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Anxiety, planning strategies, and the development of argumentation in academic writing

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Abstract

The study investigated the interaction between planning strategy (outline planning, mind mapping, no-plan) and level of trait anxiety in the development of argumentation, and linguistic coherence in academic texts written by undergraduate students. Low anxious students benefited more by generating a greater number of pro- and contra-arguments for a specified position in a debate when assigned to the outline planning condition. Whereas, students reporting high anxiety incorporated a wider diversity of connectives to bind the arguments in their essays when asked to plan with a mind map strategy. In addition, individual differences in anxiety were also instrumental in determining the benefits that could be gained from different types of planning strategy when the overall quality of elaboration of argumentation present in the plans and essays was assessed. Therefore, it is important to understand where the interaction of anxiety on different modes of organisation strategy is implicated before making recommendations for the most appropriate form of pre-writing instruction for students undertaking academic writing tasks.

Keywords

anxiety, academic writing, planning strategy, argumentation, mindmap

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1. Introduction

The composition of academic writing is challenging for most students and involves cognitive, linguistic, and affective processes (Flower and Hayes, 1980). A process writing approach stresses the importance of activities (e.g., brainstorming, planning, retrieval from long-term memory, multiple drafts, reviewing) during the production of written text, to check and evaluate the writing produced (Bayat, 2014). Prewriting strategies, such as, planning (e.g., clustering and outlining of ideas) support the chunking of elements of the writing task into manageable sub-goals, and efficient organisation of information from literature (Huerta et al, 2017; Kellogg, 1996). Feelings associated with anxiety (e.g., tension, worried thoughts, and physical changes) when confronted with a writing task which is central to academic success, can negatively impact on writing processes, product, and grades (Boice, 1996; Flower and Hayes, 1980; Martinez, Kock and Cass, 2011; Onwuegbuzie and Collins, 2001). In addition, transference of anxiety to the writing task occurs from inefficient strategy use (Flower and Hayes, 1980; Harris, Graham and Mason, 2006). Therefore, the present study directly investigated the relative importance of different forms of planning strategy (i.e., outline planning and mind mapping) in ameliorating the negative outcomes for writing performance, associated with individual differences in the affective traits of the academic writer (Al Asmari, 2013; Arju, 2018; Demirel, 2011).

1.1 Anxiety, academic writing and prewriting strategies

Although anxiety can have a positive outcome by enhancing motivation, it can underpin difficulties in getting started with writing, organising ideas, and judging their effectiveness (Al Asmari, 2013). Furthermore, feelings of anxiety can impede thinking about the wider aspects of debate when composing the main structure of an essay (Boice, 1996; Brand and Powell, 1986; Daly, 1985; Daly and Miller, 1975; Rose, 1985). All of which can lead to negative attitudes towards writing and discourage continuation of the task (Al Asmari, 2013). Therefore, this suggests that effective process strategies to enhance achievement outcomes in writing, need to play an important role in supporting the impact of anxiety as well (Harris et al., 2006; Huerta et al., 2017).

Academic writing is an effortful and skilful process (Kellogg, 1996). Prewriting tasks for argumentative text can have several functions (e.g., unpack the topic, generate ideas, provide evidence for claims, examine both sides of the argument and consider how the argument can be structured) (Dornbrack and Dixon, 2014). They maximise the available time allocated prior to writing for information and ideas to be retrieved from memory, and organised. The advantage lies in providing an opportunity for the writer to direct the main focus of attention towards translating ideas into text during the drafting stage, rather than trying to juggle several processes at once during the writing task itself. Thereby, alleviating the demands on cognition associated with planning

activity that occurs during the text-generation process (Kellogg, 1996). Prewriting strategies also become important for developing coping mechanisms when difficulties in beginning the writing task emerge and students are more likely to procrastinate. Arguably, they can further assist by supporting the consequences of feelings of anxiety and intrusive thoughts that some students experience, when writing. Planning strategies that encourage writers to focus on the overall structure and rhetorical goals of the text rather than them becoming entangled with focal points would act to minimise distractibility. In addition, an associated form of sequencing and notation can provide support when highly anxious students encounter difficulties in controlling reasoning and thinking (Rose, 1985; Boice, 1996; Kellogg, 1996).

