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**Adolescents who self-harm and commit violent crime:**

**Testing early-life predictors of dual harm in a longitudinal cohort study**

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**ABSTRACT**

**Objective.** Self-harm is associated with violent offending. However, little is known about young people who engage in "dual-harm" behavior. We investigated antecedents, clinical features, and life characteristics distinguishing dual-harming adolescents from those who self-harm only.

**Method.** Participants were from the Environmental Risk (E-Risk) Longitudinal Twin Study, a nationally-representative UK cohort of 2,232 twins born in 1994-1995. Self-harm in adolescence was assessed through interviews at age 18. Violent offending was assessed using a computer questionnaire at age 18 and police records through age 22. Risk factors were assessed between ages 5-12. Adolescent mental health, victimization, personality functioning, and use of support services were measured at age 18.

**Results.** Self-harm was associated with violent crime (OR=3.50, 95% CI=2.61-4.70), even after accounting for familial risk factors. Dual-harmers had been victims of violence from childhood, and exhibited lower childhood self-control and lower childhood IQ than self-only harmers. Dual-harmers experienced higher rates of concurrent psychotic symptoms and substance dependence. They also exhibited distinct personality styles characterized by resistance to change and by emotional and interpersonal lability. However, dual-harmers were not more likely than self-only harmers to have contact with mental health services.

**Conclusions.** Dual-harmers have self-control difficulties and are immersed in violence from a young age. A treatment- rather than punishment-oriented approach is indicated to meet these individuals' needs. Connecting self-harming adolescents with delinquency-reduction programs and transdiagnostic approaches that target self-regulation may reduce harmful behaviors. Preventing childhood maltreatment and implementing strategies to reduce victimization exposure could mitigate risk for both internalized and externalized violence.

## INTRODUCTION

Self-harm is the act of inflicting harm on oneself through the destruction of body tissue, ingestion of toxic substances, or other intentional acts (1). It can include behaviors enacted with and without suicidal intent (1). Self-harm is a leading risk factor for suicide and a major public-health problem (2-4). In the UK, where the present study is based, self-harm among adolescents is of particular concern. Between 2011-2014, the annual incidence of self-harm increased 68% among girls aged 13-16 (3). The healthcare cost associated with self-harm is estimated at £162 million yearly, with the highest costs incurred by individuals under age 18 (5). High self-harm-related costs are likewise observed in the United States (6).

Some individuals who self-harm also inflict harm on others (7-11). There may be important antecedents that increase the risk of violent crime among people who self-harm. Identifying such antecedents could guide early-years prevention strategies and the delivery of targeted interventions to reduce interpersonal violence. However, studies have primarily examined risk factors for self-harm among violent offenders, *after* they become clients of the criminal-justice system (12,13). To appropriately target assessments and treatments, clinicians need information to identify, among self-harming adolescents, who is at greatest risk for violent offending. This study aimed to characterize the risk factors that distinguish young people who engage in both self-harm and violent crime ("dual harmers") from those who only self-harm, using data from a nationally-representative cohort of British children followed across the first two decades of life.

Our analysis capitalized on four design features. First, self-harm was assessed across adolescence and violent crime was assessed through age 22 using police records and self-reports. This allowed us to test for an association between self-harm and violent crime during the period when self-harm debuts (14) and offending peaks (15).

Second, because the cohort comprises twins, we could conduct a co-twin-control analysis among pairs discordant for self-harm, to test if the sibling who self-harmed was more likely to offend than their sibling who did not self-harm. The same unmeasured risk factors that lead individuals to self-harm may also lead them to commit violent crime (16). By comparing twins who grow up in the same family, it is possible to isolate self-harm as an indicator of violent offending, independent of familial risks.

Third, the longitudinal design enabled assessment of risk factors that antedate self-harm and violent crime. We tested whether dual harmers were distinguished by low childhood self-control, as problems in self-regulation are theorized to underlie both self-harm (14,17) and violent offending (15,18) and may be important targets for intervention. In addition, we examined three risk factors identified as salient predictors of self-harm or violent crime and severe psychopathology: maltreatment, childhood self-harm behavior, and family history of psychiatric disorder (1,15,19). In response to external review, we also evaluated three secondary risk factors: low IQ, depression, and anxiety.

Fourth, we assessed participants' self-harm features, clinical correlates, and life characteristics. This allowed us to draw a comprehensive picture of dual harmers' psychosocial functioning. We examined self-harm method and frequency, as these are indicators of severity (4,14,20). We characterized dual harmers' mental-health difficulties, experiences of adolescent victimization, and informant-reported personality functioning. Lastly, we evaluated their use of support services.

## METHODS

### Participants

Participants were members of the Environmental Risk (E-Risk) Longitudinal Twin Study, a birth cohort of 2,232 British children drawn from a larger register of twins born in England and Wales in 1994-1995 (21). Details are reported elsewhere (22). The E-Risk sample was constructed in 1999-2000, when 1,116 families (93% of those eligible) with same-sex 5-year-old twins participated in home-visit assessments.

This sample comprised 56% monozygotic and 44% dizygotic twin pairs; sex was evenly distributed within zygosity (49% male). Families were recruited to represent the UK population with newborns in the 1990s on the basis of residential location throughout England and Wales and mother's age. Teenaged mothers with twins were over-selected to replace high-risk families selectively lost to the register through non-response. Older mothers having twins via assisted reproduction were under-selected to avoid an excess of well-educated older mothers. The study sample represented the full range of socioeconomic conditions in the UK, as reflected in families' distribution on a neighborhood-level socioeconomic index (23): 25.6% of E-Risk families live in "wealthy achiever" neighborhoods compared to 25.3% nationwide; 5.3% vs. 11.6% live in "urban prosperity" neighborhoods; 29.6% vs. 26.9% live in "comfortably off" neighborhoods; 13.4% vs. 13.9% live in "moderate means" neighborhoods, and 26.1% vs. 20.7% live in "hard-pressed" neighborhoods. E-Risk underrepresents "urban prosperity" households because they are likely to be childless.

