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HOW TALENTED SECOND-LANGUAGE LEARNERS REGULATE THEIR EMOTIONS AND COPE WITH STRESS

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Abstract

Most studies of talented learners focus on the nature of their accelerated cognitive abilities, and on structuring curricula to support them in achieving academically. Few studies of talented learners explore their emotional regulatory and coping strategies, as part of how they learn. Yet emotional regulation and coping strategies are an essential component of self-efficacy and self-regulation. Many talented learners are now also second-language learners. Programmers are among the most talented of 21st century learners. Programming requires linguistic proficiency, advanced quantitative reasoning, and multiple, complex forms of procedural reasoning. Mixed methods were used to explore how 34 talented programmers responded to a stressful second-language task. Data was analysed using one deductive and one emergent content coding frame, Appraisal analysis, and transitivity analysis. Results show that talented programmers handle stress by identifying and solving contextual problems. They realise positive subjective attitudes as evaluations of context, but frame negative emotions as interior experiences. As actors, they represent themselves as closely aligned with their team.

Keywords: talented learners, second-language learners, self-efficacy, emotional regulatory strategies, coping strategies, content analysis, Appraisal analysis

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Literature Review

Self-efficacy describes the emotional regulatory and coping strategies learners use to gain their academic goals (Bandura, 2006). Learners with high self-efficacy regulate affective and social determinants of their academic achievements, actively self-monitoring, re-appraising and self-correcting (Linnenbrink & Pintrich, 2010). Yet there are significant differences between individual learners (George, 2013). Talented students with exceptional abilities are a distinct category of different individuals (Schunk & Zimmerman, 2011). Studies of talented learners, that is, learners gifted with exceptional abilities who have persistently achieved academically, have identified their cognitive characteristics. They rank in the top 2% on standardised tests (Page, 2010). They enjoy better short-term and working memory than their peers (Leikin, Paz-Baruch & Leikin, 2013). They are quick to acquire new concepts and solve novel problems (Little, 2012). They have extended concentration spans (Freiman, 2010), enhanced observational abilities (Singer, Sheffield, Freiman & Brandl, 2016) and high content retention rates (Geake, 2009). Highly curious, motivated and goal oriented (McCormick & Plucker, 2013), they display both creative and critical thinking (Pfeiffer, 2012) and show a preference for complexity (Barfurth, Ritchie, Irving & Shore, 2009). Many talented learners are now educated in English-medium-of-instruction (EMI) universities.

Few studies explore the emotions of talented L2 learners, though their regulation and coping strategies must be an important part of their ability to achieve. “Gifted”, and “talented” are distinct. Many studies of the emotional dimension of learning focus on gifted students, those with exceptional abilities who have not achieved, seeking to account for their under-achievement (Lee, Olszewski-Kubilius, & Thomson, 2012). Other studies focus on gifted learners in minority groups or gifted and learning-disabled students, again seeking contextual factors to explain their failure to excel (Biddick, 2009). Despite the global spread of second-language (L2) learning, the question of talented learners working in their second language usually gets only passing mention in studies of talented learners. This study explores how talented computing post-graduates manage their emotions, when attempting a stressful learning task in their L2, English.

Many studies of talented students focus on how to design learning environments specifically for these high-achieving learners (Callahan & Hertberg-Davis, 2012). They explore curricular acceleration, course compacting, enrichment and intensive course

formats (Dixon & Moon, 2014). They explain how talented undergraduates are mature enough to assume professional investigative roles, in shared research programs (Hockett, 2009). Meta-analyses of these studies focus on talented learners' university and career achievements (Steenbergen-Hu & Moon, 2011). Even here, the emotional dimension of talented learning remains under-explored. Yet self-efficacy research foregrounds emotional regulation as a "key aspect" of learner identity and performance, as emotions help learners assess and respond to learning situations as they unfold, prompt them to adjust their performance, provide feedback about performance, and reinforce or undermine motivation to persist (Boekarts, 2011, p. 413). The same thing has long been observed of effective L2 learners (Gregersen, 2019). Talented L2 learners must be effective at emotional regulation, using an efficient mix of regulatory and coping strategies, in order to succeed. Many such talented learners also attend English medium-of-instruction (EMI) universities, though there are few studies of talented students' achievement in second-language (L2) contexts (Hymer & Michel, 2013).

To date, there are no studies of the emotion and coping strategies of talented L2 programmers. Programming requires advanced language, mathematical and procedural skills. It is not widely appreciated, that talented learners, including those in STEM fields, have better than average language skills (Biedroń, & Szczepaniak, 2009). Skilled reading connects lexical content to perceptual, experiential and long-term memory systems (Perfetti & Stafura, 2014). Prior knowledge is used to generate inferences, summaries and conceptual representations (Perfetti, Yang, & Schmalhofer, 2008). Programmers need advanced language proficiency to understand problems described by non-specialists, and explain concepts and systems used in solving them (Beynon, 2009). Coding requires advanced numeracy and quantiative reasoning, to identify, segment and coordinate complex patterns, using conditional, analogic, syllogistic, temporal and combinatory reasoning (Lee, Martin, Denner, Coulter, Allan, Erickson, Malyn-Smith & Werner, 2011). Often referred to as "the fourth literacy" (Tedre & Denning, 2016, p. 121), computational thinking is procedural, meaning the coder must structure all of this information within complex algorithms (Tedre, 2014). Complexity and causality are characteristic of computational thinking (Grover & Pea, 2013). Programmers must move easily between abstract and detailed content represented in textual, mathematical and diagrammatic formats, and between levels within their component processes and information

structures (Snyder, 2014). The cognitive demands of these tasks must create emotional responses, and talented L2 programmers clearly handle them effectively.

