

AGGRESSION AND AAS USE INTENT

## **Aggression and anabolic-androgenic steroid use intent in adolescents: A longitudinal study**

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**Abstract**

There is a dearth of longitudinal studies on risk factors for anabolic–androgenic steroid (AAS) use and intent. We conducted a longitudinal investigation of factors associated with AAS use intent from age 18 to 19, examining particularly the role of physical and verbal aggression. A sample of Norwegians completed questionnaires containing demographic, AAS use and intent, other addictions, aggression, and health measures at ages 18 ( $N = 1333$ , females = 58.9%) and 19 ( $N = 1277$ , females = 61.7%). The data were analyzed using descriptive statistics, correlations, and hierarchical multiple regression. Results show that AAS use prevalence increased from 1 person at age 18 to 4 persons at age 19. Intent to use AAS, being male, living alone, and AAS use (all at 18 years) were associated with higher AAS use intent at 19 years. We found no associations between physical or verbal aggression and AAS use intent from ages 18 to 19. Our findings indicate temporal stability in AAS use intent, as well as the influence of demographic and health factors on AAS use intent from ages 18 to 19. Implications of findings for practice and future research are discussed.

**Keywords:** adolescents; aggression; anabolic-androgenic steroids; longitudinal; risk factors

### **Anabolic-androgenic steroid use**

Anabolic–androgenic steroids (AAS) are a cluster of hormones including testosterone and its synthetic derivatives. AAS are used for muscle growth (due to the increased protein synthesis) and strength enhancement. Some individuals use AAS to improve sports performance and non-sports occupational functioning. In addition, AAS are used to enhance physical appearance, increased energy levels, and improve mood and psychological well-being (Pope & Katz, 2003; Sagoe, Andreassen, & Pallesen, 2014). However, long-term AAS use has been associated with various negative physiological consequences such as brain dysfunction, cardiac dysfunction, masculinization in females, hepatotoxicity, and hypogonadism (Bjørnebekk et al., 2017; Darke, Torok, & Duflou, 2014; Pope & Kanayama, 2012; Rasmussen et al., 2018; Robles-Diaz et al., 2015; Thiblin et al., 2015; Westlye et al., 2017). Long-term use of AAS has also been linked to negative psychological outcomes such as increased aggression and criminality, depression, and suicide (Baggish et al., 2017; Brower, 2009; Kanayama et al., 2009; Pope & Kanayama, 2012). It is also estimated that about 30% of AAS users experience AAS dependence, characterized by continued AAS use despite experiencing harms (Kanayama et al., 2009).

Nonmedical use of AAS is regarded an issue of public health concern with an overall global lifetime prevalence of 3.3%, and 2.3% for high school students (Sagoe et al., 2014). Evidence from systematic reviews suggests that about 13% of AAS users initiate use before the age of 18 (Pope et al., 2014; Sagoe, Andreassen, & Pallesen, 2014). Recent studies indicate that about 20% of adolescents have an AAS-using acquaintance (Sagoe et al., 2015). Evidence from recent investigations indicates that lifetime prevalence of AAS use among Norwegian adolescents ranges from 1.5% to 4% (Jenssen & Johannessen, 2015; Sagoe et al., 2016a; Sandvik, Bakken, & Loland, 2018).

### **Correlates of AAS use in adolescence**

Previous studies have shown that being male, the availability and attitude of close others, substance use, conduct disorder, body image disorder, and personal attitude are related to adolescents' AAS use (Hallgren, 2015; Kanayama et al., 2018; Nicholls et al., 2017; Pallesen et al., 2006; Pope et al., 2012, 2014). In addition, a typical belief of many adolescents is that they are invulnerable and that medical and psychological harms happen to others (Bowers, Clark, & Shackleton, 2009). While there is a growing literature on psychological correlates of AAS use in adolescents, further research is needed to better profile adolescent AAS users regarding risk factors (Nicholls et al., 2017). Additionally, in order to improve prevention and intervention strategies, a more comprehensive understanding of the process involved in initiating AAS use including vulnerability factors is needed (Nicholls et al., 2017).

