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Coding Vs. Presenting: a multicultural study on emotions

Abstract

Purpose – The purpose of this paper is to explore and compare emotions perceived while coding and presenting for software students, comparing three different countries and performing also a gender analysis.

Design/methodology/approach – Empirical data is gathered, by means of the discrete emotions questionnaire, which was distributed to a group of students (n=174) in three different countries: Norway, Spain and Turkey. All emotions are self-assessed by means of a likert scale.

Findings – The results show that both tasks are emotionally different for the subjects of all countries: presentation is described as a task that produces mainly fear and anxiety; whereas coding tasks produce anger and rage, but also happiness and satisfaction. With regards to gender differences, men feel less scared in presentation tasks, whereas women report more desire in coding activities. It is concluded that it is important to be aware and take into account the different emotions perceivedby students in their activities. Moreover, it is also important to note the different intensities in these emotions present in different cultures and genders.

Originality/value – This study is among the few to study emotions perceived in software work by means of a multicultural approach using quantitative research methods. The research results enrich computing literacy theory in human factors.

Keywords

Coding tasks; presentation tasks; emotions; multicultural; the discrete emotions questionnaire.

Paper type: Research paper

1. Introduction

Software work is intensive in talent and software workers remain the most important asset in the industry. In software projects, creativity and problem solving competencies are highly influenced by emotions (Carver et al., 2018). In a scenario in which software industry is determined by human capital, the study of software workers´ emotions is key for effective software engineering (Dewan, 2015). Consequently, in the software engineering community, there is an increasing set of works linking human factors and emotions in particular with software development productivity and performance (Blincoe et al., 2019; Graziotin et al., 2015; Murgia et al., 2014).

Emotions are affecting crucial aspects in software work like motivation, quality or performance (Graziotin et al., 2014, 2017a). With regards to the emotions experienced by software professionals, literature identified a wide set of emotions both positive (e.g. joy) and negative (e.g. anger) in the diversity of tasks practitioners are facing throughout their work (Colomo-Palacios et al., 2019). There is evidence on the correlation of positive emotions with productivity (Graziotin et al., 2018), as well as works devoted to determine the connection of negative emotions with bad results in software work (Gachechiladze et al.,

2017). In spite of the growing set of studies on the topic, recent efforts (Sánchez-Gordón and Colomo-Palacios, 2019) call for further research that adopts more general approaches and specific tasks.

On the other hand, presentation skills and their development for software workers have been a field of study since the early stages of computing education (Schulman, 1975). Software workers face the need to present and develop several communication skills. In the educational sphere, presentation skills are considered fundamental transferable skills to new undergraduate programs adapted to the Bologna Declaration or ABET criteria. Thus, presentation skills are nowadays present in the computing curriculum in all of the disciplines. Thereby, the guide to the software engineering body of knowledge (SWEBOK) (Abran and Fairley, 2014), included presentation skills among the communication skills that are needed for software engineering professional practice. SWEBOK underlines the importance of presentation skills throughout the software life cycle and states the influence of such skills in aspects like product acceptance, management, stakeholder's management and customer support. Presentation skills are also included in the software engineering body of skills (SWEBOS) (Sedelmaier and Landes, 2014). In this initiative, presentation skills are considered generic non-technical skills, defined as abilities that are not core for software development, yet relevant for a variety of disciplines including software development. Regardless of the discipline, presentation skills can be considered highly relevant for practitioners' skillset.

Beyond these initiatives, scientific literature highlighted the need to devote time and effort to the aforementioned tasks, i.e. coding and presenting in the educational context (García-Peñalvo and Colomo-Palacios, 2015), with a particular focus on the involvement of emotions in these tasks. In particular, scientific literature has reportedthe importance of presentation skills in software engineering curricula in several aspects. In Kitchenham et al. (2005), authors indicate that general business topics are not covered in software engineering studies proportionate to their importance, citing presentation among other aspects. For Ardis and Henderson (2012), presentation skills are crucial for software engineering education in the era of massive open online courses (MOOCs). The importance of presentation skills for software project managers education is also highlighted in the literature e.g. (Colomo-Palacios, González-Carrasco, et al., 2014; Peters and Moreno, 2015; Ruano-Mayoral et al., 2010). In their work, Nylén and Pears (2013) witness the importance of practice, reflection, review from lecturer and, to a lesser stent, peer review in the development of effective presentation skills. In sum, the importance of presentation tasks in software work is unquestionable, and also for students in the topic.