As there have been no studies of talented L2 programmers, this study is exploratory in nature, and focuses on how these learners handle their emotions, as part of the challenge of L2 learning. Research questions included: what ideational content do talented programmers realise, when they talk about handling stressful L2 learning tasks? What emotions and evaluations do they realise? How do they characterise stressful tasks, in terms of agency and process? How do they understand themselves and others as actors, and how do they characterise agency?

Method

A somewhat stressful task was given to a participant group of L2 programmers, at an EMI university. The task was used to elicit written personal reflections, after completion. Reflections were analysed, to find out how talented programmers regulate their emotions and cope with stressful cognitive challenges.

Participants

Participants included 34 full-scholarship scholarship students registered in an Information Technology major program at an EMI university. All were non-native speakers of English, who had attained a minimum CEFR B1 level of English, as required for university entrance.

Task

A twenty-minute English language oral presentation was selected as the stressful task. The preparation period was 10 days, and ran concurrent with seven other assessed L2 speaking and writing tasks required within an intensive-format course. L2 learning can never be perfect. Programming students write more than they speak. Participants were all aware that their spoken English was imperfect, and that effective L2 oral performance was required to pass the course. Thus, the task elicited participants' regulatory and coping strategies.

Instrument

Participants were asked to write about 400 words on their experience, immediately after giving the presentation, with the reflection due by the end of the

working day on which the presentation was given. The prompt was brief and lexically simple, to allow participants to determine its meaning as they chose (MacArthur, Graham & Fitzgerald, 2008). Writing personal opinions generates greater subjective content than writing more formal academic genres such as reports, patents and research articles (Geeraerts & Cuyckens, 2007).

Data analysis

Participant reflections were aggregated into a corpus, which was analysed in three ways. First, the corpus was coded for content. Two coding frames were used, one to classify content that reflected regulatory and coping strategies identified within the self-efficacy theory, and the other to reflect frequently-realised issues. Second, the corpus was coded for frequently-realised emotional content. Appraisal analysis is the most semantically delicate form of sentiment analysis, and can identify specific and discrete areas of emotion and evaluation. Third, transitivity analysis was used to taxonomise how participants characterised agency, causality and process.

Content analysis

Content analysis represents textual data as a set of frequency scores for specific ideas realised in the text. Ideational content is organised as major themes subdivided into multiple subunits. Coding frames may be deductive, using constructs drawn from the theory being applied to the corpus, or they may reflect emergent themes and subunits arising inductively from the corpus (Drisko & Maschi, 2016). Coding is usually constrained, including content relevant to the research focus, and excluding other content (Franzosi, 2008). Text corpora may be coded by human annotators or by software. Opinion mining and sentiment analysis techniques are now used in place of latent content coding (Lewis, Zamith & Hermida, 2013). Themes and subunits should be kept referentially clear and mutually exclusive (Stemler, 2015). To ensure reliable frequency scores, the clause functions as a boundaried coding unit (Krippendorf & Bock, 2009). Distal clauses are counted separately (Hopkins and King 2010). N-gram dichotomous lexeme members are counted collectively within the clause (Bazerman & Prior 2004).

Content was coded twice, using two coding frames, as in Table 1.

COPING & REGULATION		FREQUENTLY-REALISED CONTENT	
THEME	SUBUNIT	THEME	SUBUNIT
emotion regulation	distraction	self-evaluation	experience
	concentration		English
	perspective-taking		learning
	emotional expression		self-analysis
	emotional suppression		self-advising
	re-appraisal		self-criticism
context sensitivity	reported stress	team membership	process
	perceiving demands		writing prep
	perceiving opportunities		rehearsal
	engagement		decisions
	disengagement		problems
	responding to feedback		solutions
		presentation content	PPT content
			scripting
			audience relations
			team coordination
			problems
			solutions
		performance	face
			voice, speech
			body, gesture
			problems
			handouts
			timing

Table 1. Deductive and emergent coding frames

The deductive frame used coping and regulation strategies from self-efficacy theory for its themes and subunits (Webb, Miles & Sheeran, 2012). Labels and definitions were taken from Bonnano and Burton's (2013) retrospective of this research. Strategies used as subunits included: attentional deployment strategies such as self-distraction or self-focused concentration, up-regulation or expression and down-regulation or suppression as response modulation strategies, and cognitive change or re-appraisal (Boekarts, 2011). The second coding frame was emergent, reflecting frequently-realised themes and subunits in participant reflections.