### **Aggression and AAS use in adolescence**

Aggression is one of the major behavioral factors associated with AAS use (Cunningham, Lumia & McGinnis, 2013). However, the relationship between aggression and AAS use currently remains unclear especially whether aggression is a risk factor or an outcome of AAS use (Dunn, 2015; Lundholm et al., 2015). A recent study indicated that aggression is a risk factor for AAS use contemplation during adolescence (Sagoe et al., 2016a). Conversely, it has been reported that adolescents are more susceptible to the detrimental effects of AAS use (Bahrke et al., 2000; Hildebrandt et al., 2014; Seara et al., 2017) such as increased aggression, criminality, and impulsiveness (Olivares et al., 2014).

In a study of a nationally representative sample of US adolescents, it was found that compared with nonusers, male lifetime AAS users had greater involvement in violent behaviors even after controlling for previous violent behavior, polypharmacy, and the interaction of violent

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behavior and polypharmacy (Beaver et al., 2008). Consistent with evidence from human studies, it has been found that exposure of adolescent hamsters to AAS leads to the development of an aggressive phenotype (Melloni et al., 2016). In addition, it has been indicated that pubertal AAS use is associated with increased aggression (Cunningham, Lumia, & McGinnis, 2013).

### **The present study**

According to the integrative model of behavioral prediction (IMBP; Fishbein, 2000, 2008), behavioral intention attenuated by personal skills and contextual constraints predicts behaviour. The IMBP and previous formulations [theories of reasoned action (Fishbein & Ajzen, 1975) and planned behavior (Ajzen, 1985)] have been criticized (Werner 2004). However, they have explained and predicted various behaviors such as HIV/STD-prevention (Kenski et al., 2001; Montaña, Phillips, & Kasprzyk, 2008), alcohol consumption (Cooke et al., 2016), doping (Lazuras, Barkoukis, & Tsorbatzoudis, 2015; Ntoumanis et al., 2014) as well as AAS use and intent in particular (Ager, 2015; Patiro, Dharmmesta, Nugroho, & Sutikno, 2016). The foregoing provides strong theoretical and empirical support for the importance of intention in predicting behaviour, thus underlining the need for investigating AAS use intent in the trajectory of AAS use.

Correlates of AAS use intent identified in cross-sectional adolescent studies include male gender (Sagoe et al., 2016a), approval of substance use by peers and poor parental endorsement of substance use abstinence (Elliot & Goldberg, 1996), substance use particularly alcohol and marijuana (Elliot & Goldberg, 1996) as well as snus/smokeless tobacco use (Sagoe et al., 2016a). Other cross-sectional correlates of AAS use in adolescence are depression symptoms (Sagoe et al., 2016a), body dissatisfaction (Elliot & Goldberg, 1996; Jenssen & Johannessen, 2015), and aggression (Elliot & Goldberg, 1996; Jenssen & Johannessen, 2015; Sagoe et al., 2016a).

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However, there are gaps in the literature on the correlates of AAS use intent in adolescence. As previously noted, although aggression is one of the important behavioral factors associated with AAS use (Cunningham, Lumia, & McGinnis, 2013), the link between aggression and AAS use and intent currently remains unclear (Dunn, 2015). Importantly, there is a dearth of longitudinal research on the correlates of AAS use and intent particularly in adolescence and emerging adulthood. Against this backdrop, we conducted the present longitudinal study to investigate associations between the above factors (aggression, sex, living situation, grade point average, AAS, alcohol, cigarette and snus use as well as anxiety and depression symptoms) and AAS use intent from age 18 to 19, prioritizing the role of physical and verbal aggression.

### **Methods**

#### *Participants*

Of an initial sample of 3000 (1500 females) 17-year-olds randomly selected from the Norwegian National Registry and invited to participate in a survey about addiction in 2012 (wave 1), 2055 (female = 53.0%) returned completed questionnaires (response rate = 70.4%). In 2013, those who responded were contacted again (aged 18). A total of 1333 individuals responded (wave 2: females = 58.9%, retention rate = 64.9%). One year later (wave 3), those who participated were contacted again. A total of 1277 individuals (females = 61.7%) responded (retention rate = 62.1%). Table 1 presents characteristics of participants at waves 2 and 3.

Insert Table 1 about here

#### *Measures*

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The questionnaire tapped information about a number of demographic variables including sex, grade point average (GPA), and living status. Participants provided information about whether they had smoked cigarettes or used snus the previous month.

