



# Influence of coping strategies on the efficacy of YAM (Youth Aware of Mental Health): a universal school-based suicide preventive program

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## Abstract

The school-based mental health promotion and suicide prevention universal program Youth Aware of Mental Health (YAM) significantly reduces incident suicide attempts and severe suicidal ideation. This paper aims at elucidating psychological mechanisms underlying YAM's efficacy. Our hypothesis is that YAM operates through interactions with coping strategies (CS) on the reduction of suicidal ideation (SI). In the Saving and Empowering Young Lives in Europe (SEYLE) study, five coping strategies were assessed at baseline (T0) and 12-month follow-up (T12): “learning”, “help-seeking”, “arts”, “sports” and “fight”. We analyzed interactions between the YAM intervention, coping strategies and SI in the YAM group ( $N=1693$ ) and the minimal intervention group ( $N=1909$ ), after excluding prevalent cases with SI and previous suicide attempts from our total sample ( $N=5654$ ). General Linear Mixed Model regressions were performed. The present study confirms that coping strategies play an influential role on suicidal ideation. Our results showed that YAM acts whatever the prevailing coping strategies used. It is particularly efficient for pupils insufficiently using adaptive coping strategies such as LEARN and HELP-SEEKING or using maladaptive coping strategies, such as ARTS and FIGHT. The socialization induced by the YAM intervention seems to be a strong component of its efficiency.

**Keywords** YAM · Universal programme · Coping strategies · Suicide · Suicidal ideation · Adolescents · Mechanisms · Suicide prevention · Mental health promotion · SEYLE

## Introduction

Suicidality in adolescents is an important public health problem worldwide and is the second cause of premature mortality in 14–25-year-old European adolescents [1, 2]. Several suicide prevention programs have thus been developed to be delivered in schools [3, 4]. The Saving and Empowering Young Lives in Europe (SEYLE) project was the first

prospective Randomized Control Trial (RCT) conducted in Europe, on a sample of 12,395 adolescents [5, 6]. It evaluated the effects of three different suicide prevention interventions, compared to a minimal intervention (control group). One of those, the Youth Aware of Mental Health programme (YAM), a universal intervention, is designed to raise adolescent's awareness about risk and protective factors associated with suicide and to increase reflection about their different coping strategies (CS) and choices in difficult situations. It is based on role-play and interactive discussions, focused on everyday dilemmas, stress, crisis, depression and suicidality. It is delivered to an entire school class of 14–16-year-old adolescents during 5 h over 3 weeks [7]. YAM has demonstrated its efficacy in significantly reducing suicide attempts and severe suicidal ideation [8]. Furthermore, it was well accepted and proven cost effective [7, 9].

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Coping is a general response to stress [10–12]. It is a complex, multi-level and dynamic system which involves emotional, cognitive and behavioural mechanisms [13–15]. In a systemic approach, coping articulates the stressor and its interactions with the individual: his resources, constraints, appraisals and the outcomes of previous coping efforts [16]. The unlimited number of possible coping responses makes an exhaustive listing of coping mechanisms impossible [13]. Different taxonomies of copings such as dimensions, categories, families, styles, and strategies have been proposed but none has proven totally consensual [17, 18].