Appraisal analysis

The study of emotion is complex, with methods and results debated. Facial, neurological, circulatory and endocrine methods for determining what people feel remain implicit (Izard, 2013). Emotions with a biophysical substrate have been identified using neurological methods. Yet these methods have complexified our understanding of subjective responses, in revealing the brain's continual re-appraisal of external events

(Moors, Ellsworth, & Scherer, 2013). Linguistic methods of subjective attitude analysis are similarly imperfect, but offer some definition. Systematic classification systems for taxonomising the lexis used to realise subjective appraisals have emerged within psycholinguistics, reflecting lexicogrammar found in all languages (Fontaine, Scherer & Soriano, 2013). While all taxonomies remain provisional, "Appraisal theories of emotion have gained widespread acceptance in the field of emotion research" (Kuppens, Van Mechelen, Smits, De Boeck, & Ceulemans, 2007, p. 689). Derived from systemic functional linguistics, the Attitude system is analytically delicate, comprising three sets, nine categories and twenty-four semantic subcategories (Halliday & Matthiessen, 2004). Appraisal models of subjective responses offer a method of categorising the "multitude of emotional experiences that do not correspond to the categories proposed by any basic emotions theorist" (Moors, Ellsworth, & Scherer, 2013, 126).

When responding subjectively, individuals select specific words from those they know. Text corpora may be analysed for patterns representative of the participant group that generated them (Thompson, 2004). The negative-positive polarity of emotion is instantiated in all languages, and represents the most basic biophysical and psychological dimension of response (Elfenbein & Ambady, 2002). For example, "I do not have good presentation skills" is negative, where "it was a great experience" is positive. All languages contain morphosyntactic resources for realising subjective attitudes, both directly and indirectly. For example, "I feel more confident" is a direct realisation of a subjective emotional state. However, in "with a limited amount of time to explain the topic, the pressure becomes our enemy, and the challenge increases the difficulty again", a negative appraisal is dispersed among various lexicogrammatical elements in the sentence (Martin and White, 2005). The use of software for automatic tagging of text corpora is well-established (Argamon, Bloom, Esuil & Sebastiani, 2007). Emotional lexis is easily identified by softwares using natural language processing (Read & Carroll, 2010). Softwares identify and tag indirectly-realised attitudes through compiling extensive concordances, which are then sophisticated through statistical machine-learning tasks, and supervised classification tasks (Polanyi & Zaenen, 2006). Results are "robust" (Taboada, Brooke, Tofilovsky, Voll, & Stede, 2011, p. 36). In this study, the software CorpusTool (CT) was used (O'Donnell, 2008).

Transitivity analysis

Verbs are "the cornerstone of the semantic organization of experience" (Halliday, 1994, p. 19). At the neurological level, "verbs are functionally independent linguistic entities" (Crepaldi, Berlingeri, Cattinelli, Borghese, Luzzatti, & Paulesu 2013, p. 303), with signature forms of brain processing and storage (Kemmerer & Gonzalez-Castillo 2010; Moseley & Pulvermüller 2014). While neurolinguistic typologies of verbs are currently developing and changing, they provide a basic justification for distinguishing several categories of actions based on the human biophysical and cognitive systems they activate (Berlingeri, Crepaldi, Roberti, Scialfa, Luzzatti & Paulesu, 2007, p. 529). At the linguistic level, verbs are a representational strategy, used to characterise agency and activity (Kulikov, Malchukov & Swart 2006). Despite morphosyntactic differences, all languages contain resources for distinguishing processes by agent and type (Næss, 2007). These structures may be used as analytic parameters (Malchukov, 2006). For example, "enjoy" in "we enjoyed doing it" represents participants as equal and identical, assumes they are doing the same thing, and casts that as a positive emotional state. By contrast, "introduce" in "we introduced this feature to our audience" differentiates participants into novice and experienced roles. "Giving" in "My team and I were giving encouraging chocolates as a prize" identifies alignments through the complex actor, differentiates roles through its organisation of agent and object of the action, structures implicit power relations through the semantic kernel of the verb choice, and suggests different perspectives and interior experiences via syntactically coordinated attributes. Analysing verb choices helps us see regularities in how causality and responsibility are shaded with meaning (Kemmerer & Eggleston 2010).

When realising personal opinions, people select specific verbs from among those they know. Their choices may be analysed using the process type system network, as in Figure 1.