*AAS use and intent.* Participants answered a single question (*yes/no*) about whether they had used AAS in the last 12 months. At waves 2 and 3, AAS use intent was assessed by the Intent to Use AAS Scale (IUAS; MacKinnon et al., 2001). The scale has five items answered on a 5-point scale ranging from *strongly disagree* (1) to *strongly agree* (5). Higher scores on the IUAS indicate greater intention to use AAS. An example item is “I am curious to try anabolic steroids”. The IUAS had high Cronbach’s alphas of .92 and .93 in the second and third waves respectively.

*Aggression.* The physical and verbal aggression subscales of the Short-Form Buss-Perry Aggression Questionnaire (BPAQ-SF; Diamond & Magaletta, 2006) were used in the assessment of aggression. The physical subscale consists of four-items (e.g., “Given enough provocation, I may hit another person”) while the verbal subscale contains three-items (e.g., “I have threatened people I know”). Items are answered on a 5-point scale ranging from 1 (*very unlike me*) to 5 (*very like me*). Higher scores denote higher inclination to the respective form of aggression. Cronbach’s alphas for the physical subscale were .76 and .78 for waves 2 and 3 respectively. For the verbal subscale, Cronbach’s alphas were .68 for wave 2, and .67 for wave 3.

*Anxiety and Depression.* The Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983) is a self-administered rating scale and was used in the assessment of symptoms of anxiety and depression. The HADS consists of 14 items; seven items measure depression (e.g., “Worrying thoughts go through my mind”) and seven items measure anxiety (e.g., “I get sudden feelings of panic”). Items are answered on a four-point scale ranging from 0 (*not at all*) to 3

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(*very often indeed*). A score of 8 or more on either the anxiety or depression subscale has proved to be optimal in detecting mild anxiety and depression (Carroll et al., 1993). Responses for each wave were based on past week experiences. Cronbach's alphas for the anxiety subscale were .80 for wave 2, and .81 for wave 3. The depression subscale yielded Cronbach's alphas of .73 at wave 2, and .76 at wave 3.

*Alcohol misuse.* We assessed alcohol misuse with the Alcohol Use Disorder Identification Test-Consumption which is a short test comprising three items (Bush et al., 1998). Response options range from *never* (0) to *four times or more per week* (4). A total score was calculated by adding participants' scores across 3 items with 5 or above demonstrating alcohol misuse. Cronbach's alphas were .71 for wave 2, and .66 for wave 3.

### *Procedure*

Participants were randomly selected from the Norwegian National Population Registry in 2012 and received postal invitations to fill out a self-report questionnaire. The invitation letter included statements about the purpose of the study and information to assure participants about confidentiality. It was also mentioned that participants would receive NOK200 (~ €25 at data collection) each as compensation. After completion, participants placed their questionnaire in a pre-paid envelope and returned the envelope to the researchers at University of Bergen. In 2013, the Intent to Use AAS Scale (IUAS; MacKinnon et al., 2001) was included in the questionnaire and participants from wave 1 were contacted to fill out the questionnaire (wave 2). This process was repeated in 2014 (wave 3). Ethical approval for the study was obtained from the Regional Committee for Medical and Health Research Ethics in South East Norway (2012/914).

### *Statistical analysis*



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Means and standard deviations of the study variables were computed. Correlations between the independent variables at both waves were also computed using Pearson product-moment correlations, point-biserial correlations, and phi coefficients. The statistical analysis was conducted using RStudio version 1.1.463 (RStudio, Inc). We conducted a paired sample *t*-test in order to compare the mean differences of physical aggression, verbal aggression (for females and males separately), and intent to use AAS from wave 2 to wave 3.

A hierarchical multiple linear regression analysis was conducted where the dependent variable was intention to use AAS at wave 3. We conducted preliminary analyses to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. We noticed that residuals of the Intent to Use AAS Scale were not normally distributed. Accordingly, we log-transformed this variable to improve its statistical properties. In the first step of our hierarchical multiple linear regression, intention to use AAS at wave 2 was entered as an independent variable. In the second step, physical and verbal aggression at wave 2 were entered. The third and last step included all other variables (sex, living situation, GPA, last year AAS use, alcohol misuse, last month cigarette use, last month snus use, anxiety, and depression). The living situation variable was nominal and comprised six categories (both parents, single parent, shuttling between parents, alone, household/dormitory, and other). This variable was dummy coded and 'other' was chosen as the reference category.

