they are at a similar point in psychosocial development, adolescents and older people are likely to be mutual beneficiaries of intergenerational programs.
Intergenerational programs help support meaningful connections for older people who may be socially disconnected within the community, with individuals outside of their normal age and social demographic.
Greater generativity is formed through participation in intergenerational programs.
Intergenerational programs conducted in educational contexts build community connections between generations and across structural community assets like schools.

When coupled with the *a priori* theories generated from phase one, context mechanism outcome configurations (CMOC) were developed. The CMOC are eight circumstances deemed optimal for the delivery of intergenerational programs involving older adults and adolescents and are hypothesised to improve outcomes in social connectedness. These are summarised in Table 3 below.

Table 3: Summary of Context Mechanism Outcome Configurations

CMOC label and summary-level description	References of included studies
CMOC 1 Understand the participants psychosocial development phase and attitudes towards each other to foster generativity Adolescents and older adults are at a similar crossroads in the formation and maintenance of their identity[34] (context). Understanding the developmental phase and held attitudes of the participants (context) supports the design of program training activities (mechanism) and 'ice breakers' (mechanisms) that foster reciprocity (mechanism) and are more likely to trigger generativity (outcome) between the generational groups and improve social connectedness (outcome).	**All included studies**
CMOC 2 Use a pedagogic framework to trigger generativity, intercommunity connections and deliver social health outcomes Pedagogic frameworks (context) motivate the adolescent to participate in intergenerational programs and achieve a result[35, 45, 48]. Similarly, the older adult is motivated to transfer skills and wisdom and provide support to the adolescent so as they can achieve their goal (mechanism). As a result, social connectedness and attitudes (outcomes) towards the other generational group improve.	**All included studies**
CMOC 3 Design the program to be frequent and have a clear structure to support participation and improved social connectedness Pedagogic frameworks (context) provide structure. Programs that are co-designed and scheduled frequently allow relationships to form through shared goals and activities (mechanisms). Frequent and carefully structured programs allow for improved social connectedness, and sustainable health and community benefits (outcomes).	**All included studies**
CMOC 4 Conduct the program in community settings to support social health outcomes and build social capital Community settings including educational institutions, care homes or existing community groups provide a foundation for engagement (context) when delivering intergenerational programs. Programs that showed a strong connection to the community through their facilitators (mechanism) or the physical environment (mechanism) showed improved sustainability and generalisability for the participants and the broader social capital of the community (outcome).	**[15, 33, 35, 45-47, 49]**
CMOC 5 Deliver pre-program training and support participants to 'break the ice' Utilising existing community settings and knowledge of psychosocial development, (contexts), pre-program training (mechanism) and activities that support participants to connect on a more informal level (mechanism) work together to bridge gaps between the generations (outcome).	**[15, 33, 35, 45-47, 49]**
CMOC 6 Identify shared goals between program participants to build reciprocity and support program engagement Through use of pedagogic frameworks and existing community links (contexts), the identification of shared goals builds reciprocity (mechanism) between the participants and in turn may trigger	**[15, 33, 35, 45-47, 49]**

benefits including a greater sense of generativity (outcome), improved wellbeing (outcome) and social connectedness (outcome).	
CMOC 7 Include a trained facilitator to promote program participation In a variety of contexts, the inclusion of a program facilitator (mechanism) may support improved social connectedness (outcome). The other key function of a facilitator is to ensure that the participants have had the opportunity to 'break the ice' (mechanism) through pre-program training and informal opportunities such as morning tea times.	**[33, 35, 45-47, 49]**
CMOC 8 Plan inclusive activities that trigger generativity and improve physical, cognitive, psychological and social outcomes When programs use existing community connections, include relationship-based activities with a shared goal (mechanisms) and are grounded in a pedagogic framework (contexts), there is improvement in health and social wellbeing (outcome) and a sense of generativity for the older adult group (outcome).	**[15, 33, 35, 37, 45-47, 49]**

CMOC 1 Understand the participant's psychosocial development phase and attitudes towards each other to foster generativity and connection

In the included studies, pre-program psychometric measurement[33, 35, 37, 46], focus groups or interviews[47] and informal gatherings at the beginning of the program[15, 33, 35, 46, 47, 49] were used to understand the demographic and psychosocial characteristics of participants. Psychometric scales that measured attitudes towards ageing, social connectedness, loneliness, generativity and presence of depression were completed pre and post intervention[33, 35, 37, 46]. Pre-program focus groups and interviews were used with both groups[33, 47, 49] to understand participant skills and motivations. This information was used to align participants based on skills and expectations, understand participant relationships with other generations, their attitudes towards ageing and their perceptions of self [49]. Understanding baseline attitudes helped structure programs to promote alternate views of an older person's capability, foster dialogue and enhance learning between generations.

Evidence from the included studies indicates that using pre-program measures to understand participant demographics, including their psychosocial phase and cognitive and physical abilities leads to a more likely match in participant capability and outcomes that improve social connectedness and generativity.

CMOC 2 Use a pedagogic framework to trigger generativity, intercommunity connections and deliver social health outcomes

Pedagogic or service-learning frameworks support participants to learn together in a real-world context[5, 52] and featured in six of the included studies[33, 35, 46-49]. Studies that involved school students were aged between 13-19 years with 15 years the average age across studies[33, 35, 45, 47, 49]. Two studies[35, 49] involved students completing a report or a community

presentation, whilst others involved students completing a small woodwork project[33, 47]. These tasks were curriculum linked[35], motivating adolescent participants to complete the task. Older adults reported they felt needed when they were contributing to adolescent's learning and acknowledged the adolescent's contribution to their own learning - *"they can teach us the computer and their new language"[49]*

Through the use of a pedagogic framework, results showed improved understanding and respect for the other generation[47, 48] and older adults gained a sense of pride in being able to pass on their knowledge and wisdom. These findings provide evidence that in pedagogic contexts, where reciprocity is formed, it is likely that an improvement in perceived social connectedness and wellbeing will occur for the older adult.