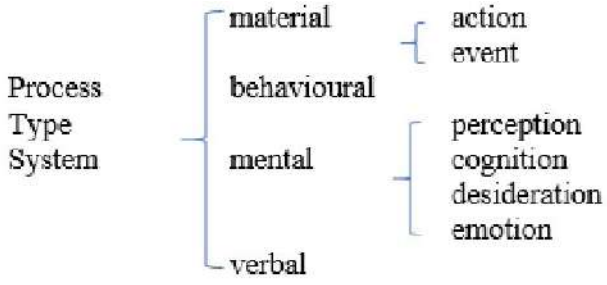

Figure 1. The Process Type System

Material processes comprise two sub-types: material actions, or physical events involving the self acting intentionally, and materials events where the self is passively acted upon (Halliday & Matthiesson, 2004). Behavioural processes represent embodied cognition, as they involve the writer's body, for example "I walked around the class". Mental processes comprise four subtypes of actions occurring within the self, including visual perceptions ("*I saw* that a smile really helps"), thoughts ("First, we analyzed the topic"), desires ("I wanted to speak") and emotions ("Presenting for me is something I love"), differentiating kinds of interiority (Shinzato 2004). Verbal processes depict the action as a negotiation or interaction ("We agreed on the topics") (Kärkkäinen 2003). Most typologies of transitivity distinguish purely syntactic from semantic process types (Dixon & Aikhenvald, 2000). In this study, purely syntactic process types such as the copular use of "be" ("the question is about good and bad practices…") have been excluded (Bowers, 2002). A semantic rather than syntactic understanding of the nature of participation in transitive events was used, typified by a "salient change-of-state" (Kitillä, 2002, p. 63). Thus, all finite, non-finite and inflected forms, modals and phrasals were tallied, but deverbalised forms, gerunds with articles, and auxiliaries were not (Sydserff & Weetman, 2002).

Data

Data was aggregated into a corpus of 15,893 words, 855 sentences and 2928 clauses, and analysed for content, appraisal, and transivity.

Content analysis

The corpus contained 2,928 clauses. For the first coding frame, 2319=79.20% of clauses contained relevant content, as in Figure 2.

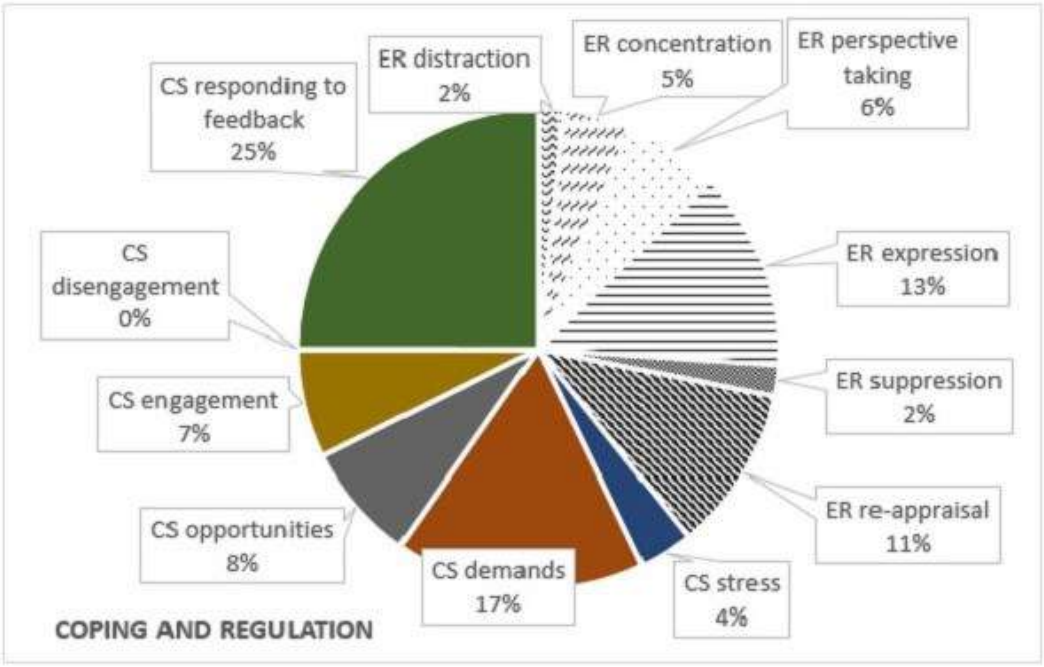

Figure 2. Theme and subunit frequency scores: Emotional Regulation (ER), Coping Strategies (CS)

The 609=20.80% of clauses containing irrelevant content ("we all know the devil is in the details") were excluded from analysis.

For the second coding frame, 2,535=86.56% of clauses contained relevant content, as in Figure 3.