### **Results**

Only 1 participant reported using AAS at wave 2 whereas 4 participants indicated AAS use at wave 3. There was no significant change in intent to use AAS (wave 2:  $M = 5.6$ ,  $SD = 2.2$ , wave 3:  $M = 5.5$ ,  $SD = 2.1$ ;  $t = 1.123$ ,  $p = .24$ ).

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Physical aggression decreased both in males (wave 2:  $M = 6.6$ ,  $SD = 3.1$ , wave 3:  $M = 5.9$ ,  $SD = 2.9$ ;  $t = 4.40$ ,  $p < .01$ ) and females (wave 2:  $M = 6.1$ ,  $SD = 3.0$ , wave 3:  $M = 5.5$ ,  $SD = 2.4$ ;  $t = 8.15$ ,  $p < .01$ ). Verbal aggression also decreased in males (wave 2:  $M = 6.3$ ,  $SD = 2.3$ , wave 3:  $M = 6.0$ ,  $SD = 2.1$ ;  $t = 3.41$ ,  $p < .01$ ) and females (wave 2:  $M = 6.1$ ,  $SD = 2.2$ , wave 3:  $M = 5.5$ ,  $SD = 2.0$ ;  $t = 7.57$ ,  $p < .01$ ).

Figure 1 displays the correlation coefficients among the study variables at wave 2 and wave 3. At wave 2, intent to use AAS had negative associations with: GPA ( $r = -.07$ ,  $p < .05$ ), alcohol misuse ( $r = -.06$ ,  $p < .01$ ), past month cigarette use ( $r = -.13$ ,  $p < .01$ ), and snus use ( $r = -.10$ ,  $p < .01$ ). There were also positive correlations between intent to use AAS and shuttling between parents (living situation,  $r = .06$ ,  $p < .05$ ) as well as anxiety ( $r = .09$ ), depression ( $r = .11$ ,  $p < .01$ ), physical aggression ( $r = .16$ ,  $p < .01$ ), and verbal aggression ( $r = .10$ ,  $p < .01$ ).

At wave 3, intent to use AAS had positive correlations with last year AAS use ( $r = .22$ ,  $p < .01$ ), as well as anxiety ( $r = .06$ ,  $p < .05$ ), depression ( $r = .12$ ,  $p < .01$ ), physical aggression ( $r = .18$ ,  $p < .01$ ), and verbal aggression ( $r = .12$ ,  $p < .01$ ). In contrast, intent to use AAS had a negative association with past month cigarette use ( $r = -.10$ ,  $p < .01$ ).

Insert Figure 1 about here

Table 2 presents the results of the hierarchical linear regression predicting AAS use intent at wave 3 as the dependent variable. Intent to use AAS at wave 2 explained 8.2% of the variance in intent to use AAS at wave 3:  $F(1,1268) = 114.8$ ,  $p < .01$ . In the second step, after including wave 2 physical and verbal aggression, the model accounted for 8.4% of the variance in intent to use AAS at wave 3:  $F(3, 1266) = 40.05$ ,  $p < .01$ . Neither forms of aggression were related to AAS use intent at wave 3 (physical:  $\beta = .003$ ,  $p = .11$ ; verbal:  $\beta = .002$ ,  $p = .493$ ). We conducted another hierarchical multiple linear regression analysis where we used a composite aggression

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variable instead of separating the verbal aggression and physical aggression subscales. However, there was no association between composite aggression and AAS use intent at wave 3 (results not shown).

The third and final model, consisting of all the independent variables, explained 15% of the variance in intent to use AAS at wave 3:  $F(16, 957) = 13.36, p < .01$ . Here, males (sex:  $\beta = -.066, p < .01$ ) and individuals living alone ( $\beta = .068, p < .05$ ), had higher intent to use AAS at wave 3. Moreover, past year AAS use at wave 2 had a positive association ( $\beta = .296, p < .05$ ) with AAS use intent at wave 3.

Insert Table 2 about here

## Discussion

The present longitudinal research studied the prevalence of AAS use, and correlates of AAS use intent from age 18 to 19. There was a marginal increase in last year AAS use prevalence from 1 person at 18 years to 4 persons at 19 years, and the incidence of new users was only 0.3% for males and 0.0% for females. Both last year prevalence estimates are similar to estimates from two Norwegian studies (Wichstrøm, 2006; Wichstrøm & Pedersen, 2001) although lower than estimates presented in more recent Norwegian studies (Jenssen & Johannessen, 2015; Sagoe et al., 2016a; Sandvik, Bakken, & Loland, 2018). It is noteworthy that only about 13% of AAS users are below 18 years (Pope et al., 2014) and that most persons initiate AAS use after age 18 (Sagoe, Andreassen, & Pallesen, 2014).