CMOC 3 Design the program to be frequent and have a clear structure to support participation and improved social connectedness

Frequency and duration of sessions

Programs that used a pedagogic framework were usually linked to a school term or semester[33, 45-47, 49]. These programs ranged from six to twelve - week blocks, often repeating over school terms. Programs that were held weekly[15, 33, 35, 46, 47], fortnightly[45, 49] or bi-monthly[48]. Biggs and Knox[48] reported less frequent sessions were chosen to avoid overwhelming the participants, compared to other participants who requested more frequent and extended program sessions so they could spend more time together[33, 45, 47, 49].

Structure of sessions

A clear program structure that included pre-training and time for "breaking the ice"[33, 47] was reported as beneficial. Typically, studies used the session to engage and introduce participants or complete training and the following weeks to cover different topics or questions relating to the aim of the study. In the Ostensen[15] study, older adults raised learning goals that formed the structure for the week ahead. Overall, evidence suggests that having a structured program that allows frequent interaction between generational participants is more likely to result in improved social connectedness and optimised health and wellbeing.

CMOC 4 Conduct the program in community settings to support social health outcomes and build social capital

Intergenerational programs that occur in community settings provide a platform for building social capital[4, 9, 26]. Four studies conducted programs in residential care facilities using existing community connections such as local youth clubs and schools that were geographically close by [15, 35, 48, 49] and two others[33, 46, 47] leveraged local community programs (volunteer groups). Evidence suggested that community-based programs had greater potential in enhancing

social health outcomes for older adults and generating social capital in the broader community. In the Biggs and Knox[48] study, older adult participants began attending church with the families of the adolescents, demonstrating connections beyond the program. Similar results were reported in the de Souza[45] study with older participants reflecting improved mood, physical wellbeing and a '*feeling of freedom'* (*p. 467)*, through their opportunities to get out of the facility and spend time with the adolescents in the community. The location, existing relationships between community organisations and activities that support participants to observe the other generation playing a role in the community are all positive predictors of a likely improvement in individual and community social connectedness and wellbeing.

CMOC 5 Deliver pre-program training and support participants to 'break the ice'

Pre-program training was provided in six of the nine included studies. Training was offered to older adults and the adolescents[33, 35, 49], to older adults only[33] or to adolescents only[15, 46]. Training included program orientation or the opportunity to learn about the other generation.

Where training was provided to both the adolescents and older adults, this appeared to foster social connections. For example, the adolescents shook the hands of the older gentleman at the beginning and end of each session. This positive social behaviour was felt by the older men to be respectful and demonstrated social connectedness between the groups[47]. However, in the Santini[49] study, despite the pre-program introductory material, students reported that they required support from teachers and older adult volunteers to overcome their emotions when they met with the older adults for the first time.

The Wilson et al[33] program provided training to the older adult mentors only. This training provided the mentors with disability awareness training via videos. Despite this, it was highlighted by the older adults that they would have liked to have been more prepared for working with the adolescents with intellectual disability. Two studies provided training to adolescents only[15, 46] however did not report on the impact of this training.

In studies where no formal pre-program training was provided, results were mixed in relation to the impact on the program. In the Kessler and Staudinger[37] study, the randomised control trial methodology required pre-program blinding. In the Biggs and Knox[48] study, the participants were already involved in an existing Scouts program, so it is assumed that pre-program education was included in Scout club activities, however, this was not reported by the authors. Parents of the adolescents in the Biggs and Knox[48] raised concern about their children's reactions to residents with dementia or if a resident died. There were also reports from the residents and parents that boundaries and behaviours were not respected by the adolescent participants. These examples indicate a role for pre-program training to reduce fears and provide education. Where

training or opportunities to interact were sub-optimal or missing, participants highlighted limited opportunities to 'get to know' each other or feel prepared for the program[33, 45]. If comfort or confidence in the program is not established, participants may not participate[45] or be reluctant to participate again[33]. This has broader implications for the sustainability of program outcomes, particularly those that aim to enhance social capital or galvanise links between community groups.

CMOC 6 Identify shared goals between program participants to build reciprocity and support program engagement

By understanding the shared aims of participants, reciprocity is nurtured, participants are more motivated, and generativity is triggered. Where participants were involved in program design[46, 49] as well as iteratively throughout the course of the program[15, 48] the program was more person centred, enhanced reciprocal behaviours and improved outcomes.

The Santini[49] study used an action participatory research approach with active older adult volunteers, social workers and teachers and Hernandez and Gonzalez[46] used a co-design approach through adolescent students designing an exercise program for older adults that was delivered with support from lecturers and trained facilitators over 32 sessions. Both generations benefited in these programs, with results indicating a positive shift in age related stereotypes when older adults and adolescents interacted as part of the program.

In programs where there was a shared goal from the outset there was greater improvement in social connectedness[33, 35, 47, 48], reduced markers for depression[46] and stereotypical attitudes towards the older generation[48]. The included studies demonstrate that creating reciprocity drives generative behaviour. Reciprocity and generativity combined leads to improved social connectedness and health and wellbeing outcomes for the individual and the community broadly.

CMOC 7 Include a trained facilitator to promote participation

Facilitation is the act of supporting and enabling a group to meet its objectives (and release its full potential) by fostering conditions that respects and encourages contributions by all members of the group[53]. Facilitation was used in seven of the included studies. The facilitators were trained professionals including teachers[35, 49], university staff[46], fitness instructors[46], health professionals[15, 33, 48], community leaders[48] and youth workers[47]. In the Santini[49] study, active older volunteers also played a facilitation role. Studies that included a facilitator resulted in greater participant interaction and improved program outcomes[33, 47, 49]. In the Wilson et al study, the youth worker that facilitated the program was described as responsible for *"keeping us on track"*[47] and was pivotal in prompting participation between the groups, for example at afternoon tea breaks.

In the study involving girl Scout groups[48], the troop leaders were trained social workers. Whilst their individual experiences were not reported in the findings, the role they played in bringing together individuals connected to existing community settings in girl Scouts, residential aged care and volunteer groups was fundamental in the program longevity and results. In four studies, active adult[33, 47, 49] and adolescent[15] volunteers were recruited from local community volunteer groups and provided additional program facilitation support that likely enhanced positive outcomes in community engagement and social connectedness.