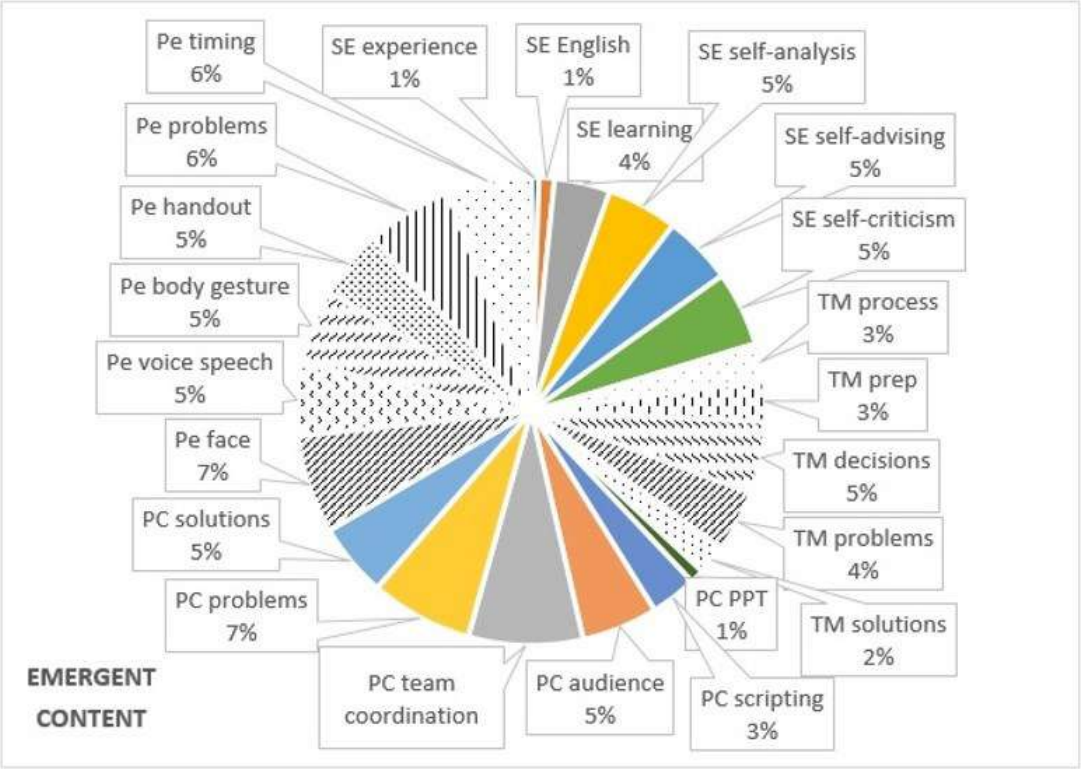

Figure 3. Theme and subunit scores: Frequently-realised content

The 393=13.42% of clauses containing irrelevant content ("Bingo!", "Thank you sincerely", "I will answer this question in short, summarized points") were excluded from analysis.

Appraisal analysis

The corpus of 15, 893 words was also analysed for subjectivity, using the Attitude system. Of 641 attitudes realised, 370=57.72% were positive and 271=42.28% negative, with an attitudinal density of 40.33 per thousand words, as in Figure 4.

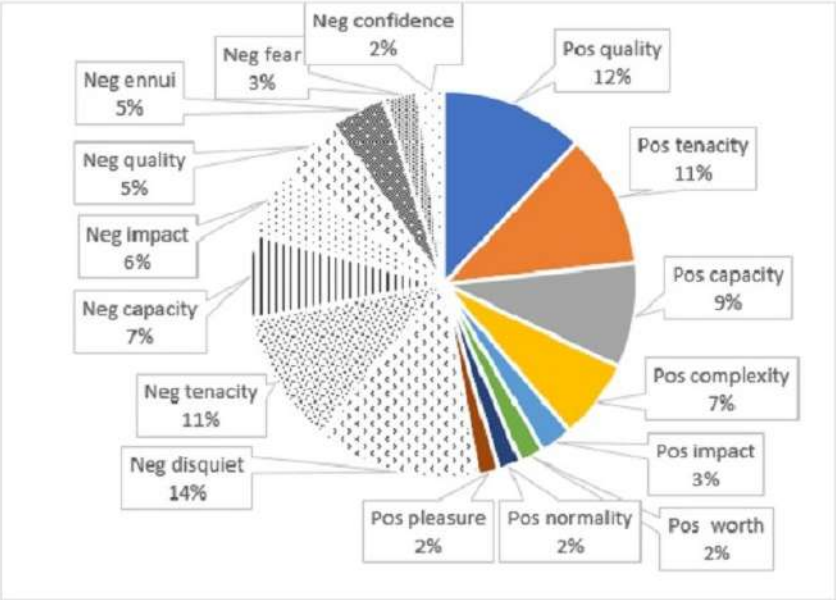

Figure 4. Frequently-realised positive and negative attitudes.

Of these, most (450=70.20%) were realised in eight positive and eight negative subcategories, as in Table 2.

	FREQUENTLY-REALISED ATTITUDES					
	SYSTEM	CATEGORY	SUBCATEGORY	N	%+VE	EXAMPLES
1	Appreciation	Reaction	quality	63	17.03	important, clear, obvious, successful
2	Judgment	Social esteem	tenacity	59	15.95	keep, keep on, always have to
3	Judgment	Social esteem	capacity	46	12.43	can, able to, figured out, know how to
4	Appreciation	Composition	complexity	35	9.46	complicated, intricate, not simple
5	Appreciation	Reaction	impact	14	3.78	amazing, attractive, friendly
6	Appreciation	Valuation	worth	11	2.97	valuable, value, worth, fulfil
7	Judgment	Social esteem	normality	10	2.70	always, sometimes, usual, mostly
8	Affect	Dis/satisfaction	pleasure	9	2.43	like, pleased with, pleasant, fun, glad
				247	66.76	
	SYSTEM	CATEGORY	SUBCATEGORY		%-VE	
1	Affect	In/security	disquiet	53	19.56	anxious, anxiety, worried, stress
2	Judgment	Social esteem	tenacity	43	15.87	didn't spend enough time, unprepared
3	Judgment	Social esteem	capacity	27	9.96	don't know how, can't, am not skilled at
4	Appreciation	Reaction	impact	22	8.12	horrible, fatal, robotic, monotonous
5	Appreciation	Social esteem	quality	21	7.75	inefficient, awful, poor, mistaken
6	Affect	Dis/satisfaction	ennui	18	6.64	bored, lose attention, losing interest, dull
7	Affect	Dis/inclination	fear	11	4.06	panic, panicked, afraid of, fear of
8	Affect	In/security	confidence	8	2.95	not sure about, unsure, not confident
				203	74.91	

Table 2. Most frequently-realised positive and negative attitudes

Relatively few positive as compared to negative attitudes were realised in Affect categories.

