NSSI in Older Adults

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This chapter explores the epidemiology of non-suicidal self-injury (NSSI) in older adults. It explains how a systematic review presents the risk and protective factors of NSSI among the elderly population, referencing the selection process of the Meta-Analyses and Systematic Reviews of Observational Studies in Epidemiology (MOOSE). Even though some findings are similar to NSSI research on adolescents and young adults, the experience of loss is specific to NSSI-related behaviors among older adults. The chapter then considers the distinction between suicidal intent and the directness of self-harm within the elderly population. It suggests conducting a longitudinal, cross-cultural design that distinguishes between the specific forms of self-harm to conduct an early intervention and prevent NSSI repetition.

Keywords:
epidemiology, NSSI, elderly population, experience of loss, suicidal intent, self-harm, systematic review, early intervention.
Introduction

Mia (75 years old) was recently admitted to an emergency unit for a suicide attempt. There she was referred to a psychiatric hospital for further treatment and diagnostics. The team of the psychogeriatric ward notices several scars on the patient’s forearms. Upon inquiry, it appears that, when she was younger, Mia injured herself to deal with high tension but not with suicidal intent. This form of self-injury disappeared when she was given “depressant” medication from her psychiatrist. Nowadays, she has a new doctor who reduced her medication resulting in greater tensions at home and with her partner. Furthermore, the team also notes that the patient is unable to follow the therapeutic sessions due to language and memory problems (later diagnosed as frontotemporal dementia). Despite the fact that she worked a whole career as a teacher, she currently is no longer able to remember appointments and to bring structure in her daily activities. This feeling of loss of control, together with a recent change in her medication may have led to an increase in stress, resulting in the suicide attempt.

Over the past two decades, an increasing number of researchers have shown interest in studying self-harm. This includes behaviors that are deliberately performed with intent (i.e., suicidal self-harm) or with no intent to die (i.e., non-suicidal self-harm; Nock, 2010). Some of these behaviors cause physical damage indirectly (i.e., indirect self-harm), such as alcohol abuse or eating disorders, while other behaviors cause direct damage to the bodily tissue (i.e., direct self-harm), such as cutting. Although many studies have since researched self-harm, only few focus on this phenomenon in older adults (aged 60 years and older). This is especially the case for nonsuicidal self-injury (NSSI).

In this chapter, we will describe the epidemiology of NSSI in older adults. As there is almost no research on risk and protective factors of NSSI in this population, we will present...
in this chapter, a systematic review of the existing literature on NSSI-linked behaviors in older adults (considering literature on indirect self-harm and suicidal thoughts and behaviors in older adults). We conclude by reviewing implications for clinicians and researchers.

Epidemiology and Etiology of NSSI (and Self-Harm) in Older Adults

Martin and Swannell (2016) were among the first to study non-suicidal self-injury (NSSI) specifically across age groups (N = 12,006). Of the 219 persons who had engaged in NSSI the preceding year, 6.8% were 60 years old or over (n = 15). These older adults were predominantly female (73.5%). They found that NSSI was more strongly associated with a psychiatric diagnosis, higher psychological distress, and lifetime suicide attempts among older adults in comparison to younger adults. However, for the execution of their analyses, they defined older adults upward of age 40. Therefore these results may not be applicable to older adults aged 60 years and above.

Choi et al. (2016) also researched NSSI among older adults. They conducted a retrospective study in which they investigated emergency department (ED) visits of older adults aged 50 years and older (N = 26,142,903) caused by any form of injury. Of these patients, 3% (n = 789,516) visited the ED after a suicidal attempt or NSSI episode. Although 76.9% of these patients presented with suicidal attempts, NSSI was the cause of the ED visit in the remaining 23.1% of these cases. Among patients aged 65 years and older specifically, NSSI accounted for 25% of the cases. Choi et al. (2016) also found this reflected in the slightly higher odds for older adults aged 65 years and older to be admitted for NSSI rather than a suicidal attempt, in comparison to adults aged 50 to 64 years. Regarding gender, males (55%) seemed to engage more often in suicidal attempts in comparison to females (45%), while more females (56%) presented with NSSI than males (44%). Moreover, multi-injury, anxiety disorder and drug use disorder were more strongly associated with NSSI than suicidal
attempts. Surprisingly, older adults who visited the ED after a NSSI episode were more likely to be admitted to the hospital, in comparison to those whose visit was caused by a suicidal attempt (Choi et al., 2016).

Most recently, Ose et al. (2021) examined the incidence of NSSI and SSI (i.e., suicidal self-injury) in a national adult psychiatric outpatient sample ($N = 23,124$) via clinician’s report. In the age-group of 60- to 69-year-olds, 6.3% of the patients had engaged in NSSI in the past four weeks, 13.6% showed suicidal thoughts, and 0.4% attempted a suicidal suicide attempt. For adults aged 70 years and older, clinicians registered NSSI for 2.9%, and 9.2% exhibited SSI thoughts in the past four weeks, whereas 0.8% attempted suicide.