Conversely, in studies where the facilitation was reported as being sub-optimal[33] or absent[45], the participants and the authors highlighted that greater support from the teachers, researchers or 'monitors' would have enhanced interactions between the generational groups. If facilitation is absent or lacking, participants may feel frustrated or unsupported, in turn causing participant disengagement, attrition or an unintended triggering of age-based stereotypes or perceived loneliness[49]. Trained facilitation supports improved connectedness between participants and when delivered within community and pedagogic contexts, favourable outcomes in generativity, social connectedness, and social capital.

CMOC 8 Plan inclusive activities that trigger generativity and improve physical, cognitive, psychosocial, and social outcomes

Included studies reported on programs that provided relationship-based inclusion[35, 45, 48, 49] and activity-based inclusion[15, 33, 46, 47] opportunities for participants.

Relationship-based inclusion:

If there is limited opportunity for relationship-based inclusion, adolescents and older adults are at risk of not experiencing meaningful social connection[35]. Feeling included by peers and the broader community promotes generativity and in turn improves wellbeing in both age groups[23, 35]. Several programs[35, 45, 48, 49] used relationship- based inclusion activities such as reminiscence (sharing old photos or learning about what jobs older people used to do) to create reciprocity between older adults and adolescents. This was also a mechanism to improve physical, cognitive, and psychological health, and in turn social connectedness. A marker of sustained relationships was demonstrated by the adolescents continuing to connect with older adults after the program[35, 49], including volunteering at a local community organisation with older people.

Activity-based inclusion:

Studies that used activity-based inclusion such as exercise programs[46], digital literacy training with an iPad[15] or woodwork construction[33, 47] also reported improved outcomes in physical, cognitive, psychological and social domains, including social connectedness. In the

studies set in Men's Shed's the young adults were mentored by the older men in occupational activities, with both groups reporting the activities provided the opportunity to connect, whilst learning new skills and doing *"something with our hands"[47].* Young adults with intellectual disability commented that the Men's Shed was a unique learning environment - *"they made me feel like part of the group"* and that they *"felt accepted"*[33]. Older adults supported to use a tablet device[15] demonstrated improved social outcomes as they were able to connect with family in other locations or the outside community through news applications or by tracking weather. Nurses in the care facility reported a change in social behaviour in the participants using iPads, taking more initiative, presenting as less anxious and being more socially active. In the Hernandez and Gonzalez[46] study, the interaction between adolescents and older people showed statistically significant improvement in depression scores and stereotypical attitudes in the older adult group. A comparison group led by the adult trainer resulted in a less significant change in depression scores in the older adults (Group 1 with adolescents= $p<.001$; Group 2 led by adult trainer = $p<.008$). The control group (who attended the local social centre but did not interact with the adolescents or participate in exercise sessions) showed a statistically significant increase in depressive symptoms ($p<.001$). The evidence supports activities that provide the participating generations with the opportunity to share time, reminisce and develop relationships are powerful mechanisms for triggering generativity and social connectedness.

Logic model

The aim of this review is to identify the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. The logic model below represents the relationships between program activities and improved social connectedness for older adults. As demonstrated through the CMOC, the act of two generations coming together in familiar community-based contexts with a shared purpose, resulted in strengthened relationships and community connections. Several participants in the included studies spoke about the benefit of having an opportunity to 'meet and greet' for example by sharing an afternoon tea as part of the program[33, 35, 47-49].

This logic model (presented in Figure 2 below) uses a nested visual to represent an optimal intergenerational program to improve social connectedness in older adults. The circumstances being the outer circle, with the mechanisms within that, driving the outcomes at the core.

***Insert here_Figure 2: Logic model**

DISCUSSION

Evidence from the included studies reveals how intergenerational programs involving adolescents can address issues of social disconnectedness in older adults. This review identifies how and why intergenerational programs work, for whom and in what circumstances. Broadly, the CMOC cover four main themes - 1) psychosocial and mental health, 2) physical and cognitive health, 3) program design and structure and 4) community engagement and social capital.

Psychosocial and mental health

Providing opportunities for older adults to participate, without being infantized or inequitably treated is highlighted by the included studies and others as a mechanism for improving reciprocity and generativity[20, 37, 54]. The opportunity to participate in an intergenerational program saw older adults improve their own self-image and stereotypical view of old age and prove to themselves that they still had something to offer the community and the younger generation[45, 46, 49]. Included programs that created opportunities for informal, relationship-based activities which triggered generativity, for example promoting conversation between the generational groups, were of greatest benefit to psycho-social health[35, 45, 49].

Physical and cognitive health

The impact of intergenerational programs on broader health outcomes, including cognitive health has been previously reported[14, 55]. The connections between social, cognitive and physical health are well known, particularly in high-risk populations like older adults[56-58]. In this review, interventions that promoted the older adult as wise or expert[33, 35, 37, 47, 48] showed improvement in both perceived and measured cognitive performance. Kessler and Staudinger[37] showed improvement in speed of processing and word fluency when older adults were paired with an adolescent and asked to solve a 'life problem'. Qualitative evidence from included studies reported improved physical health in older adults as a result of their involvement in the intergenerational program, including increased energy[33] reduced pain[49] and increased movement[45].

Program design and structure

A range of designs and structures are reported in the intergenerational program literature. Intergenerational programs embedded within pedagogic contexts are supported by existing literature[26, 59, 60] and were featured in many of the included studies. Several studies support the need for in depth, sustainable and accessible intergenerational programs to address social health issues[19, 61]. As highlighted by Cattan et al.,[62] programs that engage adults in the planning and design of the interaction are most effective. This was seen in the Ostensen[15] study

and the Wilson et al.,[33] study that highlighted the use of co-design to optimise outcomes. Martins et al.,[31] in a review of intergenrational programs also highlighted the benefit of weekly or fortnightly intergenerational meetings to create bonds between participants.

Several of the included studies highlighted the importance of informal and formal program structures to build a foundation for connection. Several interventions leveraged existing local community connections and pre – program training was shown to support participation[33, 45, 49]. However, where complex demographics exist, additional program support may be required[33, 45, 49].