Another plausible explanation for the comparatively lower prevalence of AAS use at both waves in the present study is the relatively high proportion of females at both waves, with evidence that use of AAS is predominantly a male practice (Sagoe et al., 2014; Sagoe & Pallesen, 2018). This assertion is consistent with the present association of males with higher

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AAS use intent at 19 years. In addition, there is evidence of temporal instability in AAS use in adolescence (van den Berg, Neumark-Sztainer, Cafri, & Wall, 2007). Our study demonstrates temporal (age 18 to 19) stability in AAS use intent, as well as the association of AAS use intent at age 18 with age 19 AAS use intent.

We also observed decreases in physical and verbal aggression in both males and females from ages 18 to 19 in corroboration of previous longitudinal findings on aggression in adolescence (Abramowitz, Petersen, & Schulenberg, 1984; Magnusson, 1988). One possible explanation for this is that endogenous testosterone levels are high in early adolescence and decreases and stabilizes over time leading to decreased aggressive behavior (Buchanan et al., 1992; Flannery, Rowe, & Gulley, 1993; Steinberg, 2008). It must be noted however that the association between levels of endogenous testosterone and aggression is moderated by other biological (e.g., cortisol and brain; Buades-Rotger, Engelke, & Kramer, 2018; Grotzinger et al., 2018; Peper et al., 2015) and social factors (e.g., discipline and trauma; Chen, Raine, & Granger, 2018; Fragkaki, Cima, & Granic, 2018).

However, we did not find longitudinal relationships between physical or verbal aggression or a composite aggression variable and AAS use intent from 18 to 19 years. Hence, the present study demonstrates that the cross-sectional relationship established between index aggression and AAS use intent at age 18 (Sagoe et al., 2016a) may not apply longitudinally from ages 18 to 19. Our finding that adolescents living alone at 18 years show higher intent to use AAS at 19 years is in line with previous studies (Kindlundh et al., 1999; Mulhall, Stone, & Stone, 1996) indicating that living alone is a risk factor for AAS use, as well as other substance misuse (Kindlundh et al., 1999; Makanjuola, Daramola, Obembe, 2007) and problem behaviour (Daka & Shaweno, 2014; Shoko, Ibisomi, Levin, & Ginsburg, 2018) in adolescence.

### **Implications for practice and future research**

The results of the present study have implications for prevention and harm reduction. Although the estimated prevalences of AAS use are low, it must be noted that AAS use harms may be exacerbated in adolescence (Hildebrandt, Langenbucher, Flores, Harty, & Berlin, 2014; Seara et al., 2017). Hence, preventive interventions such as the Norwegian Hercules program (Sagoe et al., 2016b) and other harm reduction efforts such as the Adolescents Training and Learning to Avoid Steroids (ATLAS) program (Goldberg et al., 1996) must be intensified.

Adolescent-targeted AAS use interventions are also necessary due to the present demonstrated temporal stability and connectivity of AAS use intent in adolescence. Additionally, the observed decreases in physical and verbal aggression, and the finding that neither forms of aggression are temporally related to AAS use intent indicates that other factors are influential in the maintenance of high AAS use intent in adolescence. Preventive interventions must therefore be targeted at adolescents with the risk factors for higher AAS use intent (males, persons living alone, and past or current AAS users) identified in this study.

Our findings also have implications for future research. Considering the aforementioned contradictory evidence, further studies, especially of longitudinal design, should be conducted to shed light on AAS use and intent. Larger sample sizes and innovative means of attrition prevention are recommended. Finally, in order to further elucidate our findings, conducting similar research using different methods, samples, factors, and in other cultural as well as geographic contexts is recommended.

### **Strengths and limitations**

To our knowledge, the present study is the first longitudinal investigation of the relationship between aggression and AAS use intent. It should be noted that from 18 to 19 years (late

adolescence and early adulthood), individuals experience important changes in their lifestyle (e.g., high school graduation and starting a career and/or attending college, moving out). Hence, we conducted our study during a critical period in the life span. Despite the aforementioned strengths, our study has limitations such as the reliance on self-reported data which may, for example, generate inaccurate responses and estimates of AAS use (Kanayama, Boynes, Hudson, Field, & Pope, 2007; Sagoe & Pallesen, 2018). The low prevalence of AAS use in our study, although desirable, should be noted in the interpretation of our findings. In addition, our model explained little variance in AAS use intent indicating that other unexamined factors have a substantial influence on AAS use intent. Furthermore, we were unable to establish a causal relationship between study variables due to our design.