Although the above-mentioned prevalence rates seem to suggest that NSSI does occur among older adults, literature on risk and protective factors of NSSI in this special population is scarce (except for sociodemographic features, and the link with SSI/SA/indirect self-harm). Moreover, the risk and protective factors found in younger populations (adults, young adults/adolescents) might not always apply to this population. This was also suggested by Crocker et al. (2006), who interviewed 15 older adults, aged 65 years to 91 years old, who had recently attempted suicide. They found that few well-established risk factors in (N)SSI literature were mentioned by the older adults.

**Systematic Review on Risk and Protective Factors of NSSI-Linked Behaviors Among Older Adults**

To address this gap of research in elderly population, a systematic review was executed to present risk and protective factors of NSSI among this age group specifically. Since literature on NSSI in older adults is sparse, we also drew from literature on indirect self-harm and
suicidal thoughts and behaviors in older adults throughout the past 20 years. This literature was used to identify needs for future research and practical implications for NSSI among older adults. Although prior systematic reviews have been performed on self-harm among older adults in general (e.g., Fässberg et al., 2016; Troya, Babatunde et al., 2019a), no review has examined risk and protective factors divided according to their intent and directness.

Method

As this systematic review primarily included observational studies, the selection process of the Meta-Analyses and Systematic Reviews of Observational Studies in Epidemiology (MOOSE; Stroup et al., 2000) was used (see [figure fig. 1]). On the 1st of September 1, 2020, four electronic databases, namely, EBSCOHost, PubMed, Scopus, and Web of Science, were systematically searched on title and abstract with the search string: ([elder* OR “older adults” OR “older people”] AND [“self-directed violence” OR self-injur* OR nssi OR self-harm* OR suicid* OR “indirect harm” OR “self-inflicted self-injury” OR self-mutilation OR automutilation] AND [risk OR protective OR epidemiology OR etiology]).

The applied eligibility criteria can be found in [figure figure 1]. As NSSI was not often delineated from suicidal behaviors before 2000, this systematic review searched for articles that were published during the past 20 years. Because a cut-off age of 60 years is applied in other studies among older adults (e.g., Lapierre et al., 2011; Troya, Babatunde et al., 2019a), we defined an older adult as being 60 years or older. A protective and risk factor was defined as “a measurable characterization of each subject in a specified population that precedes the outcome of interest and which can be used to divide the population into two groups (the high-risk and the low-risk groups that comprise the total population)” (Kraemer et al., 1997, p. 338). For quantitative studies, the cut-off sample size was 30 cases (per group if comparing
groups) based on the central limit theorem, which suggests that quantitative studies only require 30 cases to withstand violations of normality (Field, 2013; Rosenblatt, 1956). For qualitative studies, an inclusion criterion for the sample size was not applied due to the enormous difficulties researchers experience when determining an exact sample size a priori (Sim et al., 2018). Further, sample sizes are often absent or inconsistently/incompletely reported and inadequately assessed in qualitative studies (Vasileiou et al., 2018). To heighten the inter-rater reliability, studies were screened and selected independently by two researchers. Disagreements regarding the selection of studies were resolved through consensus.

Results

In the results section, the included studies are discussed in light of their methodological designs and outcomes.

Included Studies

In total, 45 articles were included (see Appendix Table 1A). Of these articles, 34 were quantitative studies and 11 were qualitative studies. Regarding the quantitative studies, the majority applied a retrospective methodology (n = 37). Of these studies, 15 applied a case-control psychological autopsy design. Further, eight articles described a cohort or nationwide study, of which two were population-based and four articles contained a community-based study. Lastly, only two studies used a longitudinal design. Of the 45 included articles, 19 studies that took place in Asian countries, 11 in Europe, and seven in North America. The majority of studies (n = 22) included suicide cases in community samples of older adults.
The remaining studies were primarily patient samples (i.e., emergency departments, general hospitals, and/or primary care facilities). Ages 60 (n = 21) and 65 years old (n = 18) were most frequently applied as the cut-off age. Because some articles did not explicitly mention the maximum age, this could not be reviewed. Regarding gender, 24 samples were predominantly male (i.e., > 50%) compared to 20 samples that mostly comprised females.

There were no studies found that specifically focused on NSSI or indirect self-injury among older adults. In total, 29 included articles discussed completed suicide, of which 29 studies analyzed risk factors and four protective factors. Suicide attempts among older adults were studied in 11 articles, of which nine included risk factors and three protective factors. Six articles were retrieved that did not distinguish in intent and directness. Importantly, no factors were found for indirect suicidal behaviors specifically. This was also the case for direct and indirect non-suicidal behaviors (see Table 1).