Follow-up home visits took place when study participants were aged 7 (98% participation), 10 (96%), 12 (96%), and 18 years (93% participation). Home visits at ages 5-12 assessed twin participants and their mothers; only twins were assessed at age 18. There were no differences between those who did and did not take part at age 18 on socioeconomic status assessed when the cohort was initially defined ($\chi^2$=0.86, $p$=0.65), age-5 IQ scores ($t$=0.98, $p$=0.33), or age-5 internalizing or externalizing behavior problems ($t$=0.40, $p$=0.69 and $t$=0.41, $p$=0.68, respectively).

Each twin was assessed by a different interviewer. Data are supplemented by searches of official records and questionnaires that are mailed, as developmentally appropriate, to teachers, and co-informants nominated by participants. The Joint South London and Maudsley and the Institute of Psychiatry Research Ethics Committee approved each study phase. Parents gave informed consent and twins gave assent between 5-12 years and then informed consent at age 18.

**Self-harm**

At age 18, participants were asked about self-harm behavior since age 12, using a life-history calendar to aid recall. Age 12-to-18 equals secondary school in the UK, a meaningful developmental period for self-harm. Participants were asked, "Have you ever tried to hurt yourself, to cope with stress or emotional pain?" Individuals who endorsed self-harm were queried about methods. 10 behaviors were probed (e.g., cutting, burning, overdose), plus the option to describe any other way they had hurt themselves. Of 2,064 participants who provided self-harm data, 280 (13.6%) were positive. To assess self-harm frequency, we summed participants' responses concerning the number of times they had performed each behavior (median reported number of self-harm incidents=6.5).

**Violent crime**

Official records of participants' criminal offending were obtained through UK Police National Computer record searches conducted in cooperation with the UK Ministry of Justice. Records include complete histories of cautions and convictions beginning at age 10, the age of criminal responsibility. Our data are complete through age 22. Violent offending was coded as a binary variable to reflect whether participants had been cautioned or convicted for a violent offense. 2,060 twins consented to search of their offending histories, of whom 106 (5.2%) had a record of a violent offense (**Supplementary Table S1**).

Violent offending was also assessed via computer questionnaire at age 18. Participants reported on past-year offending behaviors. Violent offenses were defined to include behaviors that involved the use of force or threat of force upon a victim (e.g., robbery, assault; **Supplementary Table S2**). Of 2,053 respondents with self-report data, 677 (33.0%) endorsed one or more violent behaviors and 338 (16.5%) endorsed two or more.

Respondents were coded as positive for violent crime if they had an official record of a violent crime and/or self-reported two or more violent offenses. A total of 398/2,051 (19.4%) participants met these criteria (**Supplementary Text**).

**Self- and other-harm typology**

We categorized participants into three groups for analyses: individuals coded as negative for both self-harm and violent crime ("neither harmers"; *n*=1,475 [72.0%]), coded as positive for self-harm and negative for violent crime ("self-only harmers"; *n*=177 [8.6%]), and coded as positive for both self-harm and violent crime ("dual harmers"; *n*=97 [4.7%]).

We aimed to identify which adolescents, *among those who self-harm*, are most likely to commit violent crime. Therefore, self-only harmers were the comparison group of interest. However, we also conducted comparisons with adolescents who only commit violent crime ("other-only harmers"; *n*=300 [14.6%]).

**Childhood risk factors**

We analyzed four prespecified and theory-driven childhood risk factors: low self-control, maltreatment by an adult, childhood self-harm behavior, and family history of psychiatric disorder (1,15,19,24) (**Supplementary Table S3**). We also collected information on caregiver- and teacher-reported self-regulation difficulties at age 12 (**Supplementary Table S3**). In response to suggestions from external reviewers, we analyzed three secondary childhood risk factors at age 12: low IQ, depression, and anxiety (**Supplementary Table S3**).

**Correlates of clinical importance**

We collected information on correlates of dual-harm behavior at age 18. We analyzed correlates in three categories with relevance for clinical practice: *mental-health difficulties* (DSM-IV-based symptoms or diagnoses of PTSD, depression, psychosis, and substance-dependence); experiences of *adolescent*

*victimization* (crime victimization, maltreatment, neglect, sexual victimization, family violence, internet/mobile-phone victimization, and peer/sibling victimization); and informant-reported *personality functioning* (**Supplementary Table S3**).

**Service use**

At age 18, participants were queried regarding past-year treatment for emotional problems. Participants were asked whether they had used a range of services, including mental-health professionals, other supports (e.g., medical doctor, social services), and medication (**Supplementary Table S3**).

**Statistical Analysis**

We used logistic regression to test for an association between self-harm and violent crime. We included an interaction term to test whether the association differed by sex. We used conditional logistic regression to test whether twins from discordant pairs who self-harmed were at excess risk for violent crime, relative to their co-twins who did not self-harm.

We used multinomial and binomial logistic regression to predict group membership from childhood risk factors. The binomial tests were of greatest interest, as we aimed to identify the antecedents that distinguished dual from self-only harmers.

