

The Role of Task-Unrelated Thinking Characteristics and Function in Affect Regulation During Online and On-site Classes

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Abstract

Task-unrelated thinking (TUT) can impact both performance and well-being, yet its role in affect regulation remains underexplored, especially in an educational context. This study examined TUT level, characteristics, and functions in 173 on-site and 143 online students, assessing their affect and class experiences in an ecological setting. While overall TUT levels did not differ between groups, distinctions emerged in characteristics (e.g., inner speech) and functions (e.g., stimulation or avoidance). Valence was the only characteristic predicting prospective sadness or anxiety. Using TUT for problem-solving or avoidance was linked to increased sadness, whereas using it for stimulation was linked to reduced anxiety. These findings highlight that TUT's effects depend more on its nature and purpose than its frequency. The observed link between avoidance-related TUT and negative affect has significant implications for clinical psychology and educational settings, particularly in understanding emotion regulation in online and on-site learning.

Keywords: task-unrelated thinking; mind-wandering; affect regulation; online learning

Task-unrelated thinking in educational activities

Task-unrelated thoughts, often referred to as mind-wandering or daydreaming (Seli et al., 2018) have already been studied in an educational context for several decades (Pachai et al., 2016; Szpunar et al., 2013). However, most of the studies before 2020 were focused on task-unrelated thoughts, daydreaming, or mind-wandering in the context of learning in the classroom (Risko et al., 2012) or distance learning based on pre-registered videos lectures (like in massive online courses (Lindquist & McLean, 2011)). The COVID-19 pandemic increased the popularity of another type of online learning (i.e., live online classes through tools like Meet, Teams, or Zoom) across the globe. Thus, it seems crucial to re-examine the role of task-unrelated thoughts like daydreaming or mind-wandering in the context of live online education. Consequently, the main goal of the present study was to assess the features of task-unrelated thoughts (e.g., valence, temporal orientation, personal significance,

control, visualization, repetitiveness, (Andrews-Hanna et al., 2013; Kornacka et al., 2022) and the function of task-unrelated thoughts in students during live online vs. on-site classes. Moreover, we assessed how those features were related to students' mood while controlling for class features (e.g., interest, difficulty level, and students motivation) in both online and on-site learning.

In the literature, one can find numerous definitions of mind-wandering, daydreaming, or thought meandering that can be gathered under one umbrella term of task-unrelated thinking (TUT, Seli et al., 2019). The main common feature of TUT is the fact that it is not related to one's current activity and is often perceived as difficult to control (Seli et al., 2019). In the perspective of family resemblance, Seli and colleagues (2019) suggested including all sorts of task-unrelated thoughts that are characterized by those main features under one term. TUT might however differ on the other features like intentionality, stimulus dependence, or being a structured flow of thoughts. Moreover, particular features of TUT can be crucial for its adaptive vs. maladaptive character (Andrews-Hanna et al., 2013; Kornacka et al., 2022).

The research on TUT suggests that they can play an important adaptive role in our behavior and emotion regulation (Christoff et al., 2018; Gorgolewski et al., 2014; Ottaviani et al., 2013), they might be connected with enhanced creativity (Agnoli et al., 2018; Baird et al., 2012; Smeekens & Kane, 2016), improved planning process, problem solving (Mooneyham & Schooler, 2013) and they provide relief from boredom (Martarelli & Baillifard, 2024). However, it is necessary to underline that TUT might also have maladaptive consequences (Killingsworth & Gilbert, 2010), particularly if they serve as emotional or behavioral avoidance (Kornacka et al., 2023; Somer, 2002). Some studies suggest that TUT might be responsible for emotion regulation impairment or even increase the risk for mental disorders (Marchetti et al., 2016). TUT might also negatively impact everyday life activities (Yanko & Spalek, 2014).

Lindquist and McLean (2011) underline that the result of research on TUT in a general context cannot be easily transferable to learning. In the context of education, it seems that TUT can be generally defined as involuntary task-unrelated thoughts. It can be assumed that during the class one of the main goals is to stay focused on the class content contrary to automatic activities (e.g., driving a car or jogging in the park) when TUT can be used with its adaptive function of planning or increasing creativity without any interference with the ongoing main task (Lindquist & McLean, 2011; Schimmenti et al., 2019; Seli et al., 2018). Thus, in everyday life daydreaming is often adaptive, by default activity while having free cognitive resources available, while during the classes students attention is rather required to be focused on task almost all the time and frequent mind-wandering might impaired understanding, learning and academic performance in general (Hollis & Was, 2016; Lindquist & McLean, 2011), but also affect self-perceived efficiency of judgement of learning (Was et al., 2019). A recent meta-analysis suggests that mind-wandering is associated with learning with a small

to moderate effect size, but it is less apparent in live online classes (Wong et al., 2022).