Based upon the examination of the included studies, we can conclude that few researchers have made a distinction in suicidal intent and directness of self-harm. This is especially alarming in regard to NSSI, as NSSI has been repeatedly reported as an important precursor of suicidal behaviors, including death by suicide (Nock et al., 2008; Whalen et al., 2015). Due to the lack of researching this behavior specifically, barely anything is known about the etiology and epidemiology of NSSI among older adults. Moreover, Sher (2011) has raised the question whether suicide is predictable, as the event is both context and time dependent. Findings by Hung et al. (2015) support this questionability and especially the ability to identify high suicide risk groups in need of interventions. What has been studied...
however, is the ability to identify groups that are at high risk to engage in NSSI (Somer et al., 2015). Consequently, it is a necessity that future research among older adults focuses on NSSI specifically. This will also allow us to prevent the development of or intervene at an earlier stage of the suicidal process and as NSSI is an important risk factor of suicidal behavior, disruption of NSSI may also lead to a disruption of SI.

In total, 34 quantitative studies and 11 qualitative studies were included in the outlined systematic review, of which a vast majority was conducted retrospectively (e.g., case-control psychological autopsy studies). Further, the majority solely included older adults living in an Asian country. Protective factors were included in only five studies. Regarding non-suicidal self-injury (NSSI), no studies could be retrieved. This is due to the lack of applying a distinction (i.e., suicidal versus non-suicidal and direct versus indirect) within studies. Consequently, no specific risk or protective factors for these behaviors can be reported. This is an important gap in the literature as studies show that NSSI is indeed prevalent among older adults (e.g., Martin & Swannell, 2016). Moreover, Parks and Fieldman (2006) hypothesized that NSSI methods and functions may be different in older adults.

No studies were retrieved regarding indirect self-injurious behaviors with or without suicidal intent. Concerning retrieved risk factors for completed suicide, the following themes apply: a lower socio-economic status (e.g., Niu et al., 2020a), indices of social isolation (e.g., Hedna et al., 2020), functional impairment caused by physical or mental illnesses (e.g., Yeh et al., 2020), and family discord (e.g., Wei et al., 2020). These themes corresponded with those of the included studies that focused on suicide attempts specifically (e.g., Van Orden et al., 2015). Some of these themes can be linked to and explained by the Interpersonal Theory of Suicide (Joiner, 2005). First, social isolation is an important indicator of thwarted belongingness, that can be found in older adults who live alone (e.g., Torresani et al., 2014), are unwed or single (e.g., Hedna et al., 2020), report a lower social support (e.g., Niu et al., 2020a),
al., 2020a), and more loneliness (Niu, Jin et al., 2020a). This was in line with the findings of the included studies that solely focused on suicide attempts (e.g., Bonnewyn et al., 2018; Crocker et al., 2006; Kim et al., 2016; Neufeld et al., 2015; Oh et al., 2015; Van Orden et al., 2015). These findings also align with protective factors for suicide attempts, such as the involvement of mental health services staff, community engagement, engaging in meaningful activities and interests, and interpersonal relationships (Deuter et al., 2020). Next, perceived burdensomeness also represents a key factor in Joiner’s (2005) tripartite model of suicide. This was confirmed repeatedly by the included studies in this review (Kjølseth et al., 2010; Van Orden et al., 2015). Perceived burdensomeness arises when the need for social competence is unmet (Ryan & Deci, 2000; Van Orden et al., 2012) and was found to be associated with functional impairment (Conwell et al., 2010) caused by physical health problems (e.g., Yeh et al., 2020), and mental problems (e.g., Niu, Jin et al., 2020a), and family discord (Duberstein et al., 2004; Heikkinen et al., 1994). This was supported by the identification of low family functioning and family dysfunction as risk factors for completed suicide (e.g., Wei et al., 2020) and co-residence with children (Tsoh et al., 2005) as a protective factor. Yet again, the above-mentioned risk factors for completed suicide are congruous with the predictors of suicide attempts that were reported in the included studies (see Victor et al., this volume; e.g., Bonnewyn et al., 2018; Wiktorsson et al., 2016). Six studies focused on (in)direct self-harm irrespective of intent among older adults. These studies identified adverse and/or stressful life events over the life-course (Troya, Dikomitis et al., 2019b), interpersonal problems (Troya, Dikomitis et al., 2019b; Wand et al., 2018), and physical (e.g., Morgan et al., 2018) and/or mental problems (Morgan et al., 2018; Troya, Dikomitis et al., 2019b) as risk factors. As can be expected, most of these older adults also had a mental health services, psychiatric, or self-harm history (Cheung et al., 2017; Murphy et al., 2012).
Overarchingly, three themes arose: physical (e.g., declining physical health), psychological (e.g., psychiatric disorder), and social loss/difficulties (e.g., loneliness). (See Fox, this volume, and James & Gibb, this volume for an overview on inter- and intrapersonal risk factors.) Further, few studies made a distinction in suicidal intent and directness of self-harm. Compared to risk and protective factors of NSSI among adolescents and (young) adults, some of these findings were compatible (e.g., family conflict and close friends) (e.g., Aggarwal et al., 2017). However, one theme seemed to be specific for NSSI-related behaviors among older adults, namely, experiences of loss (e.g., Bonnewyn et al., 2018).