There is an increasing concern on the study of emotions in computing, given its impact in key aspects like quality, performance or personnel motivation. On the other hand, there is also a need to devote research to the study of presentation tasks in software work, given its importance in professional and educational endeavours. To the best of authors´ knowledge, there is not a previous work devoted to study emotions in coding compared to the ones in performing presentations in multiple cultures.

Therefore, this paper is aimed to shed light into the study of emotions in these two tasks. It can be claimed that the study is relevant and significant, since emotions are crucial modifiers of software work outcomes, including coding and presentation tasks. Moreover, the multicultural flavour of the study conducted with three different countries and cultures provides a new insight to the initiative, given the increasing globalization of software world. Finally, gender issues are gaining importance in the study of human factors in computing and taking into account this fact, this paper could also shed some light into the possible differences in the area of study.

In this paper, authors propose three key research questions:

- RQ1: Are there different emotions reported by software people while perfoming coding and presentations tasks?
- RQ2: Are there cultural differences in the perception of emotions while performing these tasks?
- RQ3: Are there gender differences in the perception of emotions while performing these tasks?

In order to address these research questions, authors employed the Discrete Emotions Questionnaire (DEQ) (Harmon-Jones et al., 2016), in order to gather self-reported emotions by subjects. Results are later analysed, in order to answer the aforementioned research questions. Results of this study are of interest for software practitioners, who in the context of an ever-increasing global environment, are willing to learn and understand their emotional responses. Results are also of interest for universities and scholars in their educational endeavours, needed of guidance in the education of new professionals fulfilling the needs of society.

The remainder of this paper is structured as follows. Section 2 presents a literature review on emotions and their applications in the study of computer programing. Section 3 introduces the conducted study. Section 4 includes the discussion of results comparing them with relevant literature in the field. Section 5 depicts main limitations of this work. Finally, in section 6 readers can find can find conclusions and opportunities for future work.

2. Literature Review

2.1. Emotions

Emotions have been at the centre of attention in the study of humans, since the very beginnings. Maybe because of this, finding a unique definition of the term "emotion" represents a complicated task. In this work, authors adopt the definition proposed by Izard (1977), who states that emotions are composed of three aspects: a) the experience or conscious feeling of emotion, b) the processes that occur in the brain and nervous system, and c) the observable extensible patterns of emotion. It is noteworthy that emotions present valence and intensity (Teh et al., 2018). Another important aspect to consider is the universality of emotions. Although there are a lot of discussions on the topic, several authors and works have been devoted to provide a list of universal emotions ubiquitous in all cultures e.g. (Ekman, 1992). Taking this approach, the assessment of emotions with regards to their intensity and presence is a hot research topic. One of the most important instruments is the Positive and Negative Affect Scale (PANAS) (Watson et al., 1988). The construct implements two different scales: Positive Affect (PA) and Negative Affect (NA). Each scale presents ten items. To measure the items, five alternatives are presented: very slightly or not at all, a little, moderately, quite a bit, and extremely. In spite of its popularity, literature reported limitations to this tool, for instance, limited validity in several contexts, lack of observance of cultural variances and inadvertence of emotions like bad or joy (Graziotin et al., 2014; Harmon-Jones et al., 2016).

More recently, literature reported constructs like Scale of Positive and Negative Experience (SPANE) (Diener et al., 2010), levels of emotional awareness (Subic-Wrana et al., 2011) or the DEQ (Harmon-Jones et al., 2016). Focusing on the latter, this construct was published back in 2016 and validated in different scenarios. It is sensitive to eight distinct state emotions, namely, anger, disgust, fear, anxiety, sadness, happiness, relaxation, and desire.