Skinner, Zimmer-Gembeck and colleagues reviewed known data and analyzed them to build a coherent organization of coping [13, 19–21]. Their approach, so far, is one of the most consensual, consistent and solid attempts to cover the multiple situation-specific and personal responses to stress. Their model has also the advantage of integrating the developmental aspects of coping in children and adolescents. These authors, among a few others [22, 23], described several qualitative and quantitative age-developmental shifts in coping processes, from infancy to young adulthood [13]. According to them, four families of coping strategies are the most commonly used in ages 14 and above: (1) problem-solving; (2) support-seeking; (3) accommodation and (4) escape [21]. Problem-solving includes advanced forms of cognition such as planning, reflection and commitment. Support-seeking shifts during early adolescence from parents to peers, even though adults remain the first support in situations where they have authority or when stress is uncontrollable [13]. Accommodation includes distracting activities (such as creating arts or playing sports) and is mostly used to cope with uncontrollable events. Escape coping strategies are both behavioural and cognitive. Behavioural escape evolves between 14 and 16 years of age with an increased possibility to decide which situations to participate in. Cognitive escape may be adaptive or maladaptive, when using strategies such as wishful thinking, minimization, denial. Less frequently, other coping families such as “opposition” (i.e., aggression), may be used differently according to age. During adolescence, verbal aggression tends to replace physical aggression, even though there are some stable residual occurrences. According to Skinner and Zimmer-Gembeck, there are several coping developmental age-graded shifts from infancy to young adulthood. But these transitional shifts, in means of coping, are progressive and selective; they follow human developmental capacities [18]. In the end, through ageing and increasing experiences, different coping strategies are developed and selected, in an emotional, cognitive and behavioural repertoire and become more or less stable [24–26].

Studies evaluating the relationship between suicidality and coping strategies show that some coping strategies seem to be associated with high suicidal risk [27–31], whereas

other strategies that may increase auto-efficacy and resilience, counteract suicidality [32–34]. In particular, aggression has been demonstrated to be predictive of suicidality [34–39]. It was, therefore, also included in the SEYLE questionnaire. Most studies point out towards the preventive and clinical implications of identifying coping strategies to enhance protective copings and/or dampen maladaptive ones [28, 40, 41].

Our primary aim is to understand how YAM interacts with the different coping strategies and to test if it is equally effective, whatever coping strategies are used. Our hypothesis is that YAM’s efficacy could be mediated by the CSs and that the intervention increases the adaptive CSs and reduces the maladaptive ones.

## Method

### Sample

Our sample gathered participants allocated to the YAM group ( $N=2721$ ) and to the minimal intervention (MI) group ( $N=2933$ ). Thus, the initial sample counted 5654 adolescents. Pupils were aged 14–16 (mean  $14.9 \pm 0.86$ ) and were recruited in 85 schools (45 in the YAM, 40 in control schools) across 10 EU countries during 2009/2010. All participants were administered a self-report questionnaire at baseline (T0), 3 months (T3) and 12 months later (T12). In this study, only data from baseline and 12 months were utilized since the question on coping strategies was not addressed in the 3 month questionnaire. Pupils with a previous suicide attempt or a score greater than 2 on the Paykel Suicide Scale [42] and those with missing data for coping strategies at T0 were excluded. 3602 (63.7%) had complete data at T0 and T12 (YAM=1693, MI=1909). Among these 3602 students, 2059 were girls (57.2%).

### Data

#### Suicidal ideation

Since there were no completed suicides during the SEYLE study [8] and the numbers of attempted suicides were low, coping strategies were studied only in pupils without suicidal ideation at T0.

Suicidal ideation was assessed with the Paykel Suicide Scale’s (PSS) four items, at T0 and T12. The score sums up the four items, ranging from zero to five. Adolescents who scored 3 or more (on a scale of 20) were considered positive for suicidal ideation. Those prevalent cases were excluded at T0. Thus, at T12, only incident cases of suicidal ideation were analysed.

## Coping strategies

Five coping strategies were explored in the SEYLE questionnaire (see Table 1): learning about the problem (LEARN); help-seeking from families, peers or additional social resources (HELP-SEEKING); playing sports (SPORTS); creating art (ARTS) and physical fighting (FIGHT).

Four of those strategies are the most used during adolescence: LEARN, which belongs to the “problem-solving” family, serves to adjust action to be effective; HELP-SEEKING, which belongs to the “support-seeking” and/or “information-seeking” families, contributes to using available social resources and finding additional contingencies; SPORTS and ARTS, which belong to the “escape” and/or “accommodation” families, are used to physically or mentally escape or to adjust to the situation through distraction or avoidance. FIGHT, a less frequently used coping strategy, belongs to the “opposition” family and serves to remove constraints. Each CS was rated on a Likert scale with “Never” (0), “Sometimes” (1), “Often” (2), “Most of the time” (3).