Our findings indicate that few studies make a distinction in suicidal intent and directness of self-harm. This highlights the need for studies that do apply a clear distinction, as this will allow us to determine overlapping and/or unique risk and protective factors of specific forms of self-harm among older adults (see see Burke et al., this volume). Moreover, it would provide the opportunity to better understand the role that NSSI plays in suicidal self-harm. Furthermore, this systematic review applied the MOOSE-method, which is a standardized selection process for observational studies (Brooke et al., 2021; Stroup et al., 2000). Our search strategies were provided in detail and the applied in- and exclusion criteria were predetermined. This heightens the replicability of the systematic review. Also, multiple databases were systematically searched to ensure the minimalization of missing studies that complied to the in- and exclusion criteria. The eligibility of the studies was assessed by two independent reviewers as to ensure inter-rater reliability (Belur et al., 2018).

Aside from these strengths, some limitations should also be taken into account. First, not all included studies exhaustively defined the behaviors included. Second, the validity of systematic reviews may be subverted by a publication and reporting bias (Dwan et al., 2013; Song et al., 2010). Next, the assessment of the quality of the included studies was limited to an unstandardized, subjective judgment by both reviewers and the employment of a cut-off
sample size as an inclusion criterion. Further, this systematic review did not set out to quantify the magnitude of the identified risk factors. Lastly, most included studies were conducted retrospectively. Therefore, caution is warranted regarding causation.

Implications for Future Research

Definitions applied to self-harm are often inconsistent across studies. Consequently, future research should focus on constructing a valid, reliable definition of these behaviors. Furthermore, most studies include a wide age range. It has been observed that NSSI patterns are age group-dependent among older adults. Researchers believe these differences will further increase as the life expectancy is gradually rising (Choi et al., 2016; Waern et al., 2003). Future studies should bear these differences in mind and execute age-specific analyses.

In regard to the systematic review’s methodology, a vast majority of the included studies were conducted retrospectively. This can lead to recall bias, which signifies the effect of the period of time between the event and assessment of the event on the response reliability (Niu, Ma et al., 2020; Torresani et al., 2014; Wei et al., 2019). This is especially the case for studies that collect data by proxy informants (Conner et al., 2012; Heikkinen et al., 1992), although Conner et al. (2001) found support for the validity of proxy informant-based data in suicide research specifically. Consequently, a need for longitudinal studies arises. Most included studies collected data in hospital settings or via a psychological autopsy design, but such data are often characterized by multiple limitations. For example, reported mental health problems are often based on clinical judgment instead of validated questionnaires (Cheung et al., 2017) and therefore potentially mislabel NSSI behaviors (Rhodes et al., 2002; Wanta et al., 2009). Additionally, stigma regarding NSSI may cause an underestimation of these behaviors. Lastly, no studies that were included in the
systematic review applied a cross-cultural design. Most were conducted in Asian countries, suggesting future studies might be able to uncover cross-cultural differences.

Implications for Clinicians

The few studies that have investigated NSSI among older adults thus far, indicate that NSSI does occur in this population (i.e., Martin & Swannell, 2016; Choi et al., 2016; Martin & Swannell, 2016). As NSSI has been significantly associated with suicidal behaviors (Hamza et al., 2012; Ose et al., 2021), the current gap in the literature is alarming. Consequently, clinicians should be attentive for NSSI among older adults. Alertness for such behaviors may be heightened by inquiring about NSSI engagement in their screening. As NSSI often finds its onset in adolescence (Nock, 2010), lifetime engagement should also be assessed. Furthermore, as stigma often arises when talking about NSSI (e.g., Burke et al., 2019), clinicians should approach this topic systematically and respectfully and use adequate language (Hasking & Boyes, 2018). Lastly, although the risk and protective factors found in the systematic review do not specifically apply to NSSI, research has shown a strong overlap between risk and protective factors of NSSI and those of suicidal behaviors. Clinicians may rely on the factors identified by the systematic review to assess NSSI risk in older adults.

Conclusion

This chapter evaluated the current research field of NSSI among older adults specifically by reporting a recent systematic review that distinguished between suicidal intent and directness of self-harm. First, few studies thus far have applied this distinction. This may lead to biased
findings regarding prevalence rates, risk and protective factors, and interventions. Next, no studies zoomed in on NSSI, which calls for NSSI studies among this age group.

Lastly, most studies applied a retrospective study design and were performed in Asian countries. Future research should apply a longitudinal, cross-cultural design that distinguishes between the specific forms of self-harm. This will not only allow us to intervene at an earlier stage in the suicidal process, but also help to prevent NSSI repetition.