We used chi-square tests to determine whether the dual and self-only harm groups differed in the proportion of individuals reporting high-frequency self-harm (greater than 50 incidents [75$^{th}$ percentile of the distribution]). We used regression to test whether dual harmers were distinguished by mental-health difficulties, victimization experiences, and personality functioning; and to compare dual and self-only harmers on service use. Groups were included as predictors, first as a set of binary dummy codes (with the neither-harm group specified as the reference category), and then as a two-level nominal variable (to

compare risk between the dual-harm and self-only harm groups). We analyzed continuously-distributed outcomes using ordinary least squares. We analyzed binary outcomes using logistic regression.

Analyses were conducted using SAS version 9.4 (SAS Institute Inc., Cary, NC). We corrected all analyses (except the twin-discordance analysis) for the non-independence of twin observations using survey analysis procedures. Data were treated as clustered, with the family number for each twin pair specified as the clustering variable. Analyses in which men and women were combined were adjusted for sex. Analyses were limited to individuals with complete data for self-harm and violent crime ($n$=2,049); no data were imputed.

## RESULTS

Of the 2,232 participants in the original cohort, 2,066 (92.6%) were interviewed at age 18, of whom 2,049 (99.2%) had data for both self-harm and violent crime (970 [47.3%] male). Of the 2,049 participants included in analyses, 274 (13.4%) reported self-harm and 397 (19.4%) met criteria for violent crime.

### Is self-harm associated with violent crime in adolescence?

Self-harm was more prevalent among women than men ($\chi^2_{(1)}$=14.93, $p$<0.001) and violent crime was more prevalent among men than women ($\chi^2_{(1)}$=78.08, $p$<0.0001), but the relation between self-harm and violent offending was similar in both sexes: the odds of committing violent crime were over three times greater for adolescents who self-harmed than for those who did not (men: OR=3.77, 95% CI=2.46-5.78; women: OR=3.27, 95% CI=2.17-4.94; **Supplementary Figure S1**). Therefore, men and women were combined in analyses (but we controlled for sex; OR=3.50, 95% CI=2.61-4.70). The association remained significant when only police records for violent crime were used (OR=3.26, 95% CI=2.08-5.12) and only self-reports were used (OR=3.50, 95% CI=2.57-4.76), indicating that findings do not simply reflect common method variance.

**Is the association between self-harm and violent crime explained by familial risk factors?**

Twins who self-harmed were more likely to commit violent crime than their co-twins who did not self-harm (dizygotic twins: OR=2.57, 95% CI=1.07-6.16; genetically-identical monozygotic twins: OR=4.00, 95% CI=1.34-11.97; **Supplementary Figure S2**), indicating that the relation between self-harm and violent offending could not be entirely explained by familial risk factors (genetics or rearing environment).

**Do childhood risk factors distinguish dual from self-only harmers?**

Analyses of primary risk factors showed that low childhood self-control and maltreatment predicted increased odds of being a dual versus a self-only harmer (self-control: OR=1.82, 95% CI=1.35-2.45; maltreatment: OR=2.46, 95% CI=1.10-5.51; **Table 1**). Together, the four primary risk factors predicted membership in the dual-harm relative to the self-only harm group with high accuracy (AUC=0.75, 95% CI=0.69-0.82, indicating a large effect (25) that requires out-of-sample replication (**Supplementary Text**)).

Analyses of secondary risk factors indicated that higher childhood IQ predicted decreased odds of being a dual versus a self-only harmer (OR=0.98, 95% CI=0.96-0.996; **Table 1**). Dual harmers did not differ from self-only harmers in their rates of childhood depression or anxiety.

**Are dual harmers' self-regulation difficulties observable across settings?**

Dual harmers' self-regulation difficulties were observable across settings. Children rated by caregivers and teachers as having more self-regulation difficulties were more likely to be in the dual-harm than the self-only harm group as adolescents (caregiver's scale-score: OR=1.41, 95% CI=1.14-1.74; teacher's scale-score: OR=1.56, 95% CI=1.15-2.13; **Figure 1**).

**Do clinical features and life characteristics distinguish dual from self-only harmers?**

Dual and self-only harmers reported similar rates of high-frequency self-harm (greater than 50 incidents: dual-harm=26.6%, self-only harm=24.6%; $\chi^2_{(1)}$=0.13, $p$=0.72). Given the small sample sizes for some self-harm methods, we did not conduct tests of group differences for each method. However, inspection of **Figure 2a** suggests dual harmers exhibited higher-lethality behaviors (hanging, drowning) and aggressive acts (hitting oneself/an object, banging one's head against a wall), while self-only harmers tended to engage in lower-lethality methods (cutting, scratching).

Dual harmers did not differ from self-only harmers in their risk of developing PTSD or depression. However, they were distinguished by a higher prevalence of psychotic symptoms (OR=2.35, 95% CI=1.11-4.95). They were also more likely to meet criteria for alcohol dependence (OR=3.29, 95% CI=1.65-6.57) and cannabis dependence (OR=4.31, 95% CI=1.91-9.76; **Table 2**).

Dual harmers were more likely than self-only harmers to have experienced multiple types of victimization during adolescence (poly-victimization; OR=2.40, 95% CI=1.30-4.42; **Supplementary Figure S3**) as well as crime, maltreatment, neglect, and family violence (**Table 2**).

Dual harmers' personality styles were different from those of self-only harmers. Dual harmers were distinguished by greater resistance to change (lower Openness; Cohen's $d$=-0.41), poorer impulse-control (lower Conscientiousness; $d$=-0.63), and more aggressive/rude behavior (lower Agreeableness; $d$=-0.46). They were more outgoing (higher in Extraversion); however, the effect size was modest ($d$=0.15; **Figure 2b; Supplementary Table S4**). Both dual and self-only harmers were more easily distressed (higher in Neuroticism) and were lower in Conscientiousness and Agreeableness than neither harmers.