Types of planning are distinguished by their linear and non-linear nature, facilitation of a hierarchical structure of ideas, and the form in which they are notated on the page (e.g., portrait or landscape). Outline planning is a linear approach that develops ideas into a hierarchical structure by encouraging the writer to prioritise main and then subordinate themes, sequentially in numerical or alphabetic format. Later those ideas can be grouped and organised to reflect the overall coherence (e.g., top-down processing) the writer wishes to achieve within the subsequent text. In contrast, clustering involves drawing a visual, diagrammatically organised network of information. Non-linear links between nodes and the relations between them (e.g., bottom up processing) are marked across the page from the main conceptual idea placed in the centre (van Amelsvoort, Andriessen and Kansear, 2007). The process is often termed mind mapping (Buzan, 1991). Mind mapping becomes a hierarchical network representation when ideas branch out into other ideas through the lines that are created between information (Kellogg, 1990).

Outline planning is more advantageous to students when constructing a linear debate (Kellogg, 1990; see also, Isnard and Piolat, 1994). The basic structure of the plan can be developed in a manner that is most closely aligned to sequencing and combining phrases, sentences, and instructions related to the pro- and counter arguments within texts. However, van Amelsvoort et al (2007) proposed that diagrams can still be used to facilitate depth of argumentation in academic writing more efficiently. This occurs by allowing the writer to establish the various conceptual relations within an overall analysis of the structural elements of the debate (see also Dornbrack and Dixon, 2014). The idea corresponds with the theoretical emphasis on academic writing being recursive and nonlinear (Flower and Hayes, 1980). Furthermore, van Amelsvoort et al (2007) found that students broadened their perspectives more in the diagram condition than the text-based condition. Successful achievement outcomes for an argumentative essay are dependent on the validity of the claims being made to support the strength of the argument (Wette, 2017). Therefore, it is important to closely align prewriting strategies, such as, planning, with the process-orientated rhetorical

instruction typically employed by expert writers to deal with the exploration of ideas and content (van Amelsvoort et al, 2007; Hayes and Flower, 1980; Wette, 2017).

There is evidence to suggest that time spent on the processes of writing can reduce anxiety (Huerta et al., 2017). The step by step approach encouraged through prewriting strategies has been found to promote positive attitudes towards writing, and in doing so, reduce self-reported internal feelings of anxiety (La Roche, 1993). Furthermore, research employing mixed methods approaches has been conducted on the interaction between anxiety, process strategies, and the production of academic writing (Al Asmari, 2013; Arju, 2018). A writing strategies inventory revealed that students reported they were more likely to engage in activities (e.g., memorisation of information) while writing, rather than before, irrespective of anxiety level. However, low anxious students engaged in more strategies overall, and had better achievement on an English writing course (Al Asmari, 2013). In addition, when students were placed in an experimental condition that provided them with a checklist reminding them of what to do at each point of the writing process (i.e., planning, drafting, and reviewing) prior to writing an academic essay, they performed significantly better than the students allocated to a control condition (Bayat, 2014). Of note, the studies do not isolate the effects of different levels of anxiety in the context of explicit prewriting instructional strategies. Nor do they assess the construction and evaluation of the complexity of the argument, and associated relations required to form an overview of a main debate. All of which would be important to consider when evaluating mitigating factors against the increase in intrinsic cognitive load caused by anxiety on performance on key elements of the academic writing task (Sweller, van Merriënber and Paas, 1998).

1.2 Academic writing: argument orientation and linguistic coherence

One of the reasons for promoting the requirement for explicit instruction and pedagogical support for academic writing, is the complexity and level of skill required to develop argumentation. Effective argumentation involves the writer transforming, clarifying, and changing ideas through coordinating connecting sentences, to establish a balanced, cohesive position (Flower and Hayes, 1980). Two interdependent processes are proposed to reflect this (Chenoweth and Hayes, 2003; Coirier, Andriessen and Chanquoy, 1999; Galbraith, 2009). First, the inclusion of argument relevant information and evidence. Coirier and colleagues (1999) formulated the orientation characteristics associated with argumentation within an Alpha-Omega research paradigm, which provided an avenue to explore their development within an experimental situation. For minimal argumentation there should be arguments presented in relation to an opening (pro alpha [α]) and alternative closing (pro omega [ω]) statement of debate. Elaborated argumentation requires consideration of