Community engagement and social capital

Programs set in the community that leveraged existing community connections were more likely to promote social connectedness. Individuals already engaged with the community in a volunteer capacity were participants, and in some cases facilitators of the program. Other reviews[21] support the inclusion of volunteers as it is a cost effective way to deliver programs and promote volunteerism- a key element for enhancing social capital. Volunteers were used in the included studies to support program delivery and participant recruitment via community organisations like Rotary or Scouts[15, 33, 47-49]. Adolescents also witnessed volunteer 'models' and were interested in volunteerism beyond the program[15, 35, 49].

Strengths and limitations of this review

This realist review explored intergenerational programs that specifically involved adolescents and their impact on social connectedness in older adults and developed inclusion and exclusion criteria to reflect this aim. Whilst these criteria generated a targeted group of studies for review, there may have been additional studies missed. The included studies showed some collective limitations including a lack of participant diversity in regard to gender and rurality. From the information reported, most studies were conducted in metropolitan environments. The importance of building capacity in rural communities to protect the social health of older adults is supported by Hodgkin et al.[6] and this lacking insight is one limitation of this review. In regards to gender, three studies specifically recruited based on gender given they were located in Men's sheds[33, 47] or focused on girls scouts[48], however in other studies where gender did not appear to be a structural factor, there was a greater proportion of women over men who participated. This is a possible limitation of the review along with the limited participation of older adults with cognitive impairment, particularly in quantitative measurement[15, 35, 48]. There were also noted limitations in the quality of some studies with a paucity of evidence from the intervention, however these studies remained included in the review given their value to the overall review question and the commitment in realist methodology not to exclude solely based

on quality of evidence[38]. An additional limitation is that only studies published in English were considered.

This review is however strengthened by its specific focus and that it is the first realist review to explore the impact of intergenerational programs specifically involving adolescents on social connectedness in older adults. In addition, the review included a variety of study methods including one randomised control trial. The inclusion of evidence developed using a variety of methods is supported by the realist review methodological standards as it provides a broad view of existing literature and evidence is included based on its value and contribution to the review aim, rather than singularly on methodological type. As a result, the included studies report on a variety of different programs from several major continents. Whilst this heterogeneity may be viewed as a limitation, the realist method supports using a wide range of evidence to understand the circumstances in which complex interventions deliver an intended outcome. The review may have been further strengthened by the opportunity to test the program theories and logic with stakeholder groups.

Implications for practice and future research

This review has provided a logic model that is ready to use by clinicians, program managers and policy makers in the design and implementation of community based intergenerational interventions. This review has implications for targeting physical, social, and mental health in older adults, as well as exploring opportunities for the role of intergenerational programs in adolescent health. Furthermore, the program theory provides a suggested approach for designing programs with a broader system lens. Previous literature has also supported the use of intergenerational programs[63], in particular those with a social health focus, to counter loneliness[64], influence age related health outcomes[17] and reduce costs associated with increased care needs in older age[15, 65].

The review also provides support for the inclusion of intergenerational programs into the curriculum to influence adolescent career choices and to improve attitudes towards older people[35, 45, 49]. Included studies also called for intergenerational programs to be a “systematic component of care provision”[49] for older adults living in residential aged care, including additional resources, changes to models of care and staff training[15].

Future research where intergenerational interventions are 1) designed using the program theory as articulated within the logic model and 2) tested with stakeholders, may support further understanding what works for whom, and in what circumstances. Realist evaluation or other published frameworks like the 6-SQUID model[66, 67] are methodological options for future

projects. This style of participatory research generates community will and engagement and supports sustainability without major resource investment, as the community itself 'owns' and is committed to the intervention they have designed. Future research would also benefit from addressing the same theory in comparative or specific settings[39], such as in aged care settings or community groups like Men's sheds.

CONCLUSION

This review has identified the circumstances in which social connectedness is optimised for older adults when taking part in intergenerational interventions with adolescents. Findings have provided a logic model outlining how intergenerational programs involving adolescents are likely to improve social connectedness for older adults and builds on the evidence that social connectedness and social networks are protective for immunity, reduced depression rates and a reduced risk of frailty[16, 56, 68].

In addition to the psychosocial development theory, this review has uncovered the optimal circumstances that promote social connectedness for older adults. These include setting programs in the community, including a trained facilitator, leveraging a pedagogic framework and finding shared goals between participants. Structural elements such as pre-program training and frequency of sessions was shown to be important in delivering relationship bonds between older adults and adolescents, that trigger generative behaviours and greater perceived social connectedness. Intergenerational programs involving adolescents are a possible solution for enhancing social connectedness and health outcomes for older adults.

Authors' contributions

JS, HV and DA conceived of the project and contributed to the development of the manuscript. JS led the review, HV and DA were the co-reviewers. All authors read and approved the final manuscript.

Conflict of interest declaration

The authors declare no conflict of interest and take sole responsibility for the content of this article.

Data sharing statement

All included articles are available publicly. The data extracted from these articles can be made available upon request.