Although DEQ presents a set of limitations, authors chose this mean as a self-reporting tool. Self-reporting methods have been used frequently to report emotions and these subjective methods may be more accurate and less intrusive than objective methods (Fuentes et al., 2017). Moreover, emotional self-reporting methods can be helpful in identifying emotions in several environments, including educational settings (Ritchie et al., 2016). Authors chose DEQ as the instrument due to its accuracy for autobiographical recall (Luxon et al., 2019), but also because of its scarce use in software engineering studies, which may be because of its recent development. According to Harmon-Jones et al. (2016), the DEQ is more sensitive than the PANAS and has demonstrated stronger effects on self-reported emotions when respondents are instructed to report what they felt during an emotional experience, as compared to what individuals were feeling immediately following the emotional experience, that will be the case of the research approach adopted. The only antecedent found on its use in computing is the work by Colomo-Palacios et al. (2019) in which results from Norway are presented.

2.2. Emotions in software work

Emotions are valuable in understanding the role played by software practitioners and other stakeholders in software work. Although research on people aspects in computing has a long tradition, the study of emotions is not that popular, although can be considered a growing field. A very recent and relevant review of the literature on the intersection of emotions and software work can be found in Sánchez-Gordón and Colomo-Palacios (2019).

One of the antecedents of our paper is the set of papers by Ramos and colleagues in requirements engineering (Ramos et al., 2005; Ramos and Berry, 2005). These authors underlined that changes that computer systems bring to interact with users' values and beliefs and trigger emotional responses, which are sometimes directed against the software system and its proponents. This conclusion is rooted in two different explanations. In the first term, the transformation that involves the use of a new system by the users, and on the other hand, the difficulty in defining requirements, in such a way that is beneficial for developers and users alike. Other studies were devoted to analyse the evolution of emotions throughout the software process (Colomo-Palacios et al., 2010). More recently, several works have been devoted to introduce emotional goals in software requirements e.g. (Curumsing et al., 2019; Miller et al., 2015).

However, the majority of studies has focused on the identification and analysis of emotions associated with computer programming. A first set of works is devoted to the detection of emotions in coding, by means of the analysis of software artefacts, mostly using natural language processing (NLP). The second set of studies are rooted in the use of sensors to elicit emotions. And the final approach uses assessment instruments to study and analyse emotions. In the first set of works, there is a panoply of studies using datasets retrieved from tools like Jira (Kaur et al., 2018), Bugzilla (Umer et al., 2018), GitHub (Destefanis et al., 2018) or platforms like Stack Overflow (Calefato et al., 2018; Novielli et al., 2018) and applying NLP tools to identify emotions from texts. This set of studies is not connected with the work presented in this paper. In the second set of works, authors investigate software practitioners, by means of sensors. These sensors range from keyboard and mouse (Estrada et al., 2018; Vea and Rodrigo, 2017) to more complicated and sometimes mixed systems to collect biometric data including eye-related, skin-related, breathing-related, heart-related and brain-related (Fritz and Müller, 2016; Wrobel, 2018; Züger and Fritz, 2018). This is not relevant for this paper either. However, the third set of studies, that is, the one devoted to use emotion assessment instruments to report emotions is deeply connected with this work. One of the pioneering works is the one by Wrobel (2013), which links emotions with productivity, by means of the application of the Job Emotions Scale proposed by Fisher (2000). More recently, a set of studies devoted to investigate happiness and its consequences for software developers was developed (Graziotin et al., 2017b, 2018), by means of questionnaires.

With regards to the works devoted to study emotions in presentations for software engineering, there are, to the best of our knowledge, just two antecedents. The first is the seminal work performed in Norway of the current work (Colomo-Palacios et al., 2019). In this work, just one of the three cultures is represented and results with regards to emotions are the ones reported in this paper for Norway. The second is the work by Nazligul et al. (2018) that is focussed on anxiety and a way to reduce its intensity, by means of Virtual Reality aids. However, literature beyond computing has studied the phenomenon. In the case of the study presented in this paper, all presentations were performed in a foreign language and anxiety has been reported as one of the main outcomes in these environments (García-Pastor and Miller, 2019; Kelsen, 2019; Young, 1990), although this fear is also present in presentations in the native language (McCroskey, 1984). The work of Tóth (2019) is devoted to present findings of presentations in a foreign language teaching setup. The results of this paper report anxiety as one of the main emotional responses, but also combined with positive feelings and emotions like, for instance, achievement and joy.

In sum, literature reports work on emotions and coding, by means of different approaches, but the study of emotions during presentations is still scarce. Moreover, there are not reported comparisons between the two activities or studies considering different cultures. Given the importance of studies considering diverse environments and the unquestionable importance of both presentation and coding for software work,

authors want to devote this work to study the phenomenon in different cultures comparing their findings with relevant literature in the field.