Paradoxically, according to some studies, TUT seem to appear more often during education than other activities in a social or professional context (Unsworth & McMillan, 2013) Unsworth et al. (2012) study involving 100 students has revealed that the majority of attention failures due to mind-wandering occur in the classroom or while studying. Participants reported the presence of TUT in learning-related situations more frequently than at work or during everyday activities such as cooking or driving a car. Wong et al. (2022), based on their meta-analytic study suggest that TUT might take up to 30 % of time during learning.

The literature on TUT outcomes in the educational context suggests that TUT might be responsible for comprehension failure in reading, might harm the understanding of a lecture, and impair cognitive processes such as implicit learning (Bonifacci et al., 2023; Franklin et al., 2011, 2016). The students who have high levels of MW also seem to be less involved in other activities that might improve learning, for example in note-taking (Lindquist & McLean, 2011).

Sanchez et al. (Sanchez & Naylor, 2018) showed in a series of studies that mind-wandering has a double negative effect on overall text comprehension. Learners who reported a higher level of TUT not only remembered less correctly scientific information but also were more likely to generate content misunderstandings and incorrect associations of the material. Mindwanderers attempt to fill in the gaps in their knowledge by combining concepts in an inadequate way, thus creating erroneous information.

However, it is important to underline that all the aforementioned studies, if referring to online learning, are referring to prior to pandemic situations and thus are based rather on recorded video lectures and not on real-time online learning (Hollis & Was, 2016; Szpunar et al., 2013). One recent and rare study comparing TUT in online and on-site classes suggests that online students are more engaged in off-task thinking and spend more time on off-task digital activities (Ochs et al., 2024).

In a literature review, Szpunar et al. (2013) underlined that one of the challenges in studying TUT is how to measure it in both laboratory and ecological conditions. Although numerous studies have used various methods (from measuring visual attention through eye-tracking, note taking, and retention of information), it seems that the most efficient method of measuring TUT is using thought probs (Kane et al., 2021; Zanesco et al., 2024). However, most of the studies used this method in laboratory conditions (Risko et al., 2012) and evaluating TUT in the ecological context of education is still very scarce.

Measuring TUT in ecological settings seems to be particularly relevant, as some studies suggest that not only TUT features and function might determine TUT adaptive or maladaptive character, but those variables are in interaction with the situational context (e.g., the interest in the given course; Kane et al., 2021; Lindquist & McLean, 2010) or motivation (Smith et al., 2022).

In sum, TUT seem to be one of the key variables involved not only in the efficiency of online learning but also in affecting students' well-being. Although task-unrelated cognitions have already been studied for several years, the pandemic situation raised new questions about TUT mechanisms and functions in real-time online learning. Moreover, most of the studies examined TUT in an educational context only in laboratory settings, and thus data from ecological conditions are still missing. Consequently, the aim of the present study was to examine TUT using thought probes in ecological momentary assessment during real-time online and on-site classes.

Methods

Participants

317 (204 female, 109 male, 4 participants did not provide their gender) university students volunteers agreed to participate in the study ($n=143$ for Time 1, $n=114$ for Time 2 measure during online and $n=173$ for Time 1, $n=153$ for Time 2 measure during on-site classes). The mean age of the participants was 29,76 ($SD=10,72$) in the online group and 21,51 ($SD=5,67$) in the on-site group.

Measures

TUT level. Participants were asked to evaluate on a 7 Likert point scale from (1- not at all to 7- totally) to what extent their thoughts were focused on the current class when they heard the signal.

TUT function (adapted from Stawarczyk et al., 2011). Participants were asked to evaluate on a 7 Likert point scale from (1- not at all to 7- totally) what the function of their STUT just before the signal (problem-solving, planning, reappraisal, improving mood, stimulation, avoiding difficult issues, other, no function at all).

TUT main features (adapted from Kornacka et al., 2022). Participants were asked to assess on a 7-point Likert scale from (1- not at all to 7- totally) the main characteristics of their STUT just before the signal (inner-speech form, possibility of visualizing, control, probability, importance congruence with a goal, repetitiveness, valence, being a part of structured thinking as opposite to freely moving thoughts).