## Statistical analysis

### Descriptive statistics

The prevalence (%) of suicidal ideation at T0 in both the YAM and MI groups was computed. The use of coping strategies at T0 was also analysed and expressed as means and  $\pm$  standard deviations.

### Step 1: independence of the five coping strategies at T0 and T12

Polychoric correlations ( $\rho$ ) were computed between the five CSs on the total sample at T0. When  $\rho$  were less than 0.30, the correlations were considered to have a medium effect size [43] and the CSs were considered independent from each other. The independence of the 5 CSs was also tested at T12.

### Step 2: stability of the five coping strategies between T0 and T12

Mean differences between each CS, used at T0 and T12, were computed in the whole sample. If the effect sizes (Cohen’s  $d$ ) were less than 0.20, the CSs were considered stable over time.

### Step 3: direct effect of the YAM on each of the five coping strategies at T12

Five General Linear Mixed Models (GLMM) adjusted on “schools nested in countries” as random variables and each CS at T0 as fixed variable with “CS” at T12 as dependent variable were computed. A direct effect of the YAM intervention on the CSs can be considered if the regression coefficients are significant (i.e.,  $p < 0.05$ ). We use dummy coding for ARM; MI group was coded as 0 and YAM as 1.

**Table 1** Correspondence of coping strategies as cited in the SEYLE study with families of coping

SEYLE questionnaire (T0 and T12): which of these things do you usually do when you have a problem?	Coping strategies denomination	Higher order families or Families of coping (with examples of ways of coping)*	Adaptive process*
Learn as much as possible about the problem	LEARN	PROBLEM-SOLVING (strategizing, instrumental action, planning)	Adjust action to be effective
Talk about the problem with: parents (step-parents or other guardians)/other relatives/friend, teacher, other school staff, professionals like psychiatrist or psychologist, or religious mentors	HELP-SEEKING	SUPPORT-SEEKING (Contact seeking, instrumental aid, social referencing) INFORMATION-SEEKING (Reading, observation, asking others)	Use available social resources Find additional contingencies
Do athletics or aerobic sports	SPORTS	ESCAPE	Escape noncontingent environment
Draw, paint or write stories, poems or compose music	ARTS	(Denial, behavioural avoidance, wishful thinking) ACCOMODATION (Distraction, acceptance, minimization)	Flexibly adjust preferences to options
Get into fights	FIGHT	OPPOSITION (Projection, other-blame, aggression)	Remove constraints

Column 1: questions and answers explored in the SEYLE questionnaire; column 2: common denomination of the coping strategies in the present study; column 3: translation into Zimmer-Gembeck and Skinner’s families of coping; (in capital lettering) and some examples of strategies, as described in Zimmer-Gembeck and Skinner [21]; column 4: adaptive functions the family of copings serve, according to Zimmer-Gembeck and Skinner [21]

\*As described in Zimmer-Gembeck and Skinner [21]

#### Step 4: coping strategies' modulating effect of YAM's efficacy on suicidal ideation

General Linear Mixed Models (GLMM), adjusted on “schools nested in countries” as random variables, were used to assess the effect of the five CSs on suicidal ideation at T12 and the effect of the YAM on the interaction between the different CSs and suicidal ideation at T12. We use dummy coding for ARM; MI group was coded as 0 and YAM as 1. Therefore, a significant negative coefficient indicates a significant decrease in suicidal ideation, associated with the YAM intervention.

Four different models using a likelihood ratio test were successively computed to assess: (1) if suicidal ideation at T0 predicted suicidal ideation at T12, in both MI and YAM groups; (2) if the interactions between the different CSs at T0 and suicidal ideation at T12 were significant; (3) if the YAM reduced suicidal ideation even when controlling for CSs at T0; (4) if there was a specific influence of the YAM on the association between CSs and suicidal ideation. The total score on the PSS at T12 was not normally distributed; so it was approximated by a Poisson distribution. All statistical analyses were performed using the R program 3.3.1 [44]; the GLMM was performed using the lme4 package [45]. The significance of the GLMM's coefficients were computed, using the LmerTest package [46] with Satterthwaite's approximation to degrees of freedom [47].