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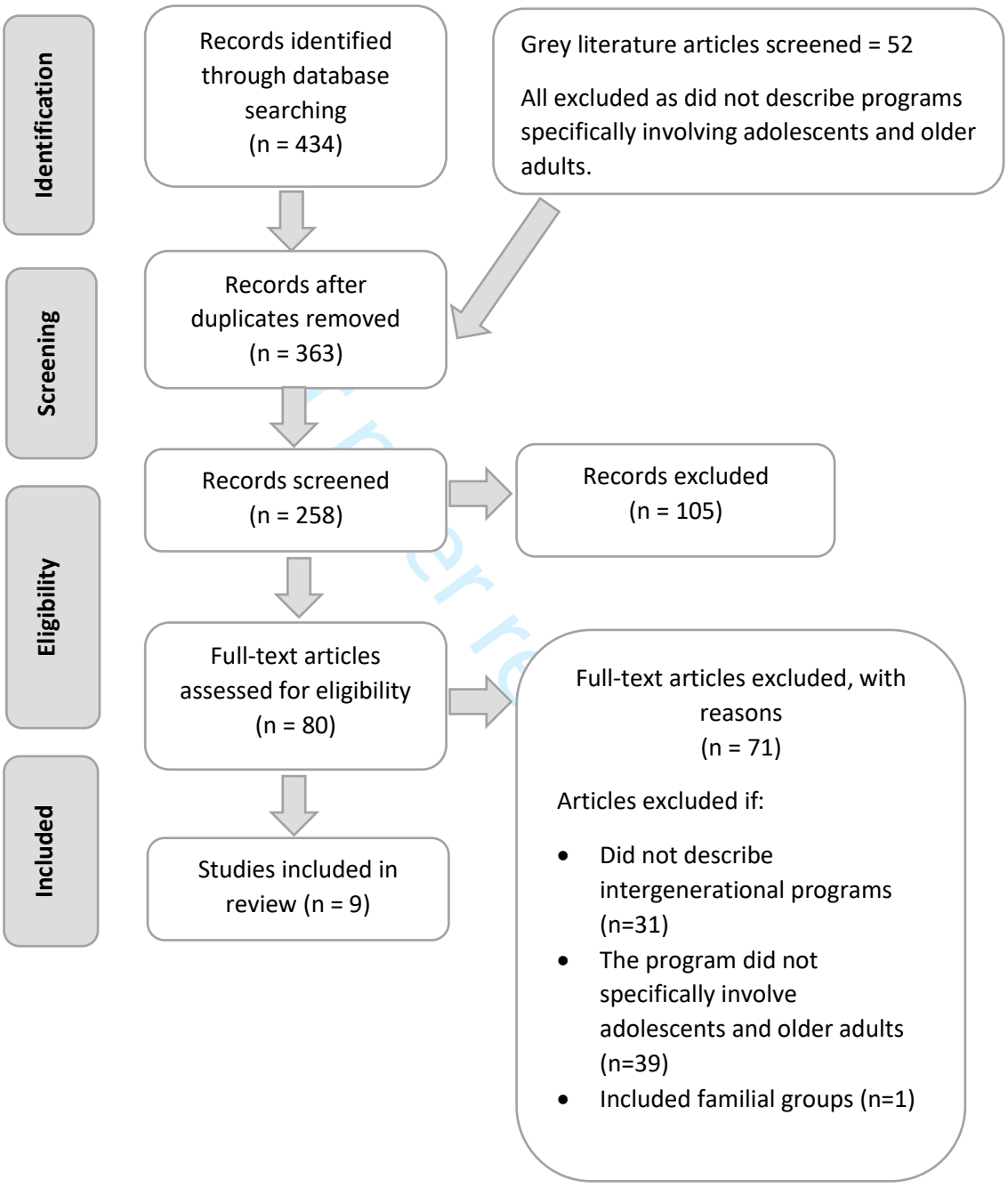
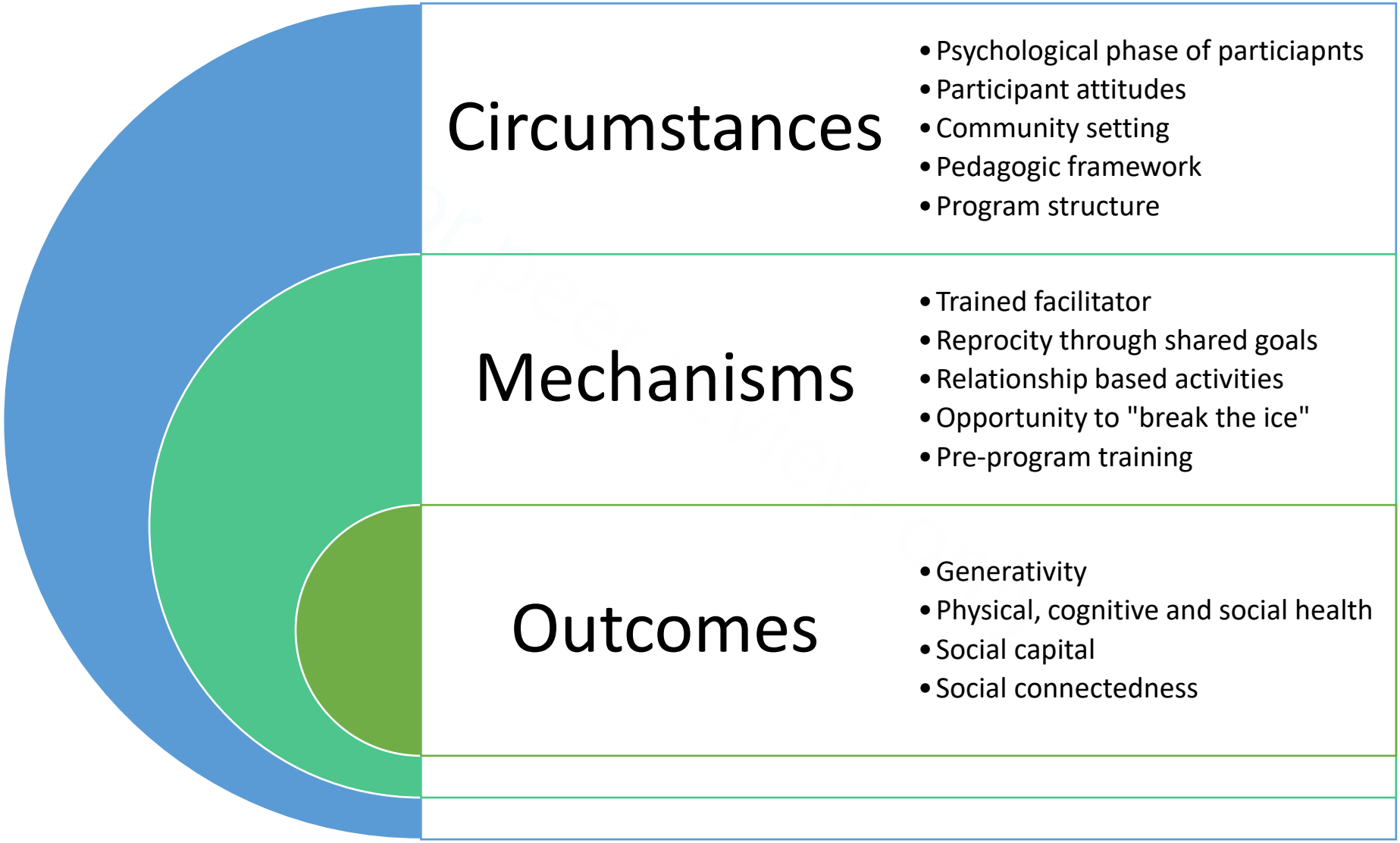
Figure 1: Flow diagram