Class features. Participants were asked to evaluate on a 7-point Likert scale from (1- not at all to 7- totally) to what extent their classes were interesting, difficult, and to what extent they felt motivated to take part in the class.

Mood (adapted from Koster et al., 2015). Participants were asked to assess on two 7-point bipolar scales (happy-sad; calm-anxious) their current mood.

Procedure

The procedure was similar in both online and on-site classes. After receiving consent from the teacher, at the beginning of the class, the experimenter explained the idea of the study, the main goal, and answered all the potential questions. During the class, volunteer participants were asked twice (around the 25th (Time 1) and 70th (Time 2) minute of the class) to answer a thought probe on their mobile phones. Participants could access the form provided through Qualtrics with a printed QR code. The first probe was preceded by a consent form and a short demographic questionnaire. Participants were asked to provide a login at each stage of the survey in order to merge two measure points without harming the anonymity.

Results

Comparing TUT level, characteristics and functions in students following online vs. on-site classes.

Descriptive statistics and 2(Time:1,2) x 2(Class type: online, on-site) mixed design ANOVAs results are presented in supplementary materials Table S1 (<https://doi.org/10.17605/OSF.IO/TC8HA>). It seems that the level of TUT does not differ in students following online and on-site classes. It also does not seem to significantly increase over time. However, Online and on-site students' TUT seem to differ in some characteristics and functions. On-site students' TUT has more inner-speech form and be more repetitive compared to online students. We also observed a significant time effect suggesting that TUT become less like inner-speech over time. Also, the TUT content was assessed as less probabilistic and less important over time independently of class type.

On-site students seem to use TUT more often as an emotion regulation strategy (particularly problem-solving strategy, reappraisal, mood improvement and avoidance) compared to online students. We also found a Time x Class type interaction for using TUT as looking for stimulation, where on-site students used TUT for this purpose significantly more in the first measuring point, but those differences were no longer significant at the second measure point ($p = .017$ for post-hoc testing with Bonferroni correction). The use of TUT for planning decreased over time independently of class (online vs. on-site form).

Class characteristics and participants affect

It is important to note that we also found an interaction, group and time effects in ANOVAs with class characteristics as dependent variables. The classes were generally assessed as more interesting at the second measure point, but the first-second point difference was only significant for online students ($p = .038$ for post-hoc test with Bonferroni correction). Students seem to evaluate classes generally as more difficult at the second measure point compared to the first one, and online students reported that their classes were more difficult compared to the on-site ones.

Finally, participant reported generally more negative affect over time independently of class type, and they felt more sad

over time but only in online classes ($p = .004$ for post-hoc testing with Bonferroni correction).

Table 1 : Hierarchical regression of TUT function (measured at Timepoint 1) on Negative affect (Sadness and Anxiety measured at Timepoint 2).