Despite their elevated rates of psychiatric comorbidity and difficult life experiences, dual harmers were not more likely than self-only harmers to be in contact with mental-health professionals (psychiatrists or psychologists/counsellors/psychotherapists) or other support services (**Figure 3**).

### Comparisons with other-only harmers

Compared to participants who committed violent crime only, dual harmers exhibited higher rates of childhood self-harm and childhood depression; had higher rates of all adolescent mental-health difficulties; were more likely to have experienced poly-victimization and nearly all types of victimization; and were lower in Conscientiousness and higher in Neuroticism (**Supplementary Tables S5-S7**).

## DISCUSSION

This study shows that self-harm and violent crime co-occur in a longitudinal, population-representative contemporary cohort of British twins. The association is evident for police records and self-reports of offending. This finding is consistent with research employing population-based samples from other countries (7-10).

This study advances knowledge in five ways. First, using a co-twin-control design, we showed that the relation between self-harm and violent crime is not solely attributable to shared genetic risk or family background; self-harm itself may be an indicator of violence against others.

Second, we demonstrated that dual harmers are distinguished from self-only harmers by poor childhood self-control, including deficits in executive functioning as indicated by lower childhood IQ. Prospective assessment enabled measurement of self-control, cognitive ability, and other antecedents prior to the onset of self-harm and offending and ensured there were no ascertainment or recall biases. Moreover, dual harmers' self-regulation difficulties were reported by multiple informants, suggesting this early-emerging risk factor is observable across settings. In addition to their experiences of childhood

dysregulation, dual harmers were characterized in adolescence by a triad of personality features that typifies emotional and interpersonal lability: low Conscientiousness, low Agreeableness, and high Neuroticism (26). (Dual and self-only harmers did not differ on Neuroticism, but both groups were elevated on this trait). Apparently, dual harmers' self-control difficulties are a stable core feature of their personalities.

Third, we showed that dual harmers are differentiated from self-only harmers by a history of childhood maltreatment. Further, dual harmers were more likely to be exposed to adolescent victimization. More than 80% of dual harmers had experienced at least one type of victimization, and one-third had experienced poly-victimization. These findings signal a need for primary and secondary preventive strategies to reduce continuity in victimization among individuals at risk for dual-harm behavior. Fourth, we found that dual harmers are distinguished from self-only harmers by higher rates of psychotic symptoms, alcohol dependence, and cannabis dependence. A prior analysis (7) did not observe differences in risk for cannabis-related problems between dual and self-only harmers. However, their study employed a retrospective survey of adults and DSM-5-based lifetime diagnoses. Ours is the first study, to our knowledge, to test these associations within a prospective sample and demonstrate the role of psychosis in the self/other harm typology. Dual harmers suffer significant psychiatric comorbidity; comprehensive diagnostic assessment is needed to appropriately target interventions within this population.

Lastly, we found that dual harmers were not more likely than self-only harmers to encounter mental-health services. Recent UK-based data (3,27) suggest long waiting lists and high thresholds in accessing treatment, and similar challenges exist in the United States (28). Research on hospital- and community-based youth violence-prevention services identifies mistrust of authorities as a barrier to treatment engagement (29). Dual harmers' psychosocial difficulties and prior experiences with the juvenile-justice system may impede service uptake.

This study has limitations. First, the sample comprised twins, and results may not generalize to singletons. However, the prevalences of antisocial behavior and mental-health problems are similar for twins and singletons (30,31), and the association between self-harm and violent crime has been documented in non-twin samples (7-10). Second, participants were followed only to the beginning of young adulthood. Future research will determine whether findings pertain to older age groups. Third, results may vary with historical and cross-national differences in crime-control policy. Fourth, findings concerning risk factors require replication. However, primary antecedents were selected based on prior theoretical and empirical evidence, increasing likelihood of replication. Fifth, our co-twin-control analyses included a rather small number of "informative cases" (pairs discordant for violent offending). Results will need to be replicated in samples with a higher prevalence of discordant pairs. Sixth, we designed our assessments of self-harm and violent offending consistent with recommendations for best practice. However, differences in the types of assessment methods used across constructs may have impacted our results. Finally, we are limited in our ability to infer causality. Assessment of self-harm and crime spanned much of the same period. Further, within-twin-pair associations between self-harm and violent offending may be confounded by twin-specific environmental differences. Additionally, our research can only support low childhood self-control, low IQ, and maltreatment as indicators of risk for dual-harm behavior, not necessarily indicators of causation. Establishing whether associations are causal, however, is secondary to this study's primary aim of informing mental-health treatment.

This study has a number of implications. First, given the robust link between self-harm and harm toward others, research about self-harm–even when conducted within community samples, not only clinical or forensic settings–should collect data on interpersonal violence. Second, theoretical models of self-harm can generate testable hypotheses for research on dual-harm behavior. Many theories propose that self-harm serves an emotion-regulatory function (14,17). Recently-developed models hold that several proximal risk factors lower perceived barriers to initiating self-harm; however, its affective benefits are its primary maintaining factor (32,33). These benefits may lower barriers to engagement in other harmful

behaviors, including violent crime. Although our study did not directly test this question, our findings support further investigation of self-regulation as a mediating factor. The interpersonal theory of suicide (34) posits that self-harm increases risk for suicide by habituating individuals to the fear and pain associated with harming oneself. Such habituation may also increase risk for harming others, or occur through repeated aggression toward others. Future research concerning the mechanisms underlying dual harm presents opportunities for interdisciplinary collaboration. Self-harm and offending have largely been studied separately within the fields of psychology, psychiatry, and criminology; collaborative cross-talk can inform more effective preventions and treatments.