Transitivity analysis

Of 2,298 processes contained in the corpus, most were material actions (749=32.59%), as in Figure 5.

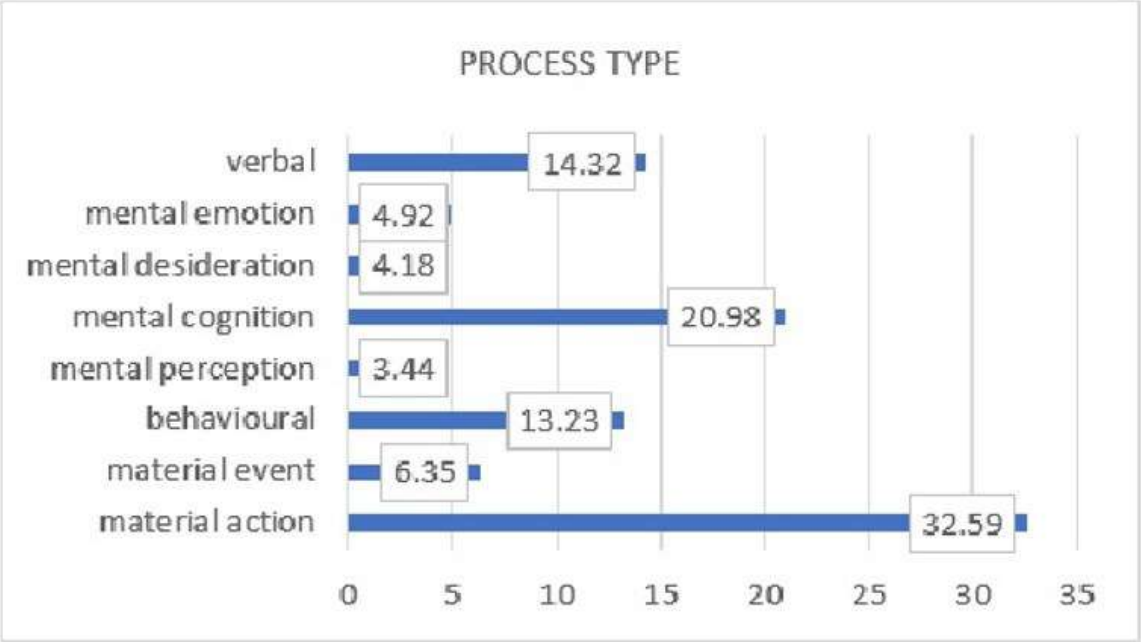

Figure 5. Process types realised (%)

Mental-cognitive (482=20.98), verbal (329=14.32%) and behavioural (304=13.23%) processes were also frequently-realised.

The most common agents were self (1099=47.82%) and team (684=29.77), as in Figure 6.