In this work, authors propose a study that compares the emotions computing students' experience, while presenting and coding. To do so, DEQ (Harmon-Jones et al., 2016) is employed to self-report emotions. Among the available options to measure emotions, authors chose this instrument due to its accuracy (Ritchie et al., 2016) . It is also true that the construct is quite recent and reports in its use are scarce. Moreover, the novelty of the study also lies in the multicultural approach taken, collecting and analysing responses from three different countries: Norway, Spain and Turkey.

3. The study

The main aspects of the conducted study are described in the following sections including the overall design, data collection and data sampling. Results are also presented, including answers to the three research questions.

3.1. Design

In this section, authors present the setup of the study conducted. Computing students from three different universities have participated in the study: Østfold University College (Norway), Universidad Carlos III de Madrid (Spain) and Çankaya University (Turkey). All students were in their third year of studies. In all the three locations, authors used the same DEQ in English applied to students with sufficient level of understanding in that language, given that their studies have been, at least, partially taught in English. All emotions are self-assessed, by means of a Likert Scale with the following values: 1: Not at all; 2: Slightly; 3: Somewhat; 4: Moderately; 5: Quite a bit; 6: Very much; 7: An extreme amount. From a set of eight high level categories of emotions included, a final set of 32 emotions was included, as shown in Table I:

TABLE I. SELF-REPORTING EMOTIONS

Anger	Anger	Sadness	Sad
	Rage		Grief
	Mad		Lonely
	Pissed Off		Empty
Disgust	Grossed out	Relaxation	Easygoing
	Nausea		Chilled out
	Sickened		Calm
	Revulsion		Relaxation
Fear	Terror	Happiness	Happy
	Scared		Satisfaction
	Panic		Enjoyment
	Fear		Liking
Anxiety	Dread	Desire	Wanting
	Anxiety		Desire
	Nervous		Craving
	Worry		Longing

In the questionnaire, researchers asked participants to code their emotions in two different situations: coding and presentation. Participants were assisted on site by researchers who gave them all the instructions required to fill out the questionnaires. Authors emphasized that questionnaire was anonymous.

With regards to details on the presentation task, it is performed by students in groups. All students in the group must participate in the presentation. This presentation was performed in the last day of the course on the project developed and was scheduled to last around 20 minutes per group. Each group was free to choose the materials, but were advised to use standard presentation programs to support their presentation.

The audience of the presentation was the set of instructors of the course (2-3). The presentation was used as part of the evidences that constitutes the final grade in the course. Previous to the final presentation, there was a first presentation on the idea of the software project they had to develop for the course. Students received feedback on formal aspects of this presentation by instructors.

3.2. Sample Description

The sample as a whole includes 174 respondents from the three countries. There are 123 men (70.7%) and 51 women (29.3%) in the sample. The mean age is 22.36 years with a standard deviation of 2.947 years. In particular, in Norway, with 47 participants, the average age was 23.06 years old with a standard deviation of 2.047 years, 10 women (21.28%) and 37 men (78.72%) participated in the study; in Spain, 81 students participated, 29 women (35.8%) and 52 men (64.2%) and average age was 20.84 years with a standard deviation of 2.021 years. Finally, with regards to Turkey, 46 respondents were part of the sample, including 26.1% women (12) and 73.9% of men (34). Average age was 24.33 years with a standard deviation of 3.634 years. It is important to note that the minimum age for a student in the third year of studies is 19-20 years old. So, both the overall mean and the standard deviation are consistent with these figures.

Furthermore, one can witness the gender imbalance in the sample. This imbalance is quite widespread among computing students (Colomo-Palacios, Casado-Lumbreras, et al., 2014), and also in professional spheres. The composition of the sample is coherent with the imbalance that is present in the career intentions, career choice, and career persistence and advancement stages (Gorbacheva et al., 2019)

The method to obtain the sample was random sampling. Respondents were recruited among students in three different courses in the three universities.Recruitment took part just after the end of the class and the participation of students was optional. All students are in the third year of studies and they are skilled in computer programming (courses in the topic start in the first semester of the first year in all cases, following the programming-first approach adopted broadly in computing curricula) and in presentation (with, at least one subject covering the topics in each university). In the three countries, students were recruited in Software Engineering classes. On the other side, the selection of the countries was driven by the formation of the research team. Thus, authors adopted a convenient sampling for the study conducted. Finally, it is noteworthy that all questionnaires were considered valid by researchers (no data entry errors or other anomalies were found).