arguments opposing counter claims as well as their justification (e.g., refutation of contra argument statement [ω-]). Second, the requirement to structurally bind sequences of information. Finding the appropriate words and establishing connections between words, and clauses can be crucial for understanding. The relationships between ideas in argumentative essays are not easily inferable, and a high level of expertise, and explicitness in the use of linguistic structural operators (e.g., connectives) is required to develop linguistic coherence (McCutchen, 1986). In comparison to narrative texts, there is a demand for an increased quantity and diversity of connectives to maintain the degree of elaboration of argumentation required (Favart and Chanquoy, 2007). It is clear that academic writing is an intricate task. Therefore, the various goals and sub-goals associated with it have the potential to overwhelm the underlying cognitive capacity available to maintain and retrieve ideas in memory to develop precise, well rounded arguments (Olive et al, 2009). Feelings of anxiety, rumination and distractibility contribute further to the cognitive load faced by the writer (Bayat, 2014). Trying to regulate emotions will place even more strain on the limited cognitive resources that direct attention to monitoring and controlling the flow of information needed (Pacheco-Unguetti et al, 2011). An exploration of the role played by the planning stage would provide insight into how pedagogy can be improved for academic writing, and how best to account for individual differences in anxiety levels displayed by students.

1.3 The present study

Of central importance to the study was the extent to which prewriting strategies impacted on the relationship between trait anxiety and academic writing quality. Our hypotheses were based on two main factors [1] the potential impact of anxiety on the availability of cognitive resources to support the generation of arguments, while at the same time maintaining the overall aims of the main debate in mind and [2] that mind mapping could advantage high anxious students more by compensating for those difficulties by encouraging the focus of attention on the main debate.

Thus, the first research question investigated the nature and extent of the associations between planning condition [outline and mind map] and level of anxiety [high and low] on all measures of argumentation (i.e., quality of plans, individual argument orientation skills, proportion and diversity of connectives, and degree of elaboration of argumentation in the final essays). The second research question explored the interaction between planning strategy and anxiety, and the overall quality of the plans produced prior to writing an academic essay. We anticipated that high anxious students would develop more sophisticated plans when assigned to the mind mapping condition. The final research question explored the association between planning strategy and the extent of the elaboration of argumentation found in the final essays.

In this instance, we predicted that there would be a significant positive relationship between anxiety level and the ability to develop a sophisticated argument in their essays when participants were allocated to the mind map planning condition.

2. Method

2.1 Participants

Sixty-seven 2nd year Undergraduate Cognitive Psychology students (11 male, and 56 female) participated in the study ($M_{\text{age}} = 24$ years, $SD = 6.4$ months). The students were randomly divided into three planning groups; outline planning ($N = 25$), mind mapping ($N = 25$) and control ($N = 17$). No significant differences were observed between the groups on gender ($\chi^2(2, N = 67, p = .98)$), trait anxiety [$F(2, 64) = 0.06, p = .94$], word count [$F(2, 64) = 1.07, p = .09$], or writing fluency [$F(2, 64) = 2.52, p = .09$]. However, there was a significant difference in academic attainment (coursework and examination grade) [$F(2, 64) = 8.18, p = .001$], which was subsequently controlled for in further analyses. All participants were treated in accordance with the University's ethical standards.

2.2 Materials and Procedure

Participants reported to a writing workshop after a lecture covering the content associated with the topic required for the academic texts.

2.2.1 State-Trait Anxiety Inventory

All participants completed the STAI (Spielberger et al., 1983). The data reported was from the 20 statements which asked them to indicate how they *generally* feel on a four-point scale from almost never to almost always (nine of which are reversed-scored) ($\alpha = .85$). Scores ranged from 22 to 62.

2.2.2 Writing process

The writing workshop was divided into three main parts. The total time allocated was 1 hour (reading and brainstorming 20 mins; planning activities 10 mins; composing final text 30 mins). Participants were instructed to read and brainstorm two pieces of prepared literature that contained relevant theories, and research evidence regarding models of reading.

Students allocated to the outline planning condition were advised to create subsections (alphabetic/numerical) in a linear manner to assist them to develop evidence-based pro- and counter arguments aligned to the two main points of the debate they had been provided with related to how young people learn to read: *Reading occurs when written language is translated into sounds via grapheme-phoneme correspondence rules* and alternatively *Reading occurs when individual*

whole word representations are mapped directly into phonological lexical associations. The mind mapping group were asked to place the main idea linked to their debate in the centre of a piece of paper, and then create branches of ideas that reflected the different argument orientations of the debate with supporting evidence. The control group was required to complete a Cognitive Psychology crossword. The participants were instructed to use contrasting statements to construct the final composition.

Two judges (one of whom was independent and naive to the study objectives) were trained in the associated scoring procedures until reliability between their scoring reached an acceptable standard (ranging from $r = .78 - .93$ $p < .01$). One of the judges continued to analyse the essays alone. After scoring had been completed a subsample of 20 % of the essays were randomly selected for the second judge to independently rate, and reliability is reported below.