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### Table 1

**Characteristics of Included Studies**

<table>
<thead>
<tr>
<th>Author, year</th>
<th>N</th>
<th>Female (%)</th>
<th>Age (years)</th>
<th>Country</th>
<th>Type of behavior (i.e., act of intentional self-injury irrespective of intent)</th>
<th>Method and sample type</th>
<th>Risk (RF) and/or protective factors (PF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheung et al. (2017)</td>
<td>339</td>
<td>55.2</td>
<td>65 -96:</td>
<td>New Zealand</td>
<td>Self-harm; patients presented to seven EDs after a self-harm episode</td>
<td>Retrospective study; patients</td>
<td>History of self-harm; positive blood alcohol reading (RF)</td>
</tr>
<tr>
<td>Morgan et al. (2018)</td>
<td>2,854</td>
<td>58</td>
<td>65+:</td>
<td>England</td>
<td>Suicidal and non-suicidal self-injury care cohort of older adults with a self-harm episode</td>
<td>Retrospective study; primary</td>
<td>Diagnosed previous mental illness; previous physical health condition (RF)</td>
</tr>
<tr>
<td>Murphy et al. (2012)</td>
<td>1,777</td>
<td>56</td>
<td>60 -97</td>
<td>England</td>
<td>Repeated self-harm; Previous self-harm; previous psychiatric treatment; age 60 - 74 years (RF)</td>
<td>Prospective, population-based study; self-harm cohort presenting to general hospitals</td>
<td></td>
</tr>
<tr>
<td>Troya et al. (2019)</td>
<td>9</td>
<td>66.7</td>
<td>60 -72:</td>
<td>England</td>
<td>Self-harm; adults engaging in self-harm throughout the life-course (i.e., health problems, adverse childhood events, loss, loneliness, and interpersonal problems) (RF)</td>
<td>Qualitative study; older</td>
<td></td>
</tr>
<tr>
<td>Dikomit et al. (2019)</td>
<td>3,7</td>
<td>63.4</td>
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<tr>
<td>Author(s)</td>
<td>Age Range</td>
<td>Country</td>
<td>Study Type</td>
<td>Sample Description</td>
<td>Themes</td>
<td></td>
<td></td>
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<tr>
<td>Wand et al. (2018)</td>
<td>80-102:</td>
<td>Australia</td>
<td>Qualitative study; people recruited from two teaching hospitals and associated community services aged 80 years and over who had self-harmed within the previous month</td>
<td>Enough is enough; loneliness; disintegration of self; being a burden; cumulative adversity; hopelessness and endless suffering; helplessness with rejection; untenable situation (RF)</td>
<td></td>
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<tr>
<td>Wand et al. (2019)</td>
<td>81-94:</td>
<td>Australia</td>
<td>Qualitative study; patients at two teaching hospitals and associated community services who self-harmed</td>
<td>Denial and secrets; endless suffering; more invalidation; being heard; miserable in care</td>
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<tr>
<td>Cao et al. (2019)</td>
<td>60+:</td>
<td>China</td>
<td>Case-control psychological autopsy study; suicide cases and community controls</td>
<td>Severeley impaired capability of DLA; low family functioning; mental disorder; low social support; more than two life events in the last year (RF) Sedatives and hypnotics (RF)</td>
<td></td>
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<tr>
<td>Carlsten et al. (2009)</td>
<td>65+:</td>
<td>Sweden</td>
<td>Case-control study: suicide cases and population-based comparison subjects</td>
<td>Reduced QoL; life as a struggle; physical health problems; inability to function independently; fear of having to live at a rest home</td>
<td></td>
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<tr>
<td>Cheung et al. (2015)</td>
<td>65+:</td>
<td>New Zealand</td>
<td>Qualitative study; suicide cases that had left a suicide note</td>
<td>Reduced QoL; life as a struggle; physical health problems; inability to function independently; fear of having to live at a rest home</td>
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<tr>
<td>Author(s)</td>
<td>Study Year</td>
<td>Sample Size</td>
<td>Age Group</td>
<td>Location</td>
<td>Case Definition</td>
<td>Control Subjects</td>
<td>Case-Controlled Study</td>
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<tr>
<td>Chiu et al.</td>
<td>2004</td>
<td>170</td>
<td>60+</td>
<td>China</td>
<td>Completed suicide cases: M = 74.6 SD = 7.7</td>
<td>Community-dwelling control subjects: M = 72.1 SD = 8.0</td>
<td>Case-controlled psychological autopsy study; suicide cases and community-dwelling control subjects</td>
</tr>
<tr>
<td>Choi and Park</td>
<td>2020</td>
<td>259,688</td>
<td>60-74</td>
<td>South Korea</td>
<td>Completed suicide cases: M = 71.1 SD = 7.7</td>
<td>Community-dwelling control subjects: M = 72.1 SD = 8.0</td>
<td>Case-controlled psychological autopsy study; suicide cases and community-dwelling control subjects</td>
</tr>
<tr>
<td>Choi et al.</td>
<td>2019a</td>
<td>558,147</td>
<td>60-74</td>
<td>South Korea</td>
<td>Nationwide retrospective cohort study: M = 70.1 SD = 7.7</td>
<td>Community-dwelling control subjects: M = 72.1 SD = 8.0</td>
<td>Nationwide retrospective cohort study: outpatients</td>
</tr>
<tr>
<td>Choi et al.</td>
<td>2019b</td>
<td>128,286</td>
<td>60-74</td>
<td>South Korea</td>
<td>Nationwide retrospective cohort study: M = 70.1 SD = 7.7</td>
<td>Community-dwelling control subjects: M = 72.1 SD = 8.0</td>