Third, clinical guidelines recommend evaluation of risk for suicide following self-harm (35,36). The present results also recommend assessment of risk for violence toward others, particularly when the clinical picture comprises relevant antecedents and correlates. Further, dual-harming prisoners should be closely monitored for suicidal behavior. Fourth, improving self-control among self-harmers could help prevent violent crime. Self-control training has been shown to reduce delinquency (37) and could be delivered to patients who self-harm. In addition, dual harmers often experience psychiatric comorbidity. Transdiagnostic approaches that target self-regulation (e.g., mindfulness-based approaches for emotion-regulation) may reduce harmful behaviors and co-occurring psychopathology (38). Lastly, our findings recommend application of available interventions to prevent childhood maltreatment (39) as well as implementation of exposure-reduction strategies (e.g., education on self-protective measures) and evidence-based programs (40,41) to prevent revictimization in adolescence. Dual harmers have been immersed in violence from a young age; a treatment- rather than punishment-oriented approach is indicated to meet these individuals' needs. Such an approach could also yield substantial reductions in violent offending: one in four other-harming adolescents was a dual harmer in this population-representative study.

There exists a pressing demand for improvements in adolescent mental-health services (42) and psychological treatment research (43,44). Our analysis responds to this demand by identifying several opportunities for early-years prevention and intervention science (43,44). Connecting vulnerable adolescents with delinquency-reduction programs that target self-control, preventing maltreatment and victimization, and improving children's self-regulation abilities could significantly reduce the health and social burden attributable to internalized and externalized violence.

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**Table 1. Predicting dual- versus self-only harm status from childhood risk factors.**

| Childhood Risk Factor | Self- and Other-Harm Status: Neither (N) n = 1475 | | Self-Only (S) n = 177 | | Dual (D) n = 97 | | S vs. N[a] | | D vs. N[a] | | D vs. S[b] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Primary risk factors***[c] | **Mean or No.** | **SD or %** | **Mean or No.** | **SD or %** | **Mean or No.** | **SD or %** | **Odds Ratio** | **95% CI** | **Odds Ratio** | **95% CI** | **Odds Ratio** | **95% CI** |
| Low self-control (Mean, SD)[d,e] | -0.19 | 0.94 | -0.03 | 0.89 | 0.70 | 1.08 | 1.39 | 1.16-1.65 | 2.36 | 1.90-2.95 | **1.82** | **1.35-2.45** |
| Maltreatment (No., %) | 58 | 3.9% | 14 | 7.9% | 18 | 18.6% | 2.28 | 1.09-4.76 | 5.33 | 2.91-9.76 | **2.46** | **1.10-5.51** |
| Childhood self-harm (No., %) | 39 / 1419 | 2.8% | 17 / 172 | 9.9% | 13 / 93 | 14.0% | 4.05 | 2.18-7.54 | 5.58 | 2.90-10.72 | 1.37 | 0.63-2.96 |
| Family psychiatric history (Mean, SD)[f,g] | 0.35 | 0.26 | 0.45 | 0.31 | 0.45 | 0.26 | 4.01 | 2.06-7.81 | 3.59 | 1.72-7.48 | 0.73 | 0.29-1.87 |
| ***Secondary risk factors***[h] | | | | | | | | | | | | |
| IQ (Mean, SD)[i] | 100.15 | 15.08 | 98.06 | 15.23 | 91.94 | 16.88 | 0.99 | 0.98-1.01 | 0.97 | 0.95-0.98 | **0.98** | **0.96-0.996** |
| Depression (No., %) | 26 / 1441 | 1.8% | 14 / 171 | 8.2% | 14 / 93 | 15.1% | 5.02 | 2.52-9.99 | 9.42 | 4.73-18.76 | 1.94 | 0.84-4.48 |
| Anxiety (No., %) | 74 / 1442 | 5.1% | 19 / 171 | 11.1% | 10 / 93 | 10.8% | 2.07 | 1.19-3.60 | 2.46 | 1.21-4.99 | 1.07 | 0.42-2.67 |

Note. Measures were assessed between ages 5-12. The number of participants with data is reported when lower than the group sample size. All regression models controlled for sex. Bolded estimates indicate a significant difference between the dual-harm and self-only harm groups, which was the test of interest.

[a] Odds ratios are from multinomial logistic regression models.
[b] Odds ratios are from binomial logistic regression models.
[c] Primary risk factors were prespecified.
[d] The self-control factor score was standardized to have a mean of 0 and a standard deviation of 1.
[e] Higher scores indicate lower levels of self-control (more self-control difficulties).
[f] Indicates the proportion of a participant's relatives with a psychiatric disorder.
[g] N = 1441, 171, and 93 participants in the neither-harm, self-only harm, and dual-harm groups, respectively, had data on family psychiatric history.
[h] Secondary risk factors were added in response to peer review.
[i] N = 1442, 171, and 93 participants in the neither-harm, self-only harm, and dual-harm groups, respectively, had data on IQ.