Variable	Outcome : Time 2 Sadness					Outcome: Time 2 Anxiety						
	B	95% CI		SE	β	R2	B	95% CI		SE	β	R2
		LL	UL					LL	UL			
Step 1						.105						.053
<i>Constant</i>	1.91***	1.21	2.60		5.39		3.08***	2.39	3.76	0.35		
Problem-solving	0.27***	0.14	0.41	0.29	4.06		0.13*	0.00	0.26	0.07	0.14	
Planning	-0.07	-0.19	0.06	-0.08	-1.10		-0.01	-0.13	0.11	0.06	-0.01	
Reappraisal	0.06	-0.06	0.18	0.07	1.00		0.07	-0.05	0.19	0.06	0.08	
Improving mood	-0.03	-0.15	0.09	-0.04	-0.55		-0.03	-0.15	0.08	0.06	-0.04	
Stimulation	-0.06	-0.19	0.07	-0.07	-0.97		-0.15*	-0.28	-0.02	0.07	-0.16	
Avoidance	0.12*	0.01	0.23	0.14	2.13		0.07	-0.04	0.18	0.06	0.09	
Step 2						.110						.053
<i>Constant</i>	1.86***	1.16	2.56		5.24		3.07***	2.38	3.76	0.35		
Problem-solving	0.28***	0.15	0.41	0.30	4.15		0.13*	0.00	0.26	0.07	0.14	
Planning	-0.08	-0.20	0.05	-0.08	-1.18		-0.01	-0.14	0.11	0.06	-0.01	
Reappraisal	0.07	-0.06	0.19	0.07	1.05		0.07	-0.05	0.19	0.06	0.08	
Improving mood	-0.03	-0.15	0.09	-0.03	-0.50		-0.03	-0.15	0.09	0.06	-0.04	
Stimulation	-0.06	-0.19	0.07	-0.06	-0.88		-0.15*	-0.28	-0.02	0.07	-0.16	
Avoidance	0.13*	0.01	0.24	0.15	2.23		0.08	-0.03	0.19	0.06	0.09	
Class type	-0.12	-0.32	0.08	-0.07	-1.16		-0.02	-0.22	0.17	0.10	-0.02	
Step 3						.137						.283
<i>Constant</i>	1.89***	0.97	2.82		4.03		4.58***	3.77	5.39	0.41		
Problem-solving	0.29***	0.16	0.42	0.30	4.27		0.15*	0.03	0.26	0.06	0.16	
Planning	-0.08	-0.20	0.05	-0.08	-1.23		-0.04	-0.15	0.07	0.06	-0.05	
Reappraisal	0.06	-0.06	0.18	0.06	0.93		0.06	-0.05	0.16	0.05	0.06	
Improving mood	-0.05	-0.17	0.07	-0.06	-0.83		-0.07	-0.18	0.03	0.05	-0.09	
Stimulation	-0.04	-0.17	0.09	-0.04	-0.57		-0.07	-0.18	0.04	0.06	-0.08	
Avoidance	0.12*	0.01	0.23	0.14	2.10		0.05	-0.04	0.15	0.05	0.07	
Class type	-0.12	-0.32	0.08	-0.07	-1.21		-0.11	-0.28	0.07	0.09	-0.07	
Interest	-0.12	-0.31	0.07	-0.12	-1.21		-0.20**	-0.36	-0.03	0.08	-0.20	
Difficulty	0.17*	0.03	0.31	0.15	2.44		0.22***	0.10	0.34	0.06	0.20	
Motivation	0.00	-0.18	0.17	0.00	-0.05		-0.29***	-0.45	-0.14	0.08	-0.32	

Note. * $p < .05$; ** $p < .01$; *** $p < .001$; SE = Standard error ; CI = Confidence interval.

The role of TUT function and characteristics in prospective negative affect

In order to test how TUT function and characteristics are linked to affect regulation we run a series of hierarchical linear regressions. In models explaining sadness and anxiety measured at Time 2 we introduced TUT function (see Table 1) or characteristics (see Table 2) measured at Time 1 as predictors in Step 1, added class type in Step 2 and reported class characteristics measured at Time 2 in Step 3. The results of hierarchical regression on affect measured at Time 1 are

included in Table S2 and S3 in supplementary materials (<https://doi.org/10.17605/OSF.IO/TC8HA>).

The results suggest that problem solving and avoidance are significant predictors of prospective sadness, they remain significant also after including class type (Step 2) and class characteristics (Step 3) in the model.

Among TUT characteristics, only their valence seems to be a significant predictor of prospective sadness or anxiety, also in models including class type and class characteristics. It is important to note that in all four models adding class type into the regression did not on only slightly affected the percentage of variance explained by the model (ΔR^2 varied from 0 to .005).

Table 2 : Hierarchical regression of TUT characteristics (measured at Time 1) on Negative affect (Sadness and Anxiety measured at Time 2).