## Results

### Prevalence of suicidal ideation and coping strategies at T0

Suicidal ideation at T0 was found in 497 pupils (12.1%,  $N$  total = 4099). 238 pupils (12.3%,  $N$  = 1931) had suicidal ideation in the YAM group and 259 (11.9%,  $N$  = 2168) in the MI group ( $X^2 = 0.104$ ;  $p$  = NS). These subjects were excluded (final sample  $N$  = 3602).

As shown in Table 2, when considering the whole sample, the most frequently used CSs at T0 were LEARN and

HELP-SEEKING. SPORTS and ARTS were less frequently used. FIGHT was used five times less than LEARN.

### Step 1: independence of the five coping strategies from each other at T0 and T12

All polychoric correlations between the five CSs at T0 and T12 were less than 0.30; therefore, all CSs are independent from each other (see Supplementary Material A).

### Step 2: stability of the coping strategies between T0 and T12

The effect sizes of the mean differences over time were “small” (Cohen's  $d < 0.20$ ); therefore, CSs are stable over time (see Table 2).

### Step 3: no direct effect of YAM on the five coping strategies at T12

The results of the five GLMM analyses confirm that there was no direct effect of the YAM on CSs at T12 (see Supplementary Material B), except for ARTS, which increased slightly with the YAM intervention ( $\beta = 0.162$ ,  $p < 0.01$ ).

### Step 4: coping strategies have a modulating effect on YAM's efficacy on suicidal ideation

Likelihood ratio tests were calculated to compare four models: a baseline Model 1 used the Paykel score as the only fixed factor at T0 and “schools nested in country” as random variables; Model 2 used the same variables as Model 1 plus the five CSs; Model 3 used the previous variables plus “the YAM” as a supplementary variable; Model 4 used an interaction between “the YAM” and the five CSs, as variables (see Table 3).

The comparison showed that Model 2 “with the CSs as predictors (fixed variables)” had a better fit ( $p < 0.0001$ ) than the Model 1 “with the Paykel score alone”. This demonstrates that CSs have an effect on suicidal ideation, as measured by the PSS.

**Table 2** Stability of CSs over time between T0 and T12

Coping items	Mean (SD) T0	Mean (SD) T12	Cohen's $d$	CI (0.025)	CI (0.975)
LEARN	1.90 (0.88)	1.96 (0.89)	0.06*	0.01	0.10
HELP-SEEKING	1.84 (1.03)	1.91 (1.02)	0.07*	0.02	0.11
SPORTS	1.48 (1.11)	1.43 (1.09)	-0.05*	-0.09	-0.0003
ARTS	1.04 (1.07)	0.92 (1.04)	-0.13*	-0.18	-0.08
FIGHT	0.39 (0.79)	0.38 (0.79)	-0.02	-0.06	0.02

Means, standard deviations and effect sizes of differences (and their confidence interval) of CSs at T0 and T12, in the whole sample for coping strategies across time

\*Difference significant at  $p < 0.05$

**Table 3** Interaction between the YAM intervention and coping strategies (CS): models comparison with the Paykel Suicide Scale score at T12, as dependent variable

Model	AIC	BIC	Loglikelihood	<i>p</i> value
Model 1: Schools and countries as random variables	6982	7007	− 3487	
Model 2: CS alone (with schools and countries as random variables)	6916	6972	− 3449	<i>p</i> < 0.0001
Model 3: Model 2 + YAM intervention	6909	6971	− 3445	<i>p</i> < 0.004
Model 4: Model 3 + interactions between intervention and coping strategies	6876	6969	− 3423	<i>p</i> < 0.0001

Significance of the comparison between four successive general linear mixed models

AIC Akaike Information Criteria, BIC Bayesian Information Criteria

The subsequent comparison showed that Model 3 “with the CSs as predictors, plus the YAM without interaction on CS”, had a better fit ( $p < 0.004$ ) than Model 2 “without the YAM”. This demonstrates that the YAM had an effect on the Paykel score, independently of what CS was used at T0. In Model 3, all the effects were significant (all  $p < 0.0001$ ): the CSs FIGHT and ARTS were associated with a higher Paykel score at T12 and the CSs LEARN, HELP-SEEKING and SPORTS were associated with a lower Paykel score at T12 (see Supplementary Material C).