Authors want to underline that all subjects classified themselves one of the two binary genders. None of the subjects indicated other options (open field) such as non-binary gender.

3.3. Data collection

Printed questionnaires were designed to be completed by the participants, who were assisted on site by, at least, one researcher who gave the respondents all the instructions they need to fill out the questionnaire. Subsequently, responses were codified using SPSS.

3.4. Results and discussion

In this subsection, authors will present main results, answering research questions and introducing also, analysis developed from the data collected.

In order to conduct a thorough measurement analysis of the questionnaire to ensure trustworthiness of results, authors used the Cronbach's Alpha. The α is a coefficient of internal consistency and

interrelatedness intended for psychological tests. The interpretation of Cronbach's alpha values on a Likert scale is α ≥ 0.8 is excellent; α= 0.6- 0.8, Acceptable; α=0.4-0.6= poor; α ≤ 0.4, unacceptable (Nunnally, 1978). The value for the applied questionnaire, applying the test, was 0.86 which indicates excellent consistency.

Table II presents descriptive statistics per emotion and country with regards to presentation and coding (mean and standard deviation):

TABLE II. PRESENTATION AND CODING DESCRIPTIVE STATISTICS PER COUNTRY

		PRESENTATION						CODING					
		NORWAY		SPAIN		TURKEY		NORWAY		SPAIN		TURKEY	
		Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
ANGER	Anger	1.94	1.673	1.52	1.361	1.93	1.340	2.72	1.838	2.43	1.788	2.63	1.466
	Rage	1.77	1.618	1.43	1.264	1.78	1.246	2.66	1.926	2.14	1.563	2.54	1.573
	Mad	1.77	1.618	1.47	1.285	1.87	1.276	2.49	1.852	2.10	1.546	2.67	1.550
	Pissed Off	2.04	1.841	1.54	1.275	1.87	1.327	2.47	1.718	2.05	1.781	2.52	1.560
DISGUST	Grossed out	2.04	1.769	1.58	1.264	2.11	1.337	1.64	1.326	1.43	1.150	1.93	1.254
	Nausea	1.57	1.118	1.38	.930	2.30	1.380	1.60	1.296	1.22	.935	1.89	1.215
	Sickened	2.09	.928	1.36	.811	2.15	1.366	1.49	1.266	1.31	1.032	1.70	1.030
	Revulsion	1.55	1.451	1.48	1.085	2.17	1.596	1.49	1.177	1.41	1.282	1.78	1.191
FEAR	Terror	1.64	1.725	1.89	1.612	1.93	1.237	1.64	1.358	1.48	1.333	2.15	1.460
	Scared	2.06	1.866	2.21	1.708	2.76	1.676	1.66	1.290	1.40	1.080	2.11	1.386
	Panic	2.89	2.046	2.48	1.878	3.48	1.709	2.11	1.697	1.51	1.246	2.91	1.736
	Fear	2.81	1.872	2.56	1.830	2.93	1.818	1.94	1.552	1.44	1.183	2.54	1.834
ANXIETY	Dread	2.28	1.651	2.05	1.710	2.57	1.940	1.81	1.345	1.44	1.129	1.93	1.181
	Anxiety	3.43	2.061	2.90	1.901	3.35	1.958	2.09	1.692	2.02	1.449	2.28	1.409