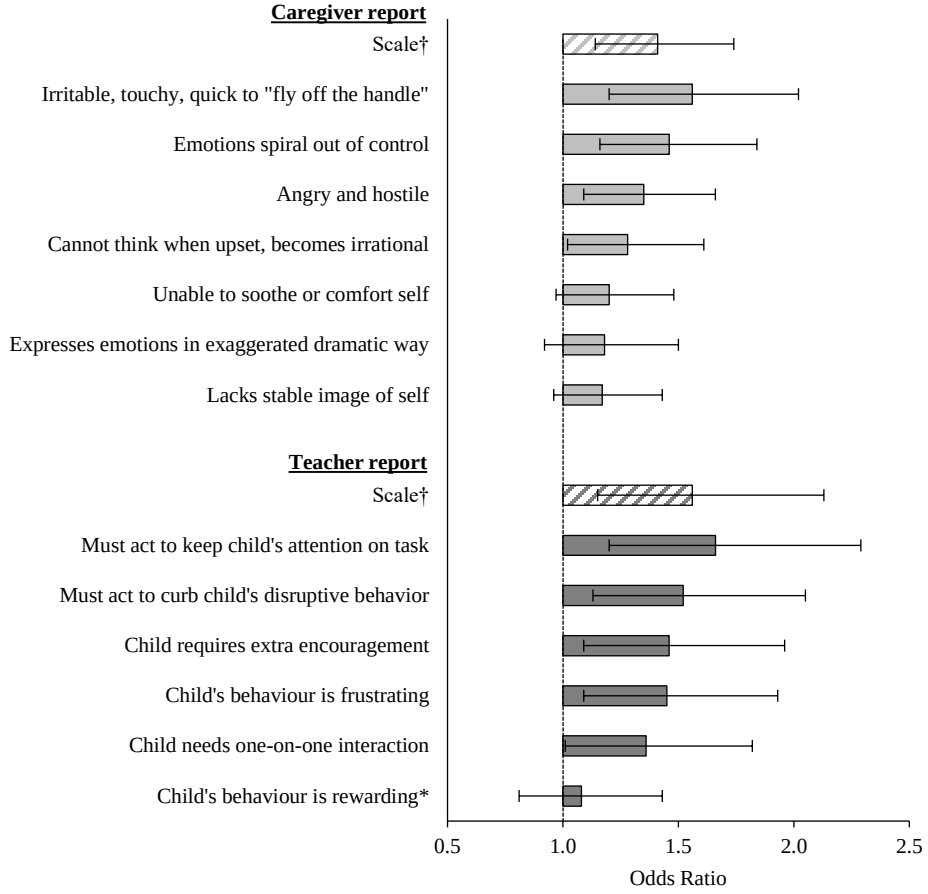
**Table 2. Comparing dual- and self-only harm groups on correlates of clinical importance.**

| | Self- and Other-Harm Status | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Neither (N) n = 1475[a] | | Self-Only (S) n = 177[b] | | Dual (D) n = 97[c] | | S vs. N | | D vs. N | | D vs. S | |
| **Mental Health Difficulties** | **No.** | % | **No.** | % | **No.** | % | **Odds Ratio** | **95% CI** | **Odds Ratio** | **95% CI** | **Odds Ratio** | **95% CI** |
| PTSD | 26 | 1.8 | 24 | 13.6 | 13 | 13.5 | 7.67 | 4.10-14.34 | 9.90 | 4.86-20.14 | 1.07 | 0.51-2.21 |
| Depression | 182 | 12.4 | 95 | 54.0 | 58 | 59.8 | 7.65 | 5.34-10.95 | 11.76 | 7.58-18.26 | 1.35 | 0.79-2.31 |
| Psychotic symptoms | 18 | 1.2 | 16 | 9.0 | 16 | 16.5 | 7.63 | 3.88-15.01 | 16.63 | 7.98-34.64 | **2.35** | **1.11-4.95** |
| Alcohol dependence | 144 | 9.8 | 23 | 13.0 | 33 | 34.4 | 1.47 | 0.88-2.44 | 4.69 | 2.93-7.52 | **3.29** | **1.65-6.57** |
| Cannabis dependence | 19 | 1.3 | 11 | 6.2 | 25 | 25.8 | 5.93 | 2.55-13.76 | 25.11 | 12.56-50.19 | **4.31** | **1.91-9.76** |
| **Victimization Experiences[d]** | | | | | | | | | | | | |
| Poly-victimization[e] | 36 | 2.4 | 38 | 21.5 | 32 | 33.3 | 9.91 | 6.05-16.25 | 22.09 | 12.51-39.03 | **2.40** | **1.30-4.42** |
| Conventional crime | 179 | 12.1 | 59 | 33.3 | 54 | 55.7 | 4.08 | 2.82-5.91 | 8.77 | 5.72-13.44 | **2.23** | **1.32-3.79** |
| Maltreatment | 15 | 1.0 | 17 | 9.6 | 20 | 20.6 | 10.13 | 4.79-21.45 | 25.63 | 11.86-55.43 | **2.63** | **1.19-5.82** |
| Neglect | 12 | 0.8 | 13 | 7.3 | 14 | 14.6 | 8.95 | 4.05-19.80 | 22.05 | 9.97-48.75 | **2.30** | **1.01-5.25** |
| Sexual | 7 | 0.5 | 25 | 14.1 | 15 | 15.6 | 27.94 | 11.62-67.18 | 52.17 | 20.52-132.68 | 1.79 | 0.83, 3.86 |
| Family | 118 | 8.0 | 41 | 23.2 | 33 | 34.4 | 3.39 | 2.24-5.13 | 6.12 | 3.79-9.89 | **1.99** | **1.11-3.57** |
| Internet | 69 | 4.7 | 24 | 13.6 | 15 | 15.6 | 2.60 | 1.57-4.31 | 4.72 | 2.46-9.09 | 1.99 | 0.88-4.50 |
| Peer | 152 | 10.3 | 64 | 36.2 | 36 | 37.5 | 4.54 | 3.17-6.50 | 5.65 | 3.54-9.02 | 1.19 | 0.68-2.09 |

Note. All measures were assessed at age 18. All regression models controlled for sex. Bolded estimates indicate a significant difference between the dual-harm and self-only harm groups, which was the test of interest. Prevalence estimates are derived using the number of participants with data for the measure; this was occasionally slightly lower than the group sample size.