In the last comparison, Model 4 “YAM with interaction effect on CS” gave the lowest log likelihood value (− 3423) and thus, the best fit. It was superior to Model 3 “without”, i.e. the comparison generated a significant Chi square ( $p < 0.0001$ ). Therefore, the inclusion of the interaction effects between different CSs and the YAM allowed for a better prediction of suicidal ideation at follow-up. Consequently, YAM modulates the effects of CSs (as measured at T0) on suicidal ideation (as measured at T12).

In the Model 4 “with interaction”, the main effects of the CSs were the same as in the Model 3 “without interaction” (see Table 4). LEARN, HELP-SEEKING and SPORTS

decrease suicidal ideations, as measured by the Paykel score at T12, whereas FIGHT and ART increase them. The YAM negatively predicted the Paykel score at T12, even when the initial CSs were controlled for. Consequently, whatever the prevalent CS was, the YAM reduced suicidal ideation (Table 4).

The analyses of the interactions of the YAM with the different coping strategies are particularly enlightening. When LEARN and HELP-SEEKING were poorly used (“never” or “sometimes”) in adolescents at T0, the YAM reduced suicidal ideation at T12, as compared to the MI (cf. Table 4 and Fig. 1).

Surprisingly, high levels of use of ARTS as a CS are correlated with high levels of suicidal ideation in the MI group. The YAM intervention significantly reduces suicidal ideation at those levels at T12 ( $p < 0.0001$ ; Fig. 1c, Table 4).

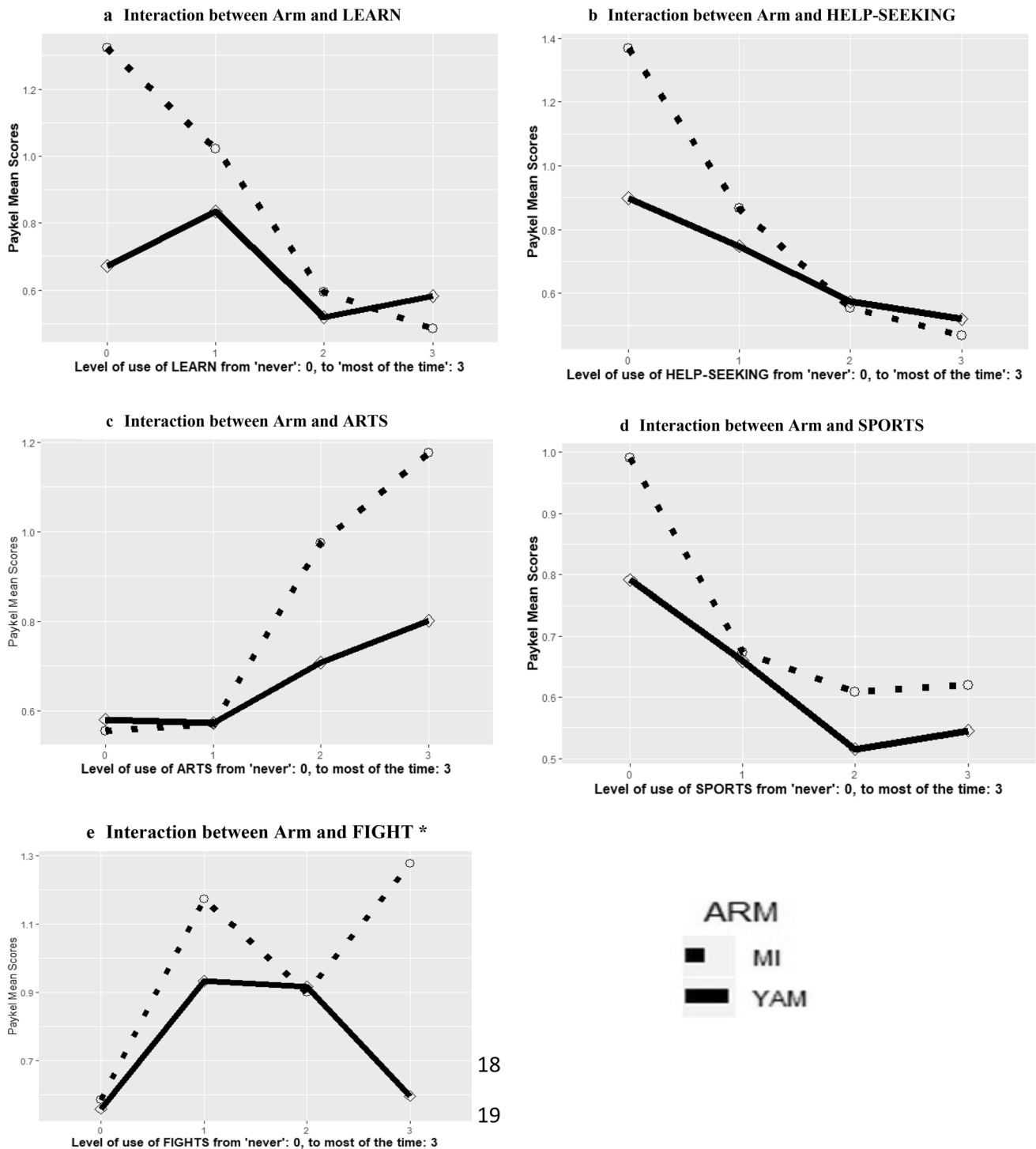
When considering SPORTS, low levels of use are associated with high scores of suicidality, as measured by the PSS, in both the MI and YAM groups, whereas high levels of use of SPORTS as a CS are associated with low levels of suicidality. YAM has no statistically significant interaction with the CS ( $p > 0.10$ ).