Circumstances
• Psychological phase of particiapnts
• Participant attitudes
• Community setting
• Pedagogic framework
• Program structure
Mechanisms
• Trained facilitator
• Reprocity through shared goals
• Relationship based activities
• Opportunity to "break the ice"
• Pre-program training
Outcomes
• Generativity
• Physical, cognitive and social health
• Social capital
• Social connectedness

RAMESES checklist for reporting a realist synthesis

From Wong et al.: RAMESES publication standards: realist syntheses. BMC Medicine 2013 11:21. doi: 10.1186/1741-7015-11-21
https://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-11-21

TITLE			**Reported in document Y/N/Unclear**	**Page number**
		In the title, identify the document as a realist synthesis or review	Y	1
ABSTRACT				
		While acknowledging publication requirements and house style, abstracts should ideally contain brief details of: the study's background, review question or objectives; search strategy; methods of selection, appraisal, analysis and synthesis of sources; main results; and implications for practice.	Y	2
INTRODUCTION				
	Rationale for review	Explain why the review is needed and what it is likely to contribute to existing understanding of the topic area.	Y	6
	Objectives and focus of review	State the objective(s) of the review and/or the review question(s). Define and provide a rationale for the focus of the review.	Y	6
	Ethical approval	State whether the project required and obtained ethical approval from the relevant authorities, with details.	Y	10
METHODS				
	Changes in the review process	Any changes made to the review process that was initially planned should be briefly described and justified.	N (no changes made)	n/a
	Rationale for using realist synthesis	Explain why realist synthesis was considered the most appropriate method to use.	Y	6 to 7
	Scoping the literature	Describe and justify the initial process of exploratory scoping of the literature.	Y	7
	Searching processes	While considering specific requirements of the journal or other publication outlet, state and provide a rationale for how the iterative searching was done. Provide details on all the sources accessed for information in the review. Where searching in electronic databases has taken place, the details should include, for example, name of database, search terms, dates of coverage and date last searched. If	Y	9

		individuals familiar with the relevant literature and/or topic area were contacted, indicate how they were identified and selected.		
9	Selection and appraisal of documents	Explain how judgements were made about including and excluding data from documents, and justify these.	Y	8 to 9
10	Data extraction	Describe and explain which data or information were extracted from the included documents and justify this selection.	Y	6
11	Analysis and synthesis processes	Describe the analysis and synthesis processes in detail. This section should include information on the constructs analyzed and describe the analytic process.	Y	10
RESULTS				
12	Document flow diagram	Provide details on the number of documents assessed for eligibility and included in the review with reasons for exclusion at each stage as well as an indication of their source of origin (for example, from searching databases, reference lists and so on). You may consider using the example templates (which are likely to need modification to suit the data) that are provided.	Y	Figure 1
13	Document characteristics	Provide information on the characteristics of the documents included in the review.	Y	Table 2
14	Main findings	Present the key findings with a specific focus on theory building and testing.	Y	Page 15 to 24
DISCUSSION				
15	Summary of findings	Summarize the main findings, taking into account the review's objective(s), research question(s), focus and intended audience(s).	Y	25
16	Strengths, limitations and future research directions	Discuss both the strengths of the review and its limitations. These should include (but need not be restricted to) (a) consideration of all the steps in the review process and (b) comment on the overall strength of evidence supporting the explanatory insights which emerged. The limitations identified may point to areas where further work is needed.	Y	26-28
17	Comparison with existing literature	Where applicable, compare and contrast the review's findings with the existing literature (for example, other reviews) on the same topic.	Y	25 to 26
18	Conclusion and recommendations	List the main implications of the findings and place these in the context of other relevant literature. If appropriate, offer recommendations for policy and practice.	Y	27
19	Funding	Provide details of funding source (if any) for the review, the role played by the funder (if any) and any conflicts of interests of the reviewers.	Y	29

Supplementary file 2: Realist Review Protocol

Title: Circumstances that promote social connectedness in older adults participating in intergenerational programs with adolescents: a realist review

Introduction

Intergenerational programs are programs that involve two unrelated generational groups and result in a mutually beneficial outcome for the participants. Erikson's theory of psychosocial development highlights that adolescents (for the purpose of this review aged 13-19) and older adults (for the purpose of this review 65 and older) are at comparable stages, facing questions around identity and integrity and dealing with life transitions of puberty and retirements respectively.

Social connectedness is highlighted as a major factor in wellbeing and health, particularly for older adults. The perceived or real lack of opportunities to be connected socially and with society can have negative impacts on a person's physical, social and mental health.

For the purpose of this review, the impact of intergenerational programs, that involve both adolescents and older adults, on social connectedness outcomes in the older adult group will be explored. The contexts and mechanism by which the program was delivered will also be explored as key parts of the interventions with the result of the review aiming to determine what contexts and mechanisms lead to the most beneficial outcomes for social connectedness. The objective of this realist review is to develop a program theory that guides the development of intergenerational programs involving adolescents and older adults, that impact upon social connectedness in older adults. There is a current gap in the literature addressing programs that involve specifically adolescents and their impact on the domain of social connectedness.

Review Question

The SPIDER framework was used to develop the review question, which is based on describing the Sample (S), Phenomenon of Interest (PI), Design (D), Evaluation (E), and Research type (R) (Cook et al. 2012).