[a] Number of participants with data ranged from 1473-1475.
[b] Number of participants with data ranged from 176-177.
[c] Number of participants with data ranged from 96-97.
[d] Prevalences for victimization experiences indicate the percentage of individuals who reported a severe level of exposure.
[e] Poly-victimization = 3 or more types of victimization.

**Figure 1. Lack of self-regulation across settings. Figure displays the odds of being in the dual-harm group versus the self-only harm group, as a function of caregiver reports of children's self-regulation difficulties (top panel) and teacher reports of children's self-regulation difficulties in the classroom (bottom panel).**

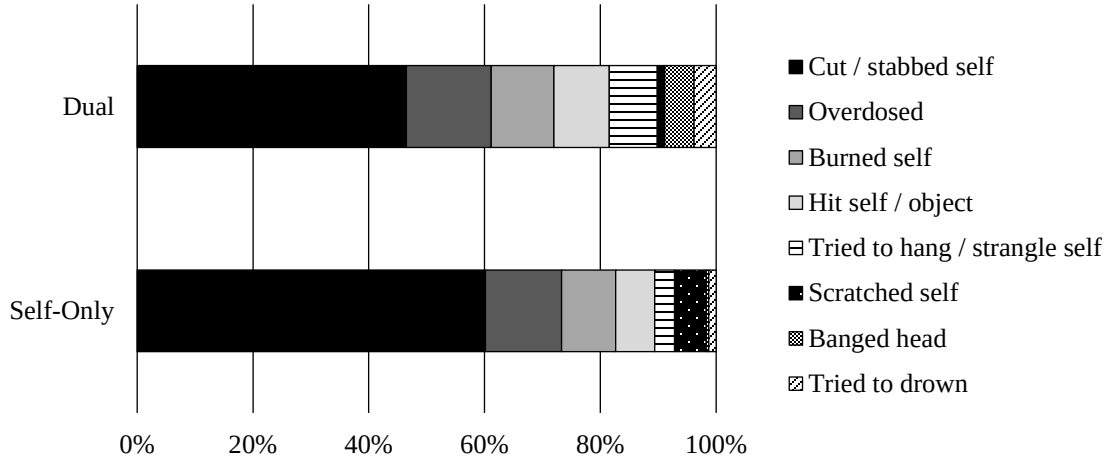



Note. For each item pertaining to self-regulation within the classroom, teachers were asked to rate how frequently they needed to intervene with the child. Sum scales and individual items were standardized to have a mean of 0 and a standard deviation of 1. N = 265 for caregiver reports and N = 215-216 for teacher reports. Error bars are 95% confidence intervals.

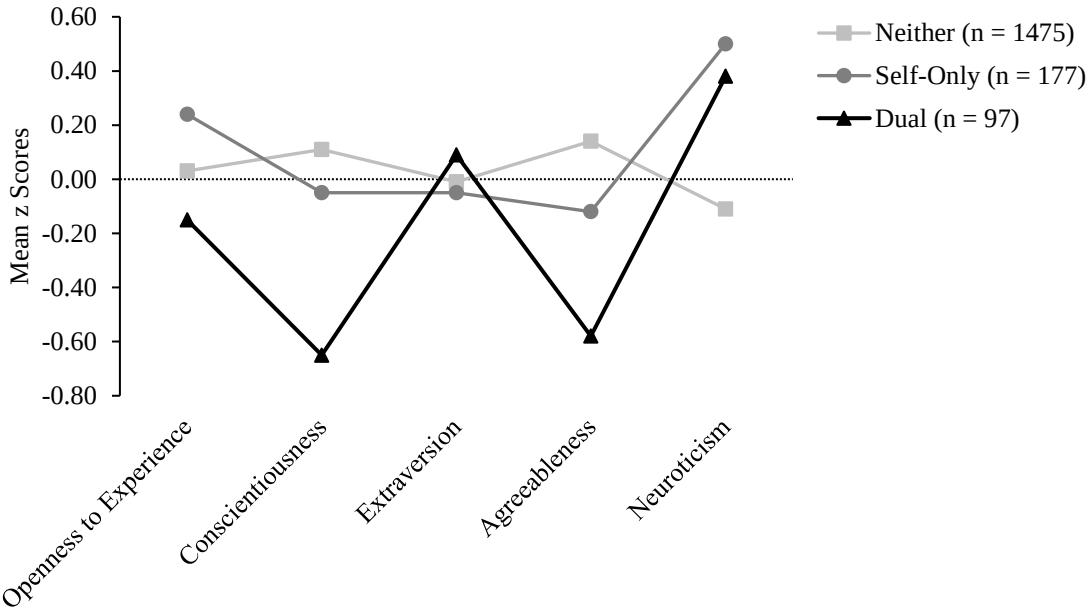
† Sum scale of all items.
* Responses to this item were reverse-scored.