**Table 4** Interaction between the YAM intervention and coping strategies on suicidal ideation at T12, as measured by the Paykel Suicide Scale (PSS): coefficients obtained

	Coping strategies	Estimate	Standard error	<i>z</i> score	<i>p</i> value
Main effects: coefficients of coping strategies and of intervention*	LEARN	− 0.22321	0.02218	− 10.063	< 0.0001
	HELP-SEEKING	0.29463	0.02669	11.037	< 0.0001
	SPORTS	− 0.14404	0.01809	− 7.963	< 0.0001
	ARTS	0.2486	0.01639	15.17	< 0.0001
	FIGHT	− 0.19783	0.01851	− 10.685	< 0.0001
	Arm	− 0.36243	0.11356	− 3.191	< 0.002
Interaction effects <sup>#</sup>	LEARN X Arm	0.18952	0.04475	4.236	< 0.0001
	HELP-SEEKING X Arm	0.14263	0.03710	3.845	< 0.001
	SPORTS X Arm	− 0.06230	0.03650	− 1.707	NS
	ARTS X Arm	− 0.18256	0.03304	− 5.526	< 0.0001
	FIGHT X Arm	− 0.11299	0.05115	− 2.209	< 0.05

\*The main effects are obtained from the model 3 “without interaction”

<sup>#</sup>The interaction effects are obtained from model 4 “with interaction”



**Fig. 1** Interactions between arm and coping strategies on suicidality, as measured by the Paykel Suicide Scale at 12 months. Interactions between each coping strategy according to its level (0: never; 1: sometimes; 2: often; 3: most of the time) and interventions (MI mini-

mal intervention, YAM Youth Aware if Mental Health) on suicidality at T12, as measured by the Paykel Suicide Scale (PSS) mean scores. \*For e only level 3 (“most of the time”) presents a significant difference between means of PSS for YAM as compared to MI

As appears on Fig. 1e, the relationship between the use of FIGHT and suicidal ideation appears to be non-linear in both the MI and YAM groups. An analysis with FIGHT as a

categorical factor showed that the interaction between YAM and FIGHT was only statistically significant ( $p < 0.003$ ) when FIGHT was used “most of the time”. For the lower

levels of use (“never”, “sometimes”, “often”), YAM had no significant interaction effect with FIGHT ( $p > 0.10$ ).