	Nervous	4.04	2.000	4.33	1.754	3.65	1.888	2.21	1.731	2.14	1.579	2.70	1.685
	Worry	2.91	1.954	3.59	1.701	3.70	1.848	2.30	1.793	2.56	1.666	3.00	1.687
SADNESS	**Sad**	1.51	1.283	1.21	.890	2.15	1.475	1.85	1.588	1.41	1.081	1.93	1.162
	Grief	1.53	1.231	1.22	.975	2.13	1.360	1.64	1.374	1.20	.797	1.87	1.166
	Lonely	1.38	.990	1.42	1.303	2.04	1.646	1.98	1.622	1.33	1.095	2.28	1.708
	Empty	1.60	s1.313	1.38	1.113	2.30	1.590	1.79	1.413	1.38	1.261	2.59	1.869
RELAXATION	**Easygoing**	2.15	1.503	2.95	1.650	3.28	1.834	2.70	1.488	3.28	1.527	3.96	1.712
	Chilled out	2.43	1.638	2.64	1.690	3.04	1.712	3.00	1.489	4.06	1.705	4.09	1.561
	Calm	2.66	1.578	2.56	1.782	3.33	1.765	3.06	1.621	4.09	1.704	4.13	1.614
	Relaxation	2.36	1.495	2.25	1.699	3.13	1.759	2.96	1.668	3.49	1.911	4.11	1.729
HAPPINESS	**Happy**	2.43	1.638	2.75	1.806	3.26	1.867	3.00	1.694	3.83	1.836	4.37	1.638
	Satisfaction	2.98	1.687	3.15	1.851	3.48	1.761	3.30	1.852	4.62	1.736	4.61	1.706
	Enjoyment	2.68	1.708	2.63	1.771	3.30	1.737	3.19	1.728	4.27	1.803	4.65	1.663
	Liking	2.70	1.756	2.57	1.717	3.02	1.820	3.17	1.761	4.36	1.932	4.37	1.691
DESIRE	**Wanting**	2.09	1.586	2.52	1.718	2.72	1.559	2.62	1.824	2.65	2.093	3.93	1.705
	Desire	2.06	1.634	2.04	1.409	2.61	1.598	2.43	1.665	2.94	1.880	3.83	1.793
	Craving	1.96	1.560	2.10	1.480	2.39	1.542	2.30	1.667	2.52	1.810	3.43	1.834
	Longing	1.89	1.577	1.74	1.349	2.37	1.420	2.34	1.710	2.30	1.735	3.26	1.843

In what follows, authors describe and analyse the data obtained. Firstly, we will compare the highest and lowest mean values in the three countries in both tasks. Secondly, we will analyse the differences between both tasks within each cultural group, with the use of repeated measures Student t-test. In the case of significant difference in the variances of the two groups, an unpaired, two tailed t-test with Welch's correction was used, and in the rest of the cases, a two tailed t-test was applied. Thirdly, we will compare the scores of the three selected countries in the 32 emotions, in each of the two tasks, by means of an ANOVA test. Finally, we will analyse the scores between pairs of countries in those items that show statistically significant differences, with the use of Student's t-test (again, Welch correction is used).

In order to check for normality and homogeneity, authors performed visual inspections of a plot of the residuals against the fitted values. Apart from that, authors performed a Shapiro-Wilk test for normality of results. These tests were performed to validate the assumptions in ANOVA tests in order to warrantee statistically valid results.

First, authors compared the highest and smallest means in the three cultural groups in both tasks. We note that, with regards to presentation, there is a certain similarity between Norwegians and Spaniards: both groups assign the highest score to Nervous, which indicates that presentation tasks (i.e. PowerPoint like presentations) provoke nervousness in these participants to a greater extent than other emotions. On the Turkish side, the highest ranked emotion is worry. The most reduced scores have been assigned to lonely, sad and rage.

Regarding coding, the highest scores are assigned to satisfaction and enjoyment, which indicates that this task is associated to a greater extent with the emotion of higher order happiness. On the contrary, it is associated to a lesser extent with emotions such as sickened, revulsion or grief, that is, it is considered to a lesser extent a task that arouses disgust and sadness. Table III presents highest and lowest means in the two tasks per country.

TABLE III.   LOWEST AND HIGHEST MEANS IN BOTH TASKS IN THE THREE COUNTRIES

	Presentation		Coding	
	Lowest Mean	*Highest Mean*	*Lowest Mean*	*Highest Mean*
Norway	Lonely (M=1.38)	Nervous (M=4.04)	Sickened and Revulsion (M=1.49)	Satisfaction (M=3.30)
Spain	Sad (M=1.21)	Nervous (M=4.33)	Grief (M=1.20)	Satisfaction (M=4.62)
Turkey	Rage (M=1.98)	Worry (M=3.70)	Sickened M=1.70	Enjoyment (M=4.65)

With this first comparison of means, we observe that presentation tasks seem to be associated with experiences of nervousness and concern, and the task of coding, with experiences of satisfaction and enjoyment.