<td>Nationwide retrospective cohort study: outpatients</td>
</tr>
<tr>
<td>Choi et al.</td>
<td>2019c</td>
<td>16,924</td>
<td>65+</td>
<td>United States</td>
<td>Retrospective study: death records</td>
<td>Death records</td>
<td>Retrospective study: death records</td>
</tr>
<tr>
<td>Author(s)</td>
<td>N</td>
<td>Mean Age</td>
<td>Age Range</td>
<td>Country</td>
<td>Suicide Type</td>
<td>Study Design</td>
<td>Risk Factors</td>
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<tr>
<td>De Leo et al. (2013)</td>
<td>152</td>
<td>29.60</td>
<td>60–95</td>
<td>Australia</td>
<td>Completed suicide</td>
<td>Case-control psychological autopsy study; suicide cases and sudden death cases</td>
<td>Hopelessness in the past 12 months; history of previous suicide attempts; living alone; better self-maintenance (RF)</td>
</tr>
<tr>
<td>Hedna et al. (2020)</td>
<td>1413</td>
<td>57.80</td>
<td>75–112</td>
<td>Sweden</td>
<td>Completed suicide</td>
<td>National population-based study; Swedish residents</td>
<td>Being unmarried; being a woman who was born outside of Nordic countries (and who did not use ADs); being a man who did not use ADs and had a blue-collar job (RF); having had a blue-collar job in women who used ADs (BF)</td>
</tr>
<tr>
<td>Hung et al. (2015)</td>
<td>101,764</td>
<td>49.1</td>
<td>65+</td>
<td>Taiwan</td>
<td>Completed suicide</td>
<td>Community-based cohort study; Taipei City residents</td>
<td>Male sex; lower educational attainment; lower income; psychological distress (i.e., depressive mood and insomnia) (RF)</td>
</tr>
<tr>
<td>Jung et al. (2020)</td>
<td>34,431</td>
<td>73.81</td>
<td>60+</td>
<td>Korea</td>
<td>Completed suicide</td>
<td>Nationwide cohort study; patients with hip fracture and matched controls</td>
<td>Hip fracture (RF)</td>
</tr>
<tr>
<td>Authors</td>
<td>Sample Size</td>
<td>Mean Age</td>
<td>Age Group</td>
<td>Country</td>
<td>Suicide Method</td>
<td>Study Type</td>
<td>Findings</td>
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</tr>
<tr>
<td>Kjølset et al.</td>
<td>23</td>
<td>17.4</td>
<td>65–90:</td>
<td>Norway</td>
<td>Completed suicide</td>
<td>Psychological autopsy study; 63 informants</td>
<td>Experiences of life (i.e., this life has been lived and life as a burden); perception of themselves (i.e., losing oneself); conceptions of death (i.e., acknowledgement/acceptance and death is better than life) (RF)</td>
</tr>
<tr>
<td>Liu et al.</td>
<td>104</td>
<td>40.4</td>
<td>60+:</td>
<td>China</td>
<td>Completed suicide</td>
<td>Case-controlled psychological autopsy study</td>
<td>Greater tendency to experience negative life events; not living with a spouse (RF)</td>
</tr>
<tr>
<td>Nguyen et al.</td>
<td>3,396</td>
<td>56.4</td>
<td>65–99:</td>
<td>Canada</td>
<td>Completed suicide</td>
<td>Case-control psychological autopsy study; suicide cases and control cases</td>
<td>At the individual level: male; aged 65–69; use of ED; hospitalization; mental disorder; dispense of psychoactive drug (RF)</td>
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<td></td>
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<td></td>
<td></td>
<td>At the area level: higher population density; highest concentration of men and persons without any diploma; highest rate of unemployment (RF); higher concentration of lone families (BF)</td>
</tr>
<tr>
<td>Niu, Jia et al.</td>
<td>484</td>
<td>43.8</td>
<td>60+:</td>
<td>China</td>
<td>Completed suicide</td>
<td>Case-control psychological autopsy study; suicide cases and living community</td>
<td>Unemployment; lower subjective social support; living alone; depressive symptoms; higher hopelessness; both higher levels</td>
</tr>
<tr>
<td>Study</td>
<td>Sample Size</td>
<td>Mean Age</td>
<td>Country</td>
<td>Study Design</td>
<td>Controls in Study</td>
<td>Suicide Cases in Study</td>
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<tr>
<td>Niu, Ma et al. (2020)</td>
<td>484</td>
<td>43.8</td>
<td>China</td>
<td>Completed psychological autopsy study; suicide cases and living community</td>
<td>$M = 74.1$, $SD = 8.2$</td>
<td>$M = 74.4$, $SD = 8.2$</td>
<td></td>
</tr>
<tr>
<td>Parasch et al. (2012)</td>
<td>30.5</td>
<td>60+–97</td>
<td>Greece</td>
<td>Two-year psychological autopsy study; suicide cases</td>
<td>$M = 74.1$, $SD = 8.2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seyfried et al. (2011)</td>
<td>294,952</td>
<td>3.8</td>
<td>United States</td>
<td>National, retrospective, cohort study; suicide cases of veterans diagnosed with dementia</td>
<td>$60–69 = 14.3%$, $70–79 = 42.9%$, $80–89 = 40.1%$, $90+ = 2.7%$</td>
<td></td>
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<tr>
<td>Schmutt &amp; Wilkins</td>
<td>26,884</td>
<td>30.9</td>
<td>United States</td>
<td>National retrospective study; suicide cases</td>
<td>$65–69 = 29.4%$, $70–74 = 22.5%$, $75–79 = 18.3%$</td>
<td></td>
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</tr>
<tr>
<td>Study</td>
<td>Year</td>
<td>Region</td>
<td>Age Group</td>
<td>Completed Suicide</td>
<td>Psychological autopsy study; Low educational level; living in</td>
<td>Case-control psychological</td>
<td>Presence of a psychiatric illness</td>
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<tr>
<td>Torresa et al. (2014)</td>