Variable	Outcome : Time 2 Sadness					Outcome: Time 2 Anxiety						
	<i>B</i>	95% CI		<i>SE</i>	β	<i>R</i> ²	<i>B</i>	95% CI		<i>SE</i>	β	<i>R</i> ²
		LL	UL					LL	UL			
Step 1						.179						.118
<i>Constant</i>	3.69***	2.95	4.43	0.38			2.79***	1.99	3.58	0.40		
Visualization	-0.02	-0.14	0.10	0.06	-0.02		-0.05	-0.18	0.08	0.07	-0.05	
Inner-speech	-0.03	-0.18	0.07	0.05	-0.04		-0.01	-0.11	0.11	0.06	-0.01	
Control	0.01	-0.12	0.12	0.06	0.01		0.07	-0.06	0.20	0.07	0.07	
Structured	-0.06	-0.19	0.06	0.06	-0.07		-0.07	-0.20	0.07	0.07	-0.07	
Probability	0.03	-0.10	0.15	0.06	0.03		-0.12	-0.25	0.01	0.07	-0.13	
Goal congruence	-0.03	-0.16	0.09	0.06	-0.04		0.10	-0.04	0.23	0.07	0.12	
Importance	0.06	-0.09	0.22	0.08	0.07		0.11	-0.06	0.27	0.08	0.12	
Repetitiveness	0.06	-0.06	0.18	0.06	0.07		0.04	-0.09	0.17	0.06	0.04	
Valence	-0.42***	-0.57	-0.28	0.07	-0.37		-0.31***	-0.46	-0.15	0.08	-0.25	
Step 2						.179						.118
<i>Constant</i>	3.67***	2.96	4.44	0.38			2.79***	1.99	3.59	0.40		
Visualization	-0.02	-0.14	0.10	0.06	-0.02		-0.05	-0.18	0.08	0.07	-0.05	
Inner-speech	-0.04	-0.14	0.07	0.05	-0.04		-0.00	-0.12	0.11	0.06	-0.01	
Control	0.01	-0.12	0.12	0.06	0.00		0.07	-0.06	0.20	0.07	0.07	
Structured	-0.06	-0.19	0.07	0.06	-0.07		-0.07	-0.20	0.07	0.07	-0.07	
Probability	0.02	-0.10	0.15	0.06	0.03		-0.12	-0.25	0.01	0.07	-0.13	
Goal congruence	-0.03	-0.16	0.10	0.06	-0.04		0.10	-0.04	0.24	0.07	0.13	
Importance	0.07	-0.09	0.22	0.08	0.08		0.11	-0.06	0.28	0.09	0.12	
Repetitiveness	0.05	-0.07	0.17	0.06	0.06		0.04	-0.09	0.17	0.07	0.042	
Valence	-0.43***	-0.57	-0.28	0.07	-0.37		-0.31***	-0.46	-0.15	0.08	-0.26	
Class type	0.04	-0.15	0.23	0.10	0.02		0.013	-0.19	0.22	0.10	0.01	
Step 3						.273						.131
<i>Constant</i>	4.75***	3.90	5.60	0.43			2.69***	1.68	3.71	0.52		
Visualization	-0.04	-0.15	0.07	0.05	-0.04		-0.06	-0.19	0.07	0.07	-0.06	
Inner-speech	-0.03	-0.12	0.062	0.05	-0.03		-0.01	-0.12	0.11	0.06	-0.01	
Control	-0.01	-0.12	0.1	0.05	-0.01		0.07	-0.07	0.20	0.07	0.07	
Structured	-0.01	-0.13	0.10	0.06	-0.01		-0.05	-0.19	0.09	0.07	-0.06	
Probability	0.01	-0.10	0.12	0.06	0.01		-0.12	-0.25	0.02	0.07	-0.13	
Goal congruence	0.01	-0.11	0.12	0.06	0.01		0.10	-0.04	0.24	0.07	0.13	
Importance	0.08	-0.06	0.22	0.07	0.09		0.11	-0.06	0.28	0.09	0.12	
Repetitiveness	0.04	-0.06	0.15	0.05	0.05		0.03	-0.10	0.17	0.07	0.04	
Valence	-0.35***	-0.49	-0.22	0.07	-0.31		-0.29***	-0.45	-0.13	0.08	-0.24	
Class type	-0.04	-0.21	0.13	0.09	-0.02		0.01	-0.20	0.21	0.10	0.00	
Interest	-0.11	-0.27	0.05	0.08	-0.11		-0.01	-0.21	0.18	0.10	-0.01	
Difficulty	0.17**	0.053	0.29	0.06	0.15		0.12	-0.02	0.26	0.07	0.10	
Motivation	-0.31***	-0.48	-0.17	0.08	-0.36		-0.07	-0.25	0.12	0.09	-0.07	

Note. ** $p < .01$; *** $p < .001$; SE = Standard error ; CI = Confidence interval.

Discussion

Task-unrelated thinking (TUT) is a naturally occurring cognitive process that has been studied in various contexts, including education, for several decades. However, the rapid expansion of online learning and the growing body of research indicating that TUT can have both adaptive and maladaptive consequences highlight the need for further

investigation. The present study is among the few that explore not only the level of TUT but also its characteristics and functions in both on-site and online students. Moreover, our primary focus was not on learning performance itself but rather on the consequences of TUT in the context of affect regulation.