2.3 Evaluation of the quality of the texts

The texts were coded according to individual argument orientations described in appendix A, with illustrative examples from the compositions. The frequency of each type of argument orientation as well as the total number of argument orientations within each text, was calculated. There was reliable agreement on the total number of argument orientations score $r = .92$, $p < .01$.

We extended the paradigm developed by Coirier et al. (1999) to assess the quality of the plans and the complexity of elaboration of argumentation in the essays, and developed five grades of elaboration; neutral, rudimentary, minimal, elaborated and maximum-elaborated (see appendix B for examples of scoring). There was reliable agreement on this measure for the plans $r = .86$, $p < .01$ and the final texts $r = .89$, $p < .01$.

To analyse text structure on the basis of linguistic cohesion and thematic continuity, the following connective categories were extended from Olive et al. (2009); chronological, temporal, goal, causal; consequence, adversative, concessive, specification; restrictive, implicative. The proportion of connectives and diversity of connectives employed to compose sequences of arguments and counter arguments were calculated (Olive et al., 2009).

2.4 Statistical analyses

Initial analyses indicated that there were significant differences in performance between the control condition and the two planning strategy groups students were assigned across all argumentation measures ($p < .05$). Whereby, those students assigned to a planning strategy group performed significantly better than those who were allocated to the control group. However, no differences were found between the

two planning groups ($p > .05$). Therefore, the two strategy conditions became the main focus of analysis in order to explore where the potential benefits to performance lay when impacted by anxiety level. First of all, correlation analyses were conducted to determine the nature and extent of the associations between anxiety and measures of argument orientation, connectives, and elaboration, depending on the planning strategy (i.e., outline planning and mind mapping) adopted by the participants. Regression analyses were then conducted to determine the direction and strength of the interaction between the effects of planning condition, and anxiety on elaboration of argumentation assessed in the quality of the plans, and final essays.

3. Results

Descriptive statistics for all measures are reported in Table 1.

Measures	Outline planning (N =25)		Mind mapping (N =25)	
	Low anxiety Mean (SD)	High anxiety Mean (SD)	Low anxiety Mean (SD)	High anxiety Mean (SD)
Quality of Plan	3.58 (.99)	2.31 (1.03)	2.62 (1.04)	3.42 (.79)
Argument orientation				
Alpha +	3.67 (1.07)	2.54 (.77)	2.69 (1.10)	2.67 (.88)
Alpha -	2.67 (.65)	1.54 (.96)	1.46 (.87)	2.00 (.74)
Neutral	1.67 (1.15)	1.62 (1.19)	1.15 (.98)	1.58 (1.24)
Omega +	2.58 (.90)	1.85 (1.21)	2.38 (.96)	3.42 (.90)
Omega -	1.42 (.99)	1.85 (1.21)	.85 (.68)	1.33 (.65)
Total argument orientations	12.00 (2.52)	8.46 (2.53)	8.54 (2.40)	11.00 (2.48)
Proportion of connectives	7.87 (.55)	6.76 (.58)	7.55 (.63)	8.03 (.80)
Diversity of connectives	7.53 (.86)	6.93 (.57)	7.55 (.64)	8.29 (.75)
Elaboration of argument	3.75 (.96)	2.31 (1.03)	2.54 (.96)	3.42 (.90)
Trait Anxiety	34.58 (3.26)	47.08 (5.93)	34.31 (5.08)	46.25 (5.69)

Table 1: Descriptive statistics for argumentation measures for the quality of plan and final essay according to prewriting strategy and anxiety group

3.1 Correlation analyses

To address the first research question, table 2 indicates the patterns of association between trait anxiety and the quality of the plan, and elaboration of argumentation in the essay produced, when allocated to either outline planning or mind mapping groups after controlling for academic achievement. There were significant correlations between the quality of the plan and the essay in both planning conditions ($p < .05$). That is, those students who elaborated arguments to a higher level in the plans also carried this through to the final essays. The participants who reported lower trait anxiety levels were on average, more likely to generate a higher number of pro - and