<td>191</td>
<td>Italy</td>
<td>60+</td>
<td>80–84 = 15.2%</td>
<td>South Tyrolians in various residential settings; a one-person household; having seen a doctor in the past month; living in a residential facility (RF)</td>
<td>60–64 = 21.5%</td>
<td>65–69 = 18.8%</td>
</tr>
<tr>
<td>Vasiliadis et al. (2017)</td>
<td>2,987</td>
<td>Canada</td>
<td>64+</td>
<td>60–84 = 36.7%</td>
<td></td>
<td>64–69 = 35.8%</td>
<td></td>
</tr>
<tr>
<td>Wang et al. (2018)</td>
<td>15</td>
<td>New Zealand</td>
<td>65+</td>
<td>65–100= 46.7%</td>
<td>Asians who lived in New Zealand; Suicide occurring in the context of a family (i.e., isolation, loss and adjustment and communication); declining health; violent suicide method (RF)</td>
<td></td>
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</tr>
<tr>
<td>Wanta et al. (2009)</td>
<td>534</td>
<td>United States</td>
<td>65–100= 46.7</td>
<td>65–74 = 47.6</td>
<td>Wisconsin residents who died by suicide; Being single; male; male in advancing age (RF)</td>
<td></td>
<td></td>
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<tr>
<td>Author(s)</td>
<td>Year</td>
<td>Sample Size</td>
<td>Age</td>
<td>Country</td>
<td>Study Type</td>
<td>Research Findings</td>
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<tr>
<td>Wei et al.</td>
<td>2020</td>
<td>484</td>
<td>60+</td>
<td>China</td>
<td>Case-control psychological autopsy study; suicide cases and control subjects</td>
<td>Family dysfunction (RF)</td>
<td></td>
</tr>
<tr>
<td>Yeh et al.</td>
<td>2017</td>
<td>2,528</td>
<td>65+</td>
<td>Taiwan</td>
<td>National pair-matched case-control study</td>
<td>Higher level of psychiatric contact in the preceding year; depression; bipolar disorder; physical illnesses; low-income households (RF)</td>
<td></td>
</tr>
<tr>
<td>Yeh et al.</td>
<td>2020</td>
<td>2,528</td>
<td>65+</td>
<td>Taiwan</td>
<td>National pair-matched case-control study</td>
<td>Psychiatric and physical illnesses, especially depression, cancer and schizophrenia (RF)</td>
<td></td>
</tr>
<tr>
<td>Zhou et al.</td>
<td>2019</td>
<td>484</td>
<td>60+</td>
<td>China</td>
<td>Matched case-control psychological autopsy study</td>
<td>Unstable marital status; unemployment; depressive symptoms; mental disorder (RF)</td>
<td></td>
</tr>
</tbody>
</table>
| Tsoh et al. | 2005 | 224 | 65+ | China | Multi-group, case-controlled study; older adults who attempted suicide or attempted suicide and comparison subjects | Suicidal attempt: major depression; past suicide attempt(s); poorer function of self-care; arthritis; low Conscientiousness (RF) Completed suicide: major depression; past suicide attempt(s); arthritis; malignancy;
<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Gender</th>
<th>Age (years)</th>
<th>Country</th>
<th>Methodology</th>
<th>Sample Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonnewyn et al. (2014)</td>
<td>8</td>
<td></td>
<td>66–85:</td>
<td>Belgium</td>
<td>Qualitative study; inpatients of a psychiatric ward after making a suicide attempt</td>
<td>Experiencing life and self as disrupted after a loss; loneliness; loss of control; unwillingness to continue living the current life (RF)</td>
</tr>
<tr>
<td>Chen et al. (2014)</td>
<td>31</td>
<td></td>
<td>65–74:</td>
<td>Taiwan</td>
<td>Qualitative descriptive study; outpatients</td>
<td>Satisfied with one’s life; suicide cannot resolve problems; fear of humiliating one’s children; religious beliefs, never thought about suicide; living in harmony with nature (BF)</td>
</tr>
<tr>
<td>Crocker et al. (2006)</td>
<td>15</td>
<td></td>
<td>65–91:</td>
<td>United Kingdom</td>
<td>Qualitative study; older adults who had recently made a suicide attempt</td>
<td>Experiencing life as a struggle; trying to maintain control over life; feeling invisible or disconnected from others (RF)</td>
</tr>
<tr>
<td>Deuter, Procter, and Evans</td>
<td>7</td>
<td></td>
<td>60–82:</td>
<td>Australia</td>
<td>Qualitative, multiple-case study; older adults who attempted suicide</td>
<td>Seeing value and meaning in surviving; focused decision-making; self-care; self-awareness, self-acceptance; spiritual faith; sense of</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year</td>
<td>Sample Size</td>
<td>Mean Age</td>
<td>Age Group</td>
<td>Country</td>
<td>Outcome</td>
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</tr>
<tr>
<td>Kim et al.</td>
<td>2016</td>
<td>78</td>
<td>42.3</td>
<td>65+</td>
<td>Korea</td>
<td>Suicide attempt</td>
</tr>
<tr>
<td>Ku et al.</td>
<td>2009</td>
<td>19</td>
<td>73-85</td>
<td>Taiwan</td>
<td>Suicide attempt</td>
<td>Qualitative study; older male residents who live in veterans’ homes</td>
</tr>
<tr>
<td>Neufeld et al.</td>
<td>2015</td>
<td>180,891</td>
<td>63.3</td>
<td>60+</td>
<td>Canada</td>
<td>Suicide attempt</td>
</tr>
<tr>
<td>Oh et al.</td>
<td>2015</td>
<td>655</td>
<td>57.7</td>
<td>60+</td>
<td>South Korea</td>
<td>Suicide attempt</td>
</tr>
<tr>
<td>Van Orden</td>
<td>2015</td>
<td>101</td>
<td>54.4</td>
<td>70-91</td>
<td>Sweden</td>
<td>Suicide attempt</td>
</tr>
</tbody>
</table>
et al. (2015) including depression, somatic problems and physical pain; perceived burdensomeness; social problems that reflected either thwarted belongingness or family conflict; lack of meaning in life (RF)