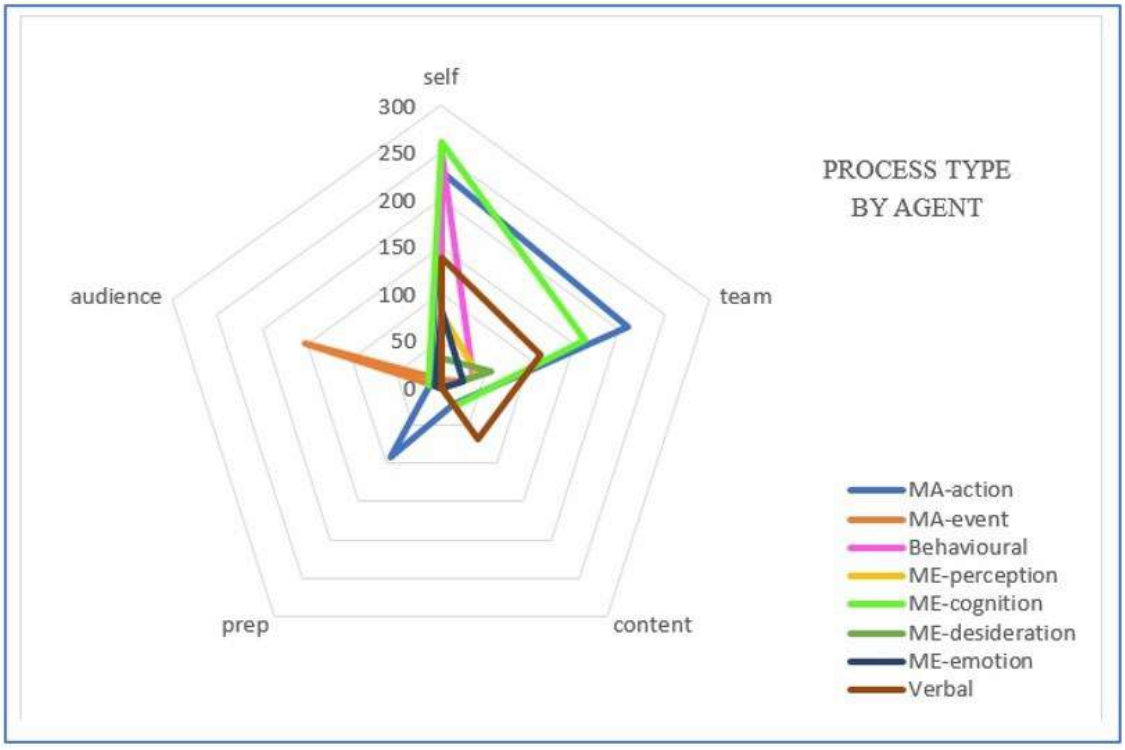

Figure 6. Process types for eight frequently-realised agents

Participants and teams were the most common agents. Participants enacted more thought ("I think it is good to ask questions"). Teams were more materially active ("we met several times for training"). Participants, teams and presentation content were frequently characterised as verbal agents: ("I need to talk about complex information", "These were issues we discussed through the process", "Our web sources said this was essential").

Discussion

This exploratory study has generated four results. First, talented L2 programmers handle stress by focusing on meeting immediate demands in their context. Content analysis data showed that participants realised context sensitivity (63.61%) about twice as often as emotion regulation (36.39%) strategies, and realised perceiving demands more than twice as often as other strategies. Their most frequently-realised regulation strategy was expressing emotion. There were no realisations of suppressing emotion in the corpus. Five subunits accounted for 1735=74.82% of all realisations in this frame, as in Table 3.

THEME	SUBUNIT	N	%T	EXAMPLE
emotion regulation	reappraisal	239	10.31	It would have been solved in a minute, I thought. I was wrong. Not only it took a lot of time, some had done it incorrectly
	emotion expression	287	12.38	I hate the process in the beginning but after doing it for three sessions I liked it and started to enjoy it.
context sensitivity	perceiving demands	634	27.40	All technical things should also be rehearsed before presentation.
	perceiving opportunities	298	12.85	Through repetition, you can control the whole process.
	engagement	277	11.94	If you go deep into the field you can always answer any question.

Table 3. Frequently-realised themes and subunits in the Coping and Regulation frame

This finding provides initial support for the idea that talented L2 learners are able to both modulate the strength of negative emotions and alleviate the intrusion of negative emotions into task performance, in the manner known as "expert performance" among high-achieving scientists in the work world (Araújo, & Almeida, 2017).

Second, the interior states of talented programmers seem focused on identifying, understanding and solving external contextual problems. Of twenty-four subunits in the

emergent frame, the six most frequently-realised focused on physical performance challenges, team coordination and related problems, as in Table 4.

THEME	SUBUNIT	N	%T	%T	EXAMPLE
performance	face	162	20.35	6.39	Smiling tricked my brain into believing that something great was happening.
	problems	142	17.84	5.60	As always, I unsderstood my mistakes and mistakes of our team only after the performance.
	timing	138	17.34	5.44	
presentation content	team coordination	188	26.82	7.42	As a speaker in a group, I had to listen attentively to my colleagues, and connect what they are saying.
	problems	168	23.97	6.63	When you have a text, you start to look at it very often. To overcome this problem, I did not include everything in my notes.
team membership	rehearsal	159	28.65	6.27	When I rehearsed, the words started to fall out of my head. It took a lot of concentration.
		957		37.75	Despite the fact that at rehearsals, each person fit into his time, the performance took longer.

Table 4. Frequently-realised themes and subunits in the emergent frame

When the subunit "problems" within three themes are aggregated, they comprise 411=16.21% of all realisations. Many subunits of the second coding frame seem to reflect regulatory strategies within self-efficacy theory. In the self-evaluation theme, experience ("Previously, I have never paid attention to the eye contact"), English ("in my case I worked with people from another culture, which added to my experience of working on something in English"), and learning ("My teammate has a great experience of performing in front of people and I can learn from him") may be understood as showing context sensitivity (Carver & Connor-Smith, 2012). The subunits self-analysis, self-criticism and self-advising comprised 353=73.08% of realisations, and can be seen as forms of motivational self-guidance ("Understanding these things does not mean I can do it", "I should have looked less robotic", "I would like to change my words to be more natural and alive") (Dörnyei & Ushioda, 2009). All subunits of the second theme could be interpreted as demonstrating "regulatory flexibility" as contrasted with "haphazard attempts at regulation" (Aldao, 2013, p. 163). Motivational self-guidance is known to operate within successful L2 learners (Dornyei and Ushioda, 2009). This result suggests that L2 learning may actively contribute to the success of talented learners in STEM fields.