Mind mapping planning strategy

Measures	1	2	3	4	5	6	7	8	9	10	11
Argument orientations											
1. Alpha +	1	.14	-.36	-.28	.17	.42*	-.09	-.10	-.44*	-.21	-.49**
2. Alpha -	.54**	1	-.30	-.18	-.22	.35	.41*	-.03	.12	.02	.26
3. Neutral	-.53**	-.55**	1	-.24	-.33	.07	-.10	.31	.23	-.16	-.06
4. Omega +	-.03	.06	-.07	1	.21	.18	.27	.09	-.11	.01	.21
5. Omega -	.35	-.13	-.32	-.12	1	.39	-.26	.30	-.13	-.14	.18
6. Total orientations	.60**	.44*	-.04	.55**	.23	1	.18	-.14	-.16	-.37	.03
7. Proportion of connectives	.20	.35	-.16	.12	.05	.28	1	.18	-.03	.10	.33
8. Diversity of connectives	-.14	-.21	.11	.24	-.08	.01	.17	1	-.02	.12	.45*
9. Quality of plan	.20	.25	-.19	.36	-.22	.25	.01	.13	1	.48*	.40*
10. Elaboration of argument	.12	.21	-.01	.33	-.10	.35	.12	.19	.78***	1	.35
11. Trait Anxiety	-.40*	-.47*	.07	-.17	.01	-.54**	-.65***	-.36	-.47*	-.63***	1

Outline planning strategy

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 2: Partial correlation analyses, for individual and total argument orientation characteristics, connectives, quality of plan, elaboration of argument in final text, and trait anxiety, according to planning strategy group, and controlling for academic attainment (N =50)

counter - opening argument statements, a total number of argument orientations, and a greater proportion of connectives, in the outline planning condition. Further significant negative correlations were found between anxiety and the degree of elaboration of the argument for the plans and essays. For students assigned to the mind mapping condition, a different pattern of associations emerged. Although students reporting lower anxiety levels were once again able to develop more pro-counter argument statements than high anxiety students, the high anxiety students were able to integrate a more diverse range of connectives in their essays. They also developed more elaborated plans than the students experiencing lower anxiety when placed in the mind mapping condition. Therefore, the analyses suggest that the impact of anxiety on performance on argumentation skills, was modified positively by planning condition.

3.2 Multiple regression analyses

3.2.1 Prewriting strategy, anxiety and quality of plan

To address the second research question, a multiple regression analysis considered the impact of anxiety on the relationship between the planning conditions on the quality of elaboration of argumentation in the plans, in more detail. The interaction effect, $b = -.52$, $t = -2.741$, $p = .009$, accounted for a significant 15.5% of the variance in the elaboration of argumentation found in the plans (adjusted $R^2 = .100$) (Fig. 1 refers). The low anxious students performed better when required to use an outline plan than those who developed mind maps ($M = 3.40$ and $M = 2.53$, respectively, for extent of elaboration of argumentation present in plans). Conversely, high anxious students appeared to significantly benefit from the processes involved in drawing up mind maps compared to those who developed outline plans ($M = 3.54$ and $M = 2.87$, respectively).

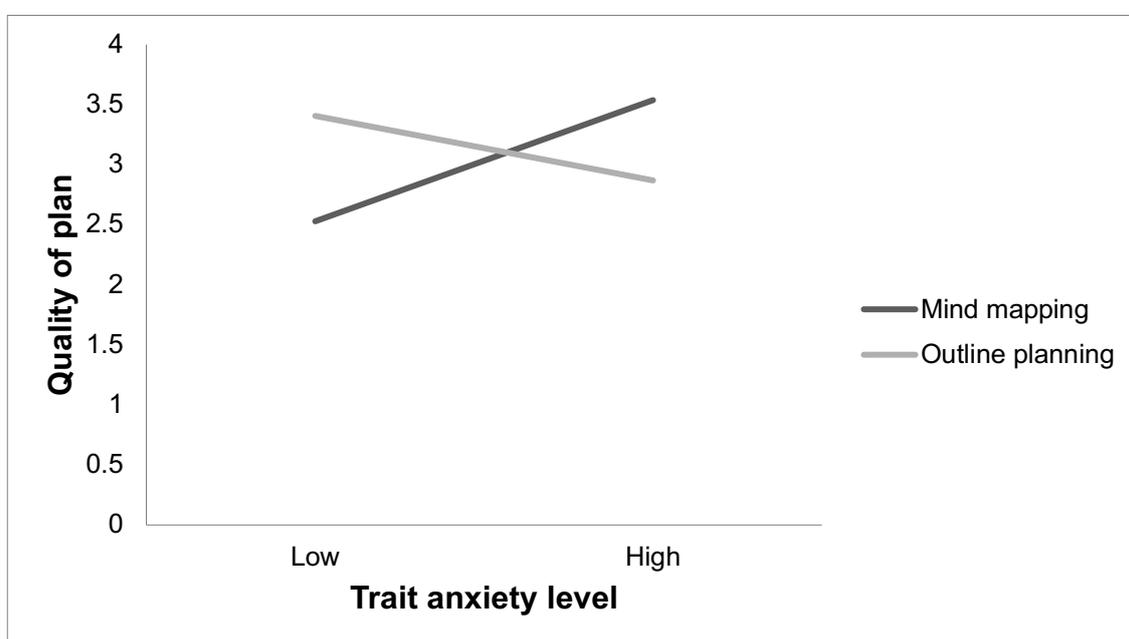


Figure 1: The interaction between trait anxiety level by prewriting strategy group for quality of plans ($p < .01$).