## Discussion

The SEYLE study has demonstrated the efficacy of the Youth Aware of Mental Health (YAM) programme in significantly decreasing incident cases of suicide attempts and severe suicidal ideation [8]. To our knowledge, no existing study so far demonstrates the role of coping strategies in the effectiveness of universal suicide preventive, school-based interventions. The aim of this paper was to explore the interactions of different coping strategies with YAM on suicidal ideation.

In our sample, 12.1% of pupils who experienced suicidal ideation at T0 (238 in the YAM group and 259 in the MI group) were excluded. This number ranges within other worldwide studies measuring current suicidal ideation in adolescents between 2007 and 2013: from 8.4% (Italy) to 19.8% (Turkey) [48–56].

In the SEYLE study, five coping strategies were documented at T0 and T12, namely: LEARN, HELP-SEEKING, SPORTS, ARTS and FIGHT. Indeed, many other CSs are used in adolescent pupils; nevertheless, those strategies have been described as the most used ones between age 14 and 16, according to Zimmer-Gembeck and Skinner [21]. FIGHT, although less frequently used, has been chosen because of its links with suicidal behavior [34–39]. The most frequently used CSs in the SEYLE adolescents were LEARN and HELP-SEEKING. The least used CS was FIGHT. This mirrors Zimmer-Gembeck and Skinner’s findings [21].

It was first shown that the five CSs were independent from each other. It has also been shown that they were stable over time (between T0 and T12). These results are in line with those of Kirchner et al. [24, 57]. Our results also show that LEARN, HELP-SEEKING and SPORT have a protective effect on suicidal ideation, whereas ARTS and FIGHT are positively related to suicidal ideation (as shown in Fig. 1). Second, this study showed that the YAM, while not having direct effects on four of the coping styles at T12, with the exception of ARTS, had a modulating effect of CSs on suicidal ideation. When efficient suicide protective strategies as LEARN and HELP-SEEKING (Gould et al. and Khurana and Romer [57, 58]) are poorly used, suicidality is high in the MI group, but strongly reduced in the YAM group (as shown in Fig. 1a and b).

Surprisingly, this study showed that coping through ARTS correlated with increased suicidal ideation at T12 in the MI group, which contrasts with what was expected from the previous literature [59]. It also showed that YAM slightly increased the use of ARTS at T12. In pupils using ARTS “often” or “most of the time” as a CS, YAM significantly

reduces suicidality, as compared to the MI group. Creating art can be seen as a “sublimation” defence mechanism, defined in the DSM-IV-TR as “achieving impulse gratification and the retention of goals but altering a socially objectionable aim or object to a socially acceptable one [...] Feelings are acknowledged, modified, and directed toward a significant object or goal, and modest instinctual satisfaction occurs” [60]. The question assessing the ARTS coping strategy in the SEYLE questionnaire matches the processes described in this previous definition. But, in spite of an expected emotional regulation, this CS in the pupils participating in the YAM was associated with higher scores of suicidal ideation. Sublimation is often classified as an adaptive defense mechanism [61, 62], but our results tend to show that this is not necessarily always true and suggest that an adaptive/maladaptive classification of coping strategies may be misleading. Coping strategies should rather be categorized on their action type [14, 16, 19] and the nature of the stressor should also be taken into account. There are other interpretations of the role of creating art as a coping strategy: Zimmer-Gembeck and Skinner see creating art as an escape. A 2011 study by Drake et al. showed that short-term mood repair through art was more efficient when used as a distraction than as a venting strategy [63]. Our hypothesis is that in some occasions, coping through ARTS tends to isolate the adolescent and does not contribute efficiently to help the pupil solve his/her problems by learning from others or improving peer relations.