### **Conclusions**

Our findings indicate a marginal increase in AAS use prevalence from ages 18 to 19. Our prevalence estimates during this period are similar to estimates from earlier Norwegian studies (Wichstrøm, 2006; Wichstrøm & Pedersen, 2001) but lower than estimates from more recent studies (Jenssen & Johannessen, 2015; Sagoe et al., 2016b; Sandvik, Bakken, & Loland, 2018). Additionally, we show evidence of temporal stability in AAS use intent, as well as the association of AAS use intent at age 18 with age 19 AAS use intent. Our findings also indicate decreases in physical and verbal aggression from ages 18 to 19 although no longitudinal associations between physical or verbal aggression and AAS use intent were found from ages 18 to 19. Furthermore, we demonstrate that male gender, living alone, and past or current AAS use are risk factors for higher AAS use intent in emerging adulthood. Accordingly, there is the need for targeted preventive and harm reduction interventions. Further studies using other approaches are warranted to elucidate factor related to AAS use and intent.

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Table 1. Sample characteristics at waves 2 ( $N = 1333$ ) and 3 ( $N = 1272$ )

Variable	Wave 2		Wave 3					
	<i>n</i>	%	<i>n</i>	%				
Sex								
Female	785	58.9	785	61.7				
Male	548	41.1	487	38.3				
Last year AAS use								
No	1277	95.7	1267	99.6				
Yes	1	0.1	4	0.4				
Living Situation								
Both parents	826	62.6	545	42.8				
Single parent	242	18.3	203	15.9				
Shuttling	81	6.1	40	3.1				
Alone	67	5.1	147	11.5				
Household/dormitory	20	1.5	145	11.3				
Other	84	6.4	189	14.8				
Alcohol								
AUDIT-C < 5	91	7.1	72	5.6				
AUDIT-C ≥ 5	1093	85.9	1033	81.3				
Last month cigarette use								
Every day	52	3.8	51	4				
Less than every day	155	11.5	120	9.4				
Not at all	1112	82.6	1101	86.5				
Last month snus use								
Every day	213	15.8	239	18.8				
Less than every day	105	7.8	110	8.6				
Not at all	1001	74.3	922	72.4				
Anxiety								
HADS A ≤ 7	914	70.0	942	74.0				
HADS A > 7	391	30.0	311	24.4				
Depression								
HADS D ≤ 7	1144	87.5	1140	89.6				
HADS D > 7	164	12.5	120	9.4				
	<u>Mean</u>	<u>SD</u>	<u>Skewness</u>	<u>Kurtosis</u>	<u>Mean</u>	<u>SD</u>	<u>Skewness</u>	<u>Kurtosis</u>
Intent to Use AAS Scale <sup>a</sup>	1.68	0.24	4.25	20.1	1.67	0.22	3.50	12.97
Physical aggression	6.4	3.1	1.5	1.8	5.9	2.8	2.0	4.3
Verbal aggression	6.3	2.3	.9	.7	5.8	2.1	1.2	1.7
Grade point average	4.1	0.8	-.5	1.1	4.4	0.8	-.6	1.1