3.2.2 Prewriting strategy, anxiety and extent of elaboration of argumentation found in the final essays

For the final research question, the findings indicated that there was a significant interaction between trait anxiety and planning strategy, when the quality of elaboration of argumentation was assessed for the essays the students wrote, $b = -.60$, $t = -3.165$, $p = .003$. The interaction effect accounted for 18% of the variance in performance in the essays (adjusted $R^2 = .127$). On average, students who reported low anxiety performed better than those reporting high anxiety when assigned to an outline planning condition ($M = 3.47$ and $M = 2.59$, respectively). The reverse was evident again in the mind mapping condition, where high anxious students improved their performance relative to low anxious students ($M = 3.50$ and $M = 2.49$, respectively).

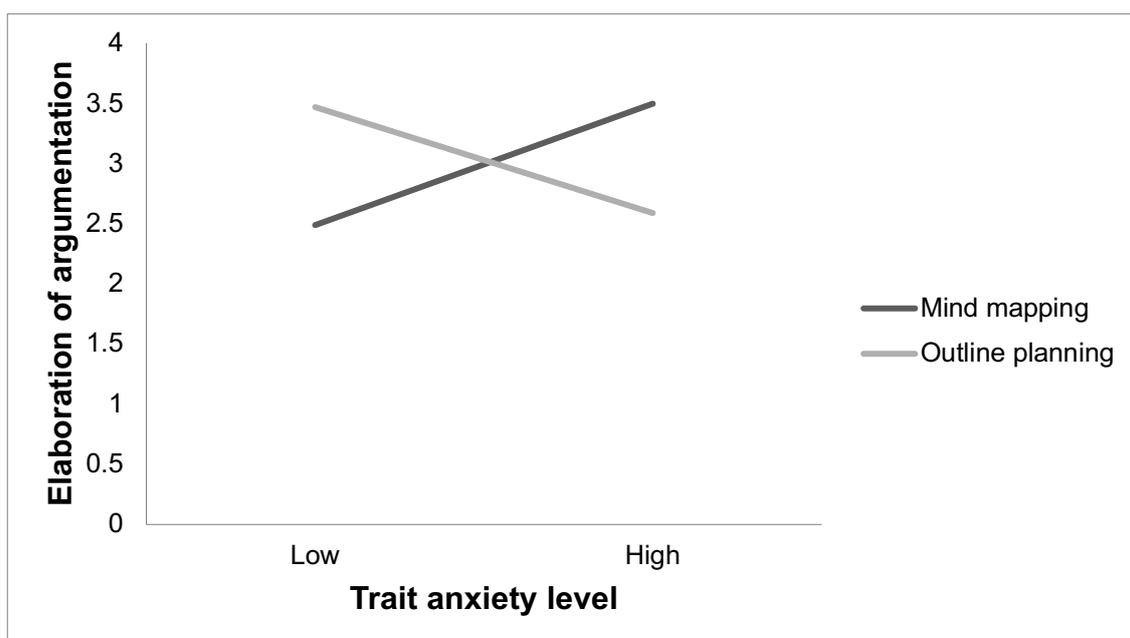


Fig. 2 The interaction between trait anxiety level by prewriting strategy group for elaboration of argumentation in final essays ($p < .01$).

4. Discussion

The interaction between planning strategy and anxiety on performance in academic writing was examined. In alignment with previous research all students benefited from engaging in a prewriting strategy, irrespective of type (Isnard & Piolat, 1994; Kellogg, 1990; van Amelsvoort et al., 2007). For example, elaboration of argumentation, indicative of the degree of sophistication in presenting balanced perspectives in the final essays, was found to be significantly higher in both the outline and mind map planning conditions, than when no prior planning took place. The linear nature of creating pro and counter arguments in academic debate was initially thought to be better promoted by outline planning (Kellogg, 1990). A lack of distinction between the effectiveness of the strategies in promoting argumentation skills in the current research can perhaps be explained as a consequence of the rise in popularity of mind

mapping as an instructional aid (e.g., Buzan, 1991). It has progressed from being conceptualised as a simplistic clustering format to including nodes representing the quality of hierarchical organisation suitable for the structural requirements of academic writing. A factor that is further emphasised through software programmes (e.g., van Amelsvoort et al., 2007). However, central to the study was not whether prewriting strategies themselves improved writing products, but whether or not the effects of anxiety on argumentation skills could be moderated by different planning methods. Notably, the interaction was significant and exerted different effects on the argumentation skills assessed.