Wiktors son et al. (2016) Suicide attempt Study using an open-ended question; hospitalized older adults who attempted suicide

<table>
<thead>
<tr>
<th>Wiktors son et al. (2016)</th>
<th>101</th>
<th>45.5</th>
<th>70–91</th>
<th>Sweden</th>
<th>Suicide attempt Study using an open-ended question; hospitalized older adults who attempted suicide</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M = 79.6</td>
<td></td>
<td></td>
<td></td>
<td>Somatic distress (RF)</td>
</tr>
</tbody>
</table>
**Figure 1.**

**MOOSE Flow Chart of the Selection Process**

- Records identified through database searching (n = 4,355)
- Additional records identified through secondary sources (n = 29)
- Records excluded due to duplication (n = 2,222)
- Records remaining after duplicates removed (n = 2,183)
- Records remaining after primary screening by abstract and title (n = 1,924)
  - Did not include elderly aged 60 and over (n = 550)
  - Did collected prior to 2000 (n = 148)
  - No original data reported (n = 40)
  - Did not include self-harm or suicidal behavior in the results section (n = 818)
  - Not published in English and/or a peer-reviewed journal (n = 8)
- Records remaining after primary screening (n = 238)
- Records excluded after secondary screening by article review (n = 195)
  - Did not exclusively include older adults aged 60 and over (n = 17)
  - Data was collected prior to 2000 (n = 60)
  - Did not include potential risk and/or protective factors of self-harm or suicidal behavior in the results’ section (n = 86)
  - Insufficiently large sample size (n = 14)
  - No full text accessible (n = 16)
- Records included in systematic review (n = 45)