Playing sports (SPORTS) has often been considered as a productive coping strategy [64] that develops life skills, especially cognitive and social [65]. But, it can also be considered as an escape reaction and distraction from emotionally working through stressful life events and crisis. Participation in sports has been found to be associated with reduced levels of depression [66] and suicidal ideation, but adolescents who play individual sports have lower levels of well-being compared to team players [67]. One might hypothesize that the more the coping strategy socializes the adolescents and stimulates reflection, the more it seems to be effective in reducing suicidality in this age group. The YAM seems to fulfil this condition through the role-plays, which enhance learning and help-seeking among peers, thus potentiating the effect of constructive CSs on the reduction of suicide ideation.

In our study, FIGHT is a CS which is not frequently used among adolescents. This confirms Zimmer-Gembeck and Skinner’s findings [21]. The results for the FIGHT CS are nevertheless of particular interest, since YAM decreased suicidal ideation, especially in pupils using FIGHT “most of the time” as a coping strategy. Indeed, the interaction coefficient is only significant at this level, but not at the other frequencies of use (see Fig. 1 and Table 4). The mechanisms at work in the moderation of fighting and regulating aggression by

the YAM are complex to analyse. The non-linear results of FIGHT interaction with the YAM intervention is puzzling. According to Zimmer-Gembeck et al. [21], engaging into fights, which induces a direct explosion of affects in a behavioural manifestation, belongs to the “opposition” family of copings. There is a well-established association between externalization syndrome, behavioural misconduct and high levels of suicidality [39, 68]. In most cases, fighting worsens the situation the subject is trying to resolve and can result in an increased risk of suicidal ideation, suicide attempts and completed suicide [39]. Another tentative explanation to the non-linearity of the FIGHT CS effects in both the MI and YAM groups could involve the concept of social desirability. Pupils could be refrained to indicate that they engage into FIGHT, because of moral disapproval and social stigma. Nevertheless, we show that, at the highest level of use of this CS, the YAM intervention significantly reduces suicidality, as compared to the MI group. For Dishion et al., the proximity to violent peers seems to have an influence on increased violence levels in adolescents, while for Stepp et al., socially competent adolescents tend to decrease their involvement with deviant peers. One explanation could be that the role-plays, used in YAM as a tool for reflecting on one’s decisions and actions, helped more aggressive and impulsive adolescents to reconsider their behaviour. Reindl et al. showed that there is a direct influence of the peers on emotion regulation strategies used by adolescents. We could, therefore, hypothesize that adolescents using aggression strategies such as FIGHT, learn through role-plays from pupils with more adaptive strategies in stressful and crisis situations, leading to their inclusion in the social setting of the classroom.

### Strengths and limitations

The results presented here contribute to a better understanding of YAM’s mechanisms of efficiency in reducing suicidal ideation and suicidal attempts. YAM probably acts on suicidal ideation through modulating effects on coping strategies. The strengths of this study are that it was performed on a large group of adolescents ( $N=5654$ ) in a randomised controlled trial and, to our knowledge, that it is the first psychopathological attempt to explain YAM’s mechanisms of action. Experimental studies on how the YAM acts on adolescents with different coping strategies should be tested further.

As previously mentioned, there is no taxonomy and measurement consensus regarding coping strategies. The principal limitation of the present paper is inherent to this fact. Skinner and Zimmer-Gembeck explored 12 families of copings and SEYLE only explored the most relevant to adolescence. Besides, our measurement tool does not assess the type of stressor inducing the coping

and, therefore, does not differentiate controllable stressors from uncontrollable ones. Also, the present study does not preclude the possibility that other factors may play a role in the efficacy of YAM.

### Conclusion

The present study confirms that coping strategies play an influential role on suicidal ideation. It showed that the short universal school-based YAM programme acts whatever the prevailing coping strategies used. It is of particular interest for pupils insufficiently using adaptive coping strategies such as LEARN and HELP-SEEKING or using maladaptive coping strategies, such as ARTS and FIGHT. The socialization induced by the YAM intervention seems a strong component of its efficiency. In future studies, more attention should be paid to psychological mechanisms underlying the efficacy of mental health-promoting and suicide-preventing strategies.

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### Compliance with ethical standards

**Conflict of interest** None.




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