Mind mapping provided an advantage over outline planning for students experiencing a greater degree of negative feelings related to anxiety (Brand and Powell, 1986; Spielberger et al., 1983). When compared to students with low anxiety, they produced more elaborated plans and essays, containing a greater diversity of connectives, independent of academic ability. Mind maps provide an overview of the main arguments and theoretical perspectives (i.e., rhetorical goals exhibited through top-down processes) while simultaneously managing the individual information parts they comprise (van Amelsvoort et al., 2007). During the mind map process, relations between arguments and ideas are indicated by arrows and lines. The sequencing and binding of arguments need to be synchronised. Importantly, the demands upon a limited cognitive capacity that occur as a consequence of representing the characteristics of various argument orientations in planning will determine the relative expertise with which connectives are generated during the writing process itself (McCutchen, 1988). A greater number of individual and total number of argument orientations were not generated by high anxious students in the mind map condition. However, it is possible that the enhanced cognitive processes engaged in through the development of mind maps, are enough to prompt the necessity for a connective to support the associations between sentences during the text-generation phase. Therefore, the trade-off that occurs between the requirement to store and process this type of information for the writing task, while protecting against the consequences of high anxiety, appears to be supported by a mind map prewriting strategy. Since connectives provide support for the development of argument sequences this could account for a comparable degree of elaboration in the final essays when compared to low anxious students in the outline planning condition.

In contrast to the high anxious students in the mind map condition, low anxious students in the outline planning condition, produced more pro and contra statements related to the opening argument, and a higher number of argument orientations overall, for the essay topic. The linear structure of outline plans facilitates the efficiency with which the sequencing of an argument can be generated, minimising the cognitive effort required to maintain associated linguistic representations in memory (Kellogg,

1990). Although, it is not entirely clear, why students need to demonstrate lower anxiety levels to benefit from outline planning in this way, it is possible that rumination emanating from higher feelings of anxiety could interfere more with the formulation of individual argument orientations. However, while low anxious students generated a greater proportion of connectives using an outline planning strategy, unlike high anxious students in the mind map condition, they did not generate a greater variety of connectives. The quality of the plans and the extent of elaboration of argumentation in the essays, was also higher for the low anxious students in the outline planning condition, with similar outcomes in terms of performance level to high anxious students in the mind mapping condition.

Previous literature has stressed the importance of appropriate writing programmes that emphasise understanding the processes that underpin academic writing (e.g., Bayat, 2014). Prewriting tasks can have several functions for academic writing, particularly in relation to providing evidence to support claims, examining both sides of the argument, and developing linguistic cohesion (Dornbrack and Dixon, 2014). Both forms of planning assessed in the current study allow for evaluation and selection processes for the organisational structure of the arguments to become more refined and focused on the overall rhetorical goal of the writing task. However, it is also important that individual differences are considered when encouraging students to take a strategic approach to minimising the cognitive and linguistic complexity of the academic writing task. It is not just the additional time spent on elements of the writing process that decreases the effects of anxiety (Bayat, 2014), but the type of planning strategy that the students undertake also impacts on the quality of writing produced (Arju, 2018).

4.1 Limitations to the study

The STAI (Spielberger et al., 1983) was useful in predicting outcomes for students experiencing different levels of anxiety for the prewriting strategies. However, in future research, it would be important to consider the impact of students' beliefs (e.g., fear of being evaluated), self-efficacy and motivations regarding the writing process itself (Heurta et al., 2017). This would allow for a more nuanced understanding of the interplay between prewriting strategies, anxiety, and argumentation in academic writing. Furthermore, the current study investigated one aspect of the writing process approach to academic writing (Flower and Hayes, 1981). Although, Demirel (2011) did not investigate quality of academic writing produced, he drew attention to the importance of a multiple-draft process approach to reduce anxiety levels. It would be useful to assess this aspect of the writing process in conjunction with planning strategy, anxiety level, and elaboration of argumentation.