Sample: Adults aged 65 and over and adolescents aged 13-19 that are unrelated and engaged in engaged in intergenerational programs

Phenomenon of interest: Any type of Intergenerational programs that involve two non-familial generational groups - adults aged 65 and over and adolescents aged 13-19. Inclusive of intergenerational programs that take place in community settings, including educational and aged care settings.

Design: Realist review

Evaluation: We will focus on characteristics, views and experiences from qualitative literature. From quantitative literature we will focus on the assessment of outcomes such as social connectedness, social isolation, social loneliness, social support, social participation and social interaction.

Research type: Quantitative studies, qualitative studies, mixed methods.

Final review question: *Which circumstances promote social connectedness in older adults participating in intergenerational programs with adolescent?*

Plan for generation of *a priori* theories:

A priori theories will be developed utilising an iterative, two-part process. This will include an initial scoping search of Medline using the search terms outlined in the *Search Strategy* section below. We will also undertake initial engagement with relevant stakeholder sot develop the *a priori* theories. The idea for this review came from a collaboration involving the authors, a municipality in regional Victoria, Australia, and a high school located within that municipality. Originally, the collaboration was centred on the development and evaluation of a pilot intergenerational digital literacy program involving adolescent school pupils and older community-dwelling individuals. However, during the initial stages of designing the program, the authors identified there was an absence of review-level evidence regarding intergenerational programs involving adolescents and older people. A decision was made to undertake a realist review on this topic. Municipal and high school collaborator stakeholders, namely senior teachers, municipal project officers and positive ageing ambassadors, will be involved in the process of generating *a priori* theories by contributing information on the need and opportunity for intergenerational programs in the school environment.

Search Strategy

The following electronic databases will be searched using English language limitation: MEDLINE, PsychINFO, CINAHL. Google Scholar will be used to supplement the search using a simplified search terms list from below.

Search terms included; (Aged OR "older adult" OR senior OR elder* OR geriatric OR "old* person*") AND ("intergenerational relation*" OR "intergenerational program*" OR "intergenerational activit*" OR "intergenerational practice" OR "intergenerational learning" OR "intergenerational service learning" OR “intergenerational relations” OR intergenerational) AND ("social connect*" OR "social isolation" OR "social interact*" OR loneliness OR "social participation") AND (“adolescent”)

Inclusion and Exclusion Criteria

Qualitative, Quantitative and Mixed method studies will be eligible for inclusion

Included	Excluded
Study reported on intergenerational programs	Reported on non-intergenerational programs
Participants from non-familial generations	Studies involving the study of grandparents / grandparenting or family intergenerational relationships
Aged 13-19	Aged <13
Aged 65 and above	Aged 20-64
Published 2000-2020	Published before 2000
Published in English	Not published in English

Where studies include part of the age range and are determined to contribute to the development of the program theory, they will be included. Two reviewers will determine such studies inclusion.

Study Selection

Two reviewers will determine included studies. Inclusion criteria as above will be applied to the studies retrieved from the search.

Data extraction and Quality Assessment

Data will be extracted using a bespoke data extraction form. A bespoke quality assessment tool will be developed. Both data extraction and quality assessment will be undertaken by two reviewers.

Data synthesis

The aim of the synthesis is to identify potential context-mechanism-outcome configurations (CMOCs) to develop a programme theory about the circumstances that can promote social connectedness in older adults participating in intergenerational programs with adolescent.

REFERENCES

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Number	combined	Search term - Medline	MeSH	Keyword	total
3 or 7	2963804	(MH "Aged") OR (MH "Aged, 80 and Over")	yes		3076650
	OR				
	355786	"older adult" OR		yes	
		senior OR		yes	
		elder* OR		yes	
		geriatric OR		yes	
		"old* person*" OR		yes	
1 or 2 or 4	**AND**				
	6242	"intergenerational relation*" OR		yes	7854
		"intergenerational program*" OR		yes	
		"intergenerational activit*" OR		yes	
		"intergenerational practice" OR		yes	
		"intergenerational learning"		yes	
	OR				
	3734	intergenerational relations	yes		
	OR				
	6242	intergenerational		yes	
5	**AND**				
	44986	"social connect*" OR		yes	44986
		"social isolation" OR		yes	
		"social interact*" OR		yes	
		loneliness OR		yes	
		"social participation"		yes	
5 and 6 and 8				**TOTAL**	**105**
				Limited to english language	**93**

Number	combined	Search term -CINAHL	MeSH	Keyword	total
S1 OR S5	720418	(MH "Aged") OR (MH "Aged, 80 and Over")	yes		772260
	OR				
	162145	"older adult" OR		yes	
		senior OR		yes	
		elder* OR		yes	
		geriatric OR		yes	
		"old* person*" OR		yes	
S2 OR S3	**AND**				
	6242	"intergenerational relation*" OR		yes	6242
		"intergenerational program*" OR		yes	
		"intergenerational activit*" OR		yes	
		"intergenerational practice" OR		yes	
		"intergenerational learning"		yes	
	OR				
	6242	intergenerational		yes	
S6	**AND**				
	22543	"social connect*" OR		yes	22543
		"social isolation" OR		yes	
		"social interact*" OR		yes	
		loneliness OR		yes	
		"social participation"		yes	
S6 AND S12 AND S14	**TOTAL**				**143**
	Limited to age and english language				**139**

Number	combined	Search term -PsycINFO	MeSH	Keyword	total
1 or 6		(MH "Aged") OR (MH "Aged, 80 and Over")		yes	
	OR				
		"older adult" OR		yes	
		senior OR		yes	
		elder* OR		yes	
		geriatric OR		yes	
		"old* person*"		yes	
2 or 3 or 4	**AND**				
		"intergenerational relation*" OR		yes	
		"intergenerational program*" OR		yes	
		"intergenerational activit*" OR		yes	
		"intergenerational practice" OR		yes	
		"intergenerational learning"		yes	
	OR				
		intergenerational relations	yes		
	OR				
		intergenerational		yes	
5	**AND**				
		"social connect*" OR		yes	
		"social isolation" OR		yes	
		"social interact*" OR		yes	
		loneliness OR		yes	
		"social participation"		yes	
5 and 6 and 7				**TOTAL**	**144**
				Limited to english language	**133**