**Figure 2. Comparing dual harmers and self-only harmers on clinical features. Panel A displays the proportion of 393 total reported self-harm behaviors attributable to different self-harm methods. Panel B displays Big Five Inventory profiles, provided by one to two informants who know the participants well, for each group.**

A)



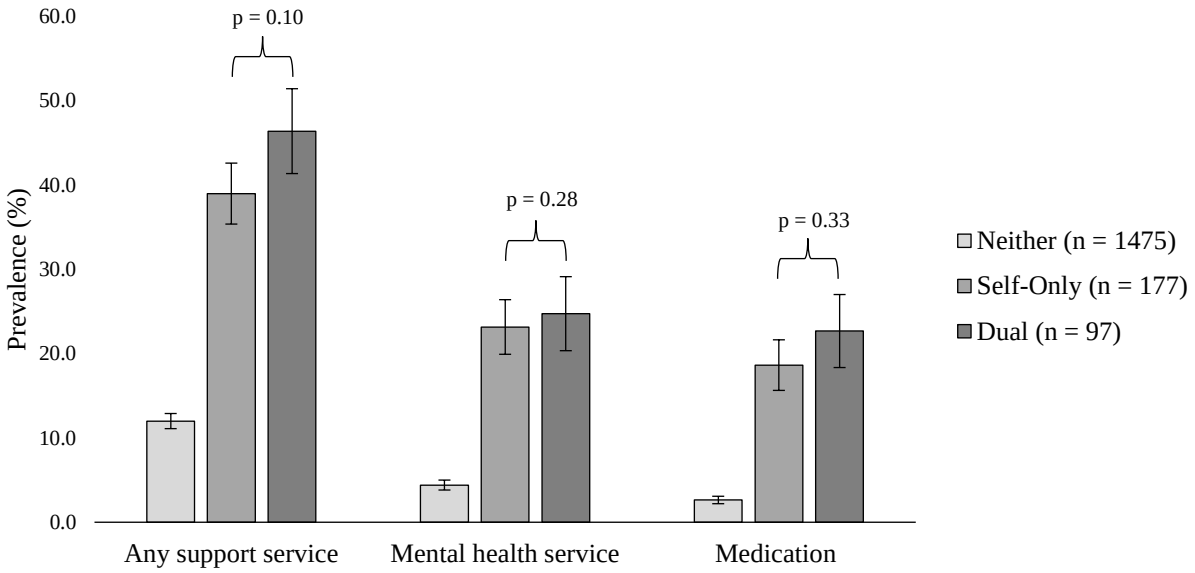

B)



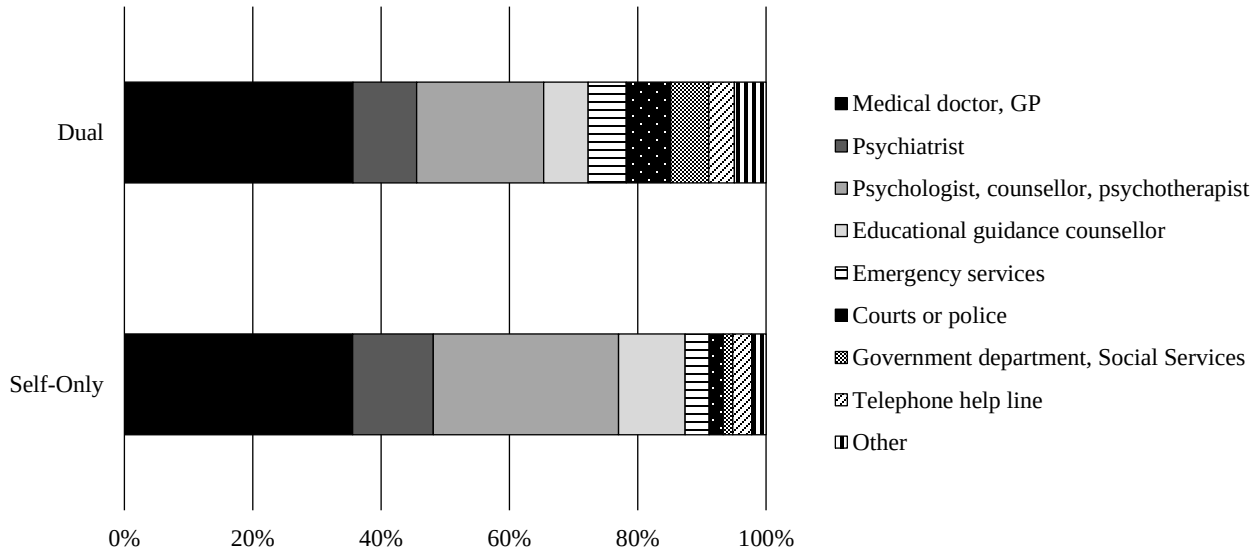

Note. Totals in Panel A were derived by summing the number of individuals who endorsed each self-harm method. Dual harmers endorsed 157 behaviors. Self-only harmers endorsed 236 behaviors. Participants were allowed to endorse multiple behaviors and could be included more than once within the total. Only behaviors endorsed by at least 3% of the sample are depicted. In Panel B, of the 1749 participants, 1730 (98.9%) had personality data.

**Figure 3. Comparing dual harmers and self-only harmers on past-year service use at age 18. Panel A displays the prevalence of any service use, mental health service use, and medication use across the groups. Panel B displays the proportion of 236 total reported services used attributable to different service types.**

A)




B)




Note. Totals in Panel B were derived by summing the number of individuals who reported using each service type in the past year. Dual harmers reported using 101 services. Self-only harmers reported using 135 services. Participants were allowed to report multiple services and could be included more than once within the total. Only services reported by at least 3% of the sample are depicted. Error bars are robust standard errors.