4.2 Educational implications

Pedagogic instruction of a complex, high stakes genre of writing, such as, academic writing, should involve explicit encouragement to students to engage in activities that promote awareness of the cognitive, and generative processes that underpin the processes of writing. In addition, it should be noted that, on average, irrespective of planning condition and anxiety level, students in their second year of undergraduate studies (UK) adopted a minimal argumentation style. That is, they tended to generate a supporting position for a main claim and one counter position. Although, not the focus of the current study, additional workshops that include opportunities to generate multiple drafts and develop skills for self-guiding one's writing are likely to be critical to further improvements in elaboration of argumentation skills (Heurta et al., 2017). However, they should focus first on acknowledging how the specific aspects of the academic writing process are modified by individual differences in anxiety levels manifested by the use of prewriting strategies. Written expression is a difficult language skill for students, and it is important to develop an awareness of the benefits of a full range of instructional strategies for managing text in an effective way, that address motivation and affective characteristics explicitly through the distinctive thinking processes involved in academic writing (Al Asmari, 2013; Bayat, 2014; Demirel, 2011; Hayes, 1996).

4.3 Conclusion

The study highlights one aspect of the writing process that could explain inconsistencies in evidence that discuss the relative importance of outline planning and mind mapping strategies to writing essays. Feelings of anxiety are known to place a limit on what can be achieved in academic contexts. However, a clearer understanding within university pedagogy of the potential for the modification of strategies to suit the individual student would enhance the experience of academic writing for all students.

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Appendix A

Coding criteria for individual argument orientations and total number of argument orientations with examples from the students' essays.

Argument orientations	Description	Examples of sentences generated to support statements
alpha α^+	Arguments justifying the opening statement	<ol style="list-style-type: none"> 1. <i>Grapheme-phoneme correspondence rules are when a person is reading a word and has to say it out as it is spelled i.e. k-i-t-t-e-n.</i> 2. <i>This is often used when the word is more difficult or not recognised and also when a child is learning to read this technique is used.</i>
alpha α^-	Arguments refuting the opening statement	<ol style="list-style-type: none"> 1. <i>Although an adequate theory, part of the three component theory by Ellis and Young, it does not answer the question of both routes being activated simultaneously.</i> 2. <i>If people relied on grapheme-phoneme conversion then it would be presumed that all of the irregular words would be mispronounced but this does not happen.</i>
neutral statement	Neither pro or contra statement	<ol style="list-style-type: none"> 1. <i>According to the dual-route model, most normal readers will make use of both routes with familiar words.</i> 2. <i>Reading is an artificial activity and therefore, must be taught to us.</i>
omega ω^+	Arguments justifying the final statement	<ol style="list-style-type: none"> 1. <i>As an alternative, psychologists have looked to another theory of reading that acknowledges that an individual will read by recognising a word as a whole, whole word reading.</i> 2. <i>Visual presentation of the word leads to an activation of the visual input lexicon.</i>
omega ω^-	Arguments refuting the final statement	<ol style="list-style-type: none"> 1. <i>The third route that may be used in reading is similar to that of route 2, however words that are pronounced are not understood For example, 'gave' and 'have' own the same structure but are pronounced differently.</i> 2. <i>This is when a person recognises the word as a whole, however the way a person pronounces words depends on the context in which the words are used.</i>

Each illustrative sentence is taken from a different composition.

Appendix B

Scoring for the degree of elaboration of argumentation present in the plans and essays

Score	Type of elaboration	Description of extent of elaboration for argumentation
1	Neutral	Statements where no explicit position is stated.
2	Rudimentary argumentation	One argument orientation position is stated throughout and is not supported by a counter position. That is: either <i>all</i> a+ (e.g. a+a+ and so on); or a- (e.g. a-, a-,); or w+; or w-.
3	Minimal argumentation	One argument orientation position is stated and supported by one counter position. Example argument orientation sequences: either a+ a-; or a+ w+; or w+ w-; or w+ a+ only.
4	Elaborated argumentation	Two argument orientations supporting positions are stated, and then two related supporting counter positions are stated. Example argument orientation sequences: a+ a+ a- w+; a+ a+ w+ w+; w+ w+ w- a+.
5	Maximum-elaborated argumentation	Where at least two supporting positions are used, followed by two related supporting counter positions and an overall conclusion statement supported by a third approach to reading (e.g. connectionist approach). Example sequences: a+ a+ a- w+; a+ a+ w+ w+; w+ w+ w- a+; etc. plus a 3 rd alternative perspective which students will be aware of from the lecture and reading materials.