Google Scholar	
older people or aged or senior AND "intergenerational program*" or intergenerational AND "social connectedness"	**73**

Search two	Added "adolescent" search term to each of the above search strategies in order to refine search by age limit of agreed 13-19 years

Supplementary File 4: Inclusion and Exclusion Criteria

Included	Excluded
Study reporting on intergenerational programs. Study can be quantitative, qualitative or mixed-methods	Reported on non-intergenerational programs
Participants from non-familial generations	Studies involving the study of grandparents / grandparenting or family intergenerational relationships
Aged 13-19	Aged <13
Aged 65 and above	Aged 20-64
Published 2000-2020	Published before 2000
Published in English	Not published in English

SUPPLEMENTARY FILE 5: DATA EXTRACTION FORM

1. Bibliographic details	
Article number:	
Article reference:	
Extracted by:	
Checked by:	
Researcher details (discipline or professional background)	
What are the geographic details of the study?	
2. Aims and Methods	
What is the study type?	
What methods were used?	
Are the aims/ objectives clearly stated in the study? Detail	
Is the research question/s stated explicitly or within the text? Detail	
What materials were used to collect the data?	
How was the data analysed?	
Does the intervention use a particular theory to inform its design?	
3. Participants	
What was the sample size?	
What were the sample characteristics?	
How were participants recruited?	
What were the inclusion and exclusion criteria?	
4. Intervention details	
What was the intervention?	
How was the intervention delivered?	
Who is delivering the intervention?	
In what setting was the intervention delivered? Why was this setting / context chosen?	
Was this setting appropriate to examine the research question?	
Was the intervention designed with the participants (one or both age groups)?	
How were adolescents involved in the intervention?	

How were older people involved in the intervention?	
5. Findings/ Results	
What was the reported experiences of the participants?	
What was the reported experience of the facilitators?	
Did the intervention focus on/ impact on social connectedness?	
Did the adolescents report (or was it reported by others) greater understanding of older people?	
Did the older people report (or was it reported by others) impact upon social connectedness?	
Did the older people report (or was it reported by others) impact upon overall health and wellbeing?	
Did the older people report (or was it reported by others) greater understanding of the younger generation?	
Did the age range of the participants impact upon the success of the intervention? Were there structural barriers here e.g. transport, health issues?	
What themes (qualitative) / headline findings (quantitative) were generated by the study? (around intergenerational programs, adolescents, older people, context in which delivered/ undertaken)	
Are the findings interpreted within the contexts of other studies and theory?	
6. Were the *a priori* theories supported/ confirmed?	
That intergenerational programs involving adolescents and older adults improve social connectedness in the older adult group	
That intergenerational programs conducted in educational contexts result in positive outcomes in social connectedness for one/both groups	
Adolescents and older people are at a similar psychological milestone and therefore are mutual beneficiaries of intergenerational programs	
Older people may be socially disconnected in the absence of loneliness- intergenerational programs help support meaningful connections within the community, with individuals outside of their normal age and social demographic	
Greater generativity is formed through participation in intergenerational programs	
Intergenerational programs conducted in educational contexts build community connections between generations and across structural community assets like schools.	
What new theories were generated by this study?	

SUPPLEMENTARY FILE 6: QUALITY ASSESSMENT

Quality Assessment Criteria	
1	Is there adequate rationale for using this design to address the research aim/ question?
2	Did the authors justify the sample size used?
3	Is adequate evidence provided to support the findings?
4	Quantitative Studies: When comparing / analysing the groups (if more than one), did the authors consider the - Comparability - Confounding variables and controlling for these?
5	Qualitative Studies: Did the researchers consider their own position, assumptions and possible biases?
6	Were the strengths and limitations stated?
7	Was ethical committee approval obtained?
8	How valuable is this research to the review? High, Medium or Low

*Items 1,2,3,5,7,8 from CASP qualitative checklist (CASP 2018a). Items 5, 1 and 7 also from Long (2005). Item 4 from CASP Cohort Study Checklist (CASP 2018b)

REFERENCES

Long A (2005). Evaluative tool for mixed method studies. University of Leeds, School of Healthcare[online]. 24:2017.

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Critical Appraisal Skills Programme (2018). CASP (Cohort Study) Checklist. [online] Available at: https://casp-uk.net/images/checklist/documents/CASP-Cohort-Study-Checklist/CASP-Cohort-Study-Checklist-2018_fillable_form.pdf. Accessed: Date Accessed: 17/2/20

Quality Assessment Criteria		de Souza[45]	Kessler and Staudinger[37]	Hernandez and Gonzalez[46]	Wilson, Cordier[47]	Biggs and Knox[48]	Knight, Skouteris[35]	Ostensen, Gjevjon[15]	Santini, Tombolesi[49]	Wilson, Cordier[33]
1	Is there adequate rationale for using this design to address the research aim/ question?	✔	✔	✔	✔	✔	✔	✔	✔	✔
2	Did the authors justify the sample size used?	UNCLEAR	✔	✔	✔	✔	✔	✔	✔	✔
3	Is adequate evidence provided to support the findings?	✔	✔	✔	✔	UNCLEAR	✔	✔	✔	✔
4	Quantitative Studies: When comparing / analysing the groups (if more than one), did the authors consider the - Comparability - Confounding variables and controlling for these?	N/A	✔	✔	N/A	✔	N/A	N/A	N/A	✔
5	Qualitative Studies: Did the researchers consider their own position, assumptions and possible biases?	UNCLEAR	N/A	N/A	✔	N/A	✔	UNCLEAR	✔	UNCLEAR
6	Were the strengths and limitations stated?	✔	✔	✔	✔	✔	✔	✔	✔	✔
7	Was ethical committee approval obtained?	UNCLEAR	UNCLEAR	✔	✔	✔	✔	✔	UNCLEAR	✔
8	How valuable is this research to the review? High, Medium or Low	HIGH	HIGH	MEDIUM	HIGH	MEDIUM	HIGH	HIGH	HIGH	HIGH