Although our results suggest no significant differences in TUT levels over time or between on-site and online

learners—aligning with previous findings (e.g., Wammes et al., 2019)—they shed light on the role of TUT characteristics and functions in learning, regardless of the class format. Among TUT characteristics, only valence was significantly related to prospective negative affect. These findings support previous research suggesting that TUT valence plays a crucial role in its maladaptive outcomes (e.g., Welhaf & Banks, 2024). Similarly, Andrews-Hanna et al. (2013) demonstrated that negative TUT valence, along with personal relevance, was linked to negative psychological outcomes such as depression and trait negative affect. Other studies have also indicated that certain TUT characteristics, such as interest (Franklin et al., 2013) and subjective control (Kornacka et al., 2023), may be essential for affect regulation. The role of control over thoughts in maladaptive TUT outcomes aligns with existing theories, such as McVay and Kane's (2009) proposition that mind-wandering results from an interaction between contextual and self-control failures. Subsequent research has confirmed that this effect extends to subjective control over thoughts (Kornacka et al., 2023).

An important question remains as to whether the lack of significant effects of other TUT characteristics in the present study is due to the specific educational context or the method of assessment. The observed link between TUT valence and affect also supports the idea that mind-wandering and rumination may be a two (adaptive and maladaptive) end points of the same continuum (Ottaviani et al., 2013), with rumination characterized as off-task thinking focused on negative content that is difficult to control (Ehring & Watkins, 2008). However, if this is the case, other TUT characteristics—such as a lack of control (Watkins & Roberts, 2020) or a structured, less freely-moving form (Christoff et al., 2018)—should also be considered in the context of affect regulation.

To our knowledge, this study is among the few that examine different TUT functions in general. Our findings suggest that using TUT as a problem-solving or avoidance strategy is linked to higher levels of sadness. Additionally, on-site learners were more likely to use TUT for avoidance and problem-solving than online learners. These results align with current concerns theory, which posits that mind-wandering is triggered by personally relevant unresolved concerns (Klinger, 2013). They also support experimental studies suggesting that mind-wandering (e.g., Somer, 2002) and rumination (e.g., Giorgio et al., 2010; Kornacka et al., 2023) function as avoidance-based regulation strategies. Viewing TUT as an avoidance strategy may also help explain the differences between online and on-site learners: while online learners have multiple external distractions available (e.g., browsing other websites or social media), on-site learners may be more limited to cognitive distraction strategies such as mind-wandering. This explanation seems plausible, given findings that technology itself can be a significant distractor (Hollis & Was, 2016), that fear of missing out on social media contributes to mind-wandering (Sumner & Kaşıkçı, 2022), and that computer use can sometimes reduce mind-wandering (Risko et al., 2013).

Limitations and Future Directions

This study has several limitations. The assessment of TUT relied solely on self-reported thought probes, which may limit measurement reliability—particularly in the context of avoidance-related regulation strategies (Ball & Gunaydin, 2022). Moreover, the present study focused on evaluating TUT in the ecological setting of a real classroom. This decision, although it addresses an important gap in the literature, also entails several methodological consequences that could be more effectively explored in controlled experimental studies. First, the naturalistic setting limits the frequency of thought probes for ethical reasons, as they might interfere with real-life learning processes. One promising approach to overcoming this limitation could involve the use of behavioral and passive measures of mind-wandering, such as eye-tracking (Bühler et al., 2024; Wong et al., 2022). Increasing the number of TUT assessments over time might yield valuable insights into the temporal dynamics and time-dependent interactions of off-task thinking across different forms of learning.

Additionally, we controlled only for subjective class characteristics reported by participants. However, prior studies have suggested that other, more objective features—such as class size or lecture format—may also play a role in TUT (e.g., Lindquist & McLean, 2011). Finally, recruiting participants in a naturalistic context resulted in some differences between the online and on-site groups—for example, in participant age—which may also influence TUT levels and interact with thought valence (e.g., Maillet et al., 2018; Welhaf et al., 2025). Moreover, in the present paper, we examined only linear relationships between variables. Future studies could explore non-linear associations, which may be particularly relevant for examining the link between TUT characteristics (e.g., perceived control) and participants' affect.

Conclusions

In sum, this study supports previous findings that in the context of affect regulation, not only TUT levels but also its valence and functions must be considered. Our results suggest that using TUT for problem-solving and avoidance may be detrimental to affect regulation and that these strategies are more frequently used by on-site learners. These findings are particularly relevant from a clinical perspective, as quantitative research on TUT as an avoidance mechanism remains scarce. Future studies should further disentangle the role of TUT characteristics in affect regulation, both in general and in educational contexts.

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