AUDIT-C: Alcohol Use Disorders Identification Test-Consumption

HADS: Hospital Anxiety and Depression Scale

<sup>a</sup>Log-transformed

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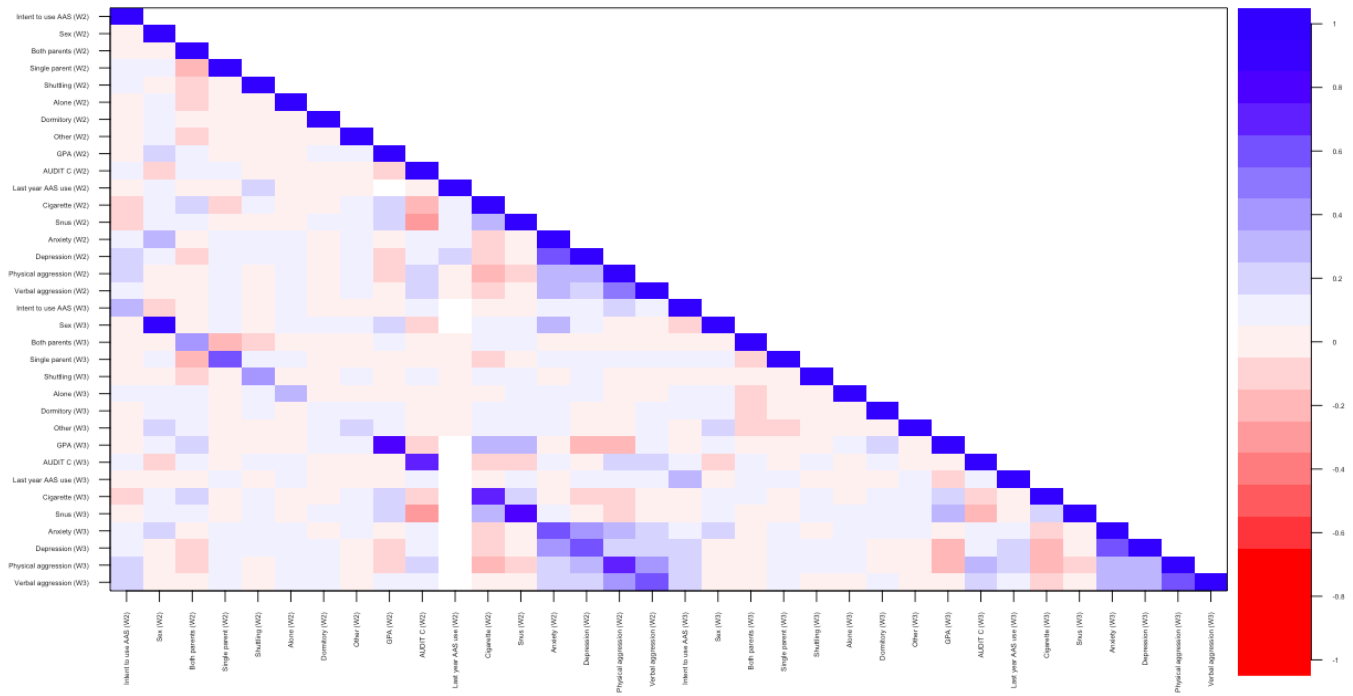


Figure 1. Correlation matrix of study variables at waves 2 ( $N = 1333$ ) and 3 ( $N = 1277$ ).

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Table 2. Hierarchical linear regression of predictors of AAS use intent (log-transformed) at wave 3 ( $N = 1333$ )

Wave 2 variables	B	SE	$\beta$	$t$	$\Delta R^2$
First step					
Intent to Use AAS Scale <sup>a</sup>	.300	.028	.305	<b>10.713**</b>	.082
Second step					
Intent to Use AAS Scale <sup>a</sup>	.243	.028	.292	<b>10.088**</b>	.084
Physical aggression	.001	.002	.003	1.594	
Verbal aggression	.000	.003	.002	.686	
Third step					
Intent to Use AAS Scale <sup>a</sup>	.264	.027	.287	<b>10.655**</b>	.15
Physical aggression	.001	.002	.003	1.361	
Verbal aggression	.000	.003	.001	.343	
Sex (male = 0, female = 1)	-.047	.013	-.068	<b>-5.112**</b>	
Living situation					
Both parents	.071	.027	.075	2.51	
Single parent	-.000	.016	-.000	-.121	
Shuttling between parents	-.329	.026	-.036	-1.370	
Alone	.956	.028	.072	<b>2.430*</b>	
Household/dormitory	-.372	.057	-.056	.321	
Grade point average	-.186	.108	-.066	-1.724	
Last year AAS use	.963	.025	.296	<b>2.417*</b>	
AUDIT-C	.001	.003	.000	.076	
Last month cigarette use	-.003	.013	-.007	-.501	
Last month snus use	.240	.009	.011	1.286	
HADS Anxiety	.002	.002	.003	.059	
HADS Depression	-.002	.002	-.001	-.871	

<sup>a</sup>Log-transformed

\* $p < .05$ , \*\* $p < .01$

AUDIT-C: Alcohol Use Disorders Identification Test-Consumption

HADS: Hospital Anxiety and Depression Scale