Third, participants realised positive emotions as evaluations of contexts and behaviours, but negative emotions as personal experience. The Appraisal data showed that about half of frequently-realised positive attitudes clustered in Appreciations (123=49.80%). These subjective responses rework statements of emotion indirectly as

evaluations of objects outside the self (Martin & White, 2005). For example, "We selected an attractive but strict design for the presentation, which grabs attention, but keeps the focus on content", attributes the quality of being attractive to a specific ensemble of colours and patterns. Clearly, the experience of attraction must be the author's own response to that ensemble. Positive judgments comprised the other half (115=46.56%) of frequently-realised subjective responses. Judgments of esteem reframe subjective responses as evaluations of persons, behaviours and situations with reference to social and personal norms. Among these, modals of possibility indicate active potentials likely to be instantiated in future action (Stack, 2012). That is, "I learned that I can interest the audience by giving contradicting examples against the topic" implies that, having acquired this behaviour, the author will do it again. Judgments of tenacity assess how much effort is required ("it took much effort"), where Judgments of normality assess how usual an experience is ("you must always smile"). Participants realised substantial negative as well as positive emotions. Of frequently-realised negative attitudes, 90=44.33% were realised as affect ("it forced me to overcome my fear"). Of total realisations of negative affect, 108=39.85% were realised congruently, as compared to 64=17.30% realisation of positive affect. Congruent constructions are the most direct lexicogramamtical means of realising emotion, because they "bear a natural relation to the meanings they have evolved to express" (Halliday, 1985, p. xviii). This finding, that talented L2 learners ascribe their positive and negative emotions to different sources within and beyond the self, merits further investigation.

Fourth, transitivity analysis shows that participants were closely aligned with their team, as actors. While participants were more thoughtful, and teams more active, many clauses blurred the line between the two: "I think it makes us look simpler and connects with the audience". Here, both author and team are the object of the material process "make" and indistinct due to the shared perceptual process "look". Team actions were cast as collective even when represeting participants' embodied processes. In "[w]e tried to switch the volume of our voices to ensure maximum audience attention", "switch" must be behavioural, yet the team is actor creating the intended change of state in the audience. Collectivity was also realised through typification, which reframes idividual experience as an example of a a general class or category (Biber, 2006). In: "When you talk to people about something you must believe in it; also this leads you to read a lot

about it, so in my case, me and my group studied the subject that was assigned to us", the participant's mental process "studied" has been characterised as a typical verbal process through the agency of the shared pronoun "you". One can only interpret this sentence by understanding that all representations of self in this sentence ("you", "my", "me", "us") are meant to be taken as typical actors enacting typical verbal and cognitive processes (Graff & Birkenstein 2010). Of 139 instances where participants were the agents of verbal processes, many (58=41.73) used shared subjectivity, both "we" (31) ("If we talk about the difficulties, the main one is a large amount of text that must be remembered") and "you" (27) ("you should have a good charisma to keep the audience's attention"). Teams were represented as thinking collectively: "We thought it could happen that the attention on the serious and not entertaining part would be difficult after the relaxing part." Here, the group takes a benign supervisory role, projecting potential audience experiences, and coordinating these with desired outcomes. Participants spoke only slightly more than teams did ("I usually do some grammar mistakes", "My groupmates told me I need to raise my voice a bit because sometimes it was hard to hear me"). This finding coordinates well the research showing sociability as underwriting successful L2 learning.

Conclusion

This study has explored the ideational content, subjective attitudes, and agency of talented L2 programmers' responses to a stressful learning task. It offers support for the view that talented programmers are focused on identifying and addressing external contextual problems, and while they freely express their negative emotions, they frame positive emotional experiences as elements of their social environment. Frequently-realised content themes and subunits are consonant with regulatory and coping insights, suggesting that they are highly aware of contextual problems, and use self-guides. They use contextual strategies, particularly perceiving demands and opportunities, and reappraisal. They use emotion regulation strategies, particularly expressing emotions and engagement. This is the particular blend of coping and regulation strategies which make them exceptionally effective learners. The findings of this study suggest that L2 learning may contribute substantially to talented learners developing these regulatory and coping strategies.

Results must be taken as provisional, as this is the first study of its kind. Further, this has limitations. First, as the sample size is small, results may not accurately represent the regulation and coping strategies of talented programmers more generally. Results for programmers may not generalise to STEM fields or beyond to other disciplines. However, while the small sample size at this time prohibits a systematic exploration of contextual factors, the numbers of talented programmers, and talented STEM students will continue to increase, and may make research into the synergies between language learning and other areas of learning more viable in future.

Second, as the stressful task chosen had to be acceptable within an educational program, it was perhaps not stressful enough to elicit coping strategies on par with those discussed in many coping studies, for example death of a close relative. On the other hand, participants were taking heavier course-loads than most students, all weeks in the semester contained multiple assessments, and participants took all assessments seriously, making them describe them as genuinely stressful. Finally, the well-known problems with self-reporting suggest that it would be useful to explore talented L2 learners' coping strategies with quantitative methods (Paulhaus & Vazire 2007). The short turn-around time for handing in a written reflection may lessen these potential errors. However, it is still possible that specific results, as well as their proportionality, would be different in different disciplines and context, and with different stressful tasks.

The value of this study lies in the effort to identify the sensitive, interior and emotional dimensions of effective learning, particularly in an L2, which has become more common, and will continue to be the norm for talented students in future. It is not simply that talented programmers may be type-cast as unemotional, or inexpressive, or members of various categories of neurodiversity. In fact, they may be the leading edge of a new norm for learning and handling the emerging demands of higher education and the workplace. We may be able to use today's talented programmers to identify a specific syndrome of coping strategies which allow us to train and support more ordinary learners to be more effective and more fulfilled, in a world which is becoming more complex, particularly in the integration of computing fields into every area of daily life.

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