3.4.1. Intracountry comparison in both tasks

Differences between presentation and coding in Norway.

In order to find out the possible differences between presentation and coding within each country, a comparison of the average scores assigned in each task by the subjects was performed. Findings indicate that there are many significant differences between the two tasks in the three countries, that is, the

participants from each country describe both tasks in a different way. In the case of Norway, there are differences in anger (anger and rage), disgust (nausea), fear (scared, panic and fear), anxiety (in all emotion words) and sadness (lonely). Norwegian participants feel more anger (t (46) = - 2,551, p <.05) and rage (t (46) = - 3.093, p <.05) when they perform coding tasks. On the contrary, they feel more scared (t (46) = 4,118, p <.05), experience more panic (t (46) = 2,656, p <.05), and more fear (t (46) = 2.804, p <.05) in the presentation tasks. Likewise, presenting also produces more nausea (t (46) = 2.278, p <.05), more dread (t (46) = 2.180, p <.05), anxiety (t (46) = 4.379, p <.05), nervous (t (46) = 5.754, p <.05) and worry (t (46) = 2.132, p <.05) compared to coding. Finally, subjects also consider coding task as lonely (t (46) = - 2,282, p <.05) compared to presentation.

In general, Norwegians report fear and anxiety in presentation tasks, while coding is more associated with anger and rage.

TABLE IV.   NORWAY: DIFFERENCES BETWEEN PRESENTATION & CODING

	Emotion words	**Presentation vs. coding**
Anger	Anger	(t(46)=-2,551, p<.05)
	Rage	(t(46)=-3.093, p<.05)
Disgust	Nausea	(t(46)=2.278, p<.05)
Fear	Scared	(t(46)=4.118, p<.05)
	Panic	(t(46)=2.656, p<.05)
	Fear	(t(46)=2.804, p<.05)
Anxiety	Dread	(t(46)=2.180, p<.05)
	Anxiety	(t(46)=4.379, p<.05)
	Nervous	(t(46)=5.754, p<.05)
	Worry	(t(46)=2.132, p<.05)
Sadness	Lonely	(t(46)=-2.282, p<.05)

Differences between presentation and coding in Spain.

Spaniards report more anger (t(80)=-4.229, p<.05), rage (t(80)=-3.576, p<.05), mad (t(80)=-3.395, p<.05) and pissed off (t(80)=-2.797, p<.05), with regards to coding. However, they report also more chilled out (t(80)=-5.789, p<.05); calm (t(80)=-6.191, p<.05) and relaxation (t(80)=-5.253, p<.05) along with more happiness (happy (t(80)=-4.078, p<.05); satisfaction (t(80)=-5.868, p<.05); enjoyment (t(80)=-6.199, p<.05) and liking (t(80)=-7.104, p<.05). Spaniards feel also more desire (t(80)=-3.649, p<.05) and longing (t(80)=-2.702, p<.05).

However, they report more fear in presentation: terror (t(80)=2.434, p<.05); scared (t(80)=4.706, p<.05); panic (t(80)=4.692, p<.05); fear (t(80)=4.969, p<.05). in this task they report also more anxiety: dread

(t(80)=3.558, p<.05); anxiety (t(80)=3,880, p<.05); nervous (t(80)=9.338, p<.05), worry (t(80)=4.277, p<.05).

In general, Spaniards feel angrier in carrying out coding compared to presentation, but coding also produces more relaxation, happiness and desire than presentation. Also, with regards to presentation, they report more fear and anxiety than during the coding activity.

TABLE V.   SPAIN: DIFFERENCES BETWEEN PRESENTATION & CODING

Presentation vs. coding		
Anger	Anger	(t(80)=-4.229, p<.05)
	Rage	(t(80)=-3.576, p<.05)
	Mad	(t(80)=-3.395, p<.05)
	Pissed Off	(t(80)=-2.797, p<.05)
Fear	Terror	(t(80)=2.434, p<.05)
	Scared	(t(80)=4.706, p<.05)
	Panic	(t(80)=4.692, p<.05)
	Fear	(t(80)=4.969, p<.05)
Anxiety	Dread	(t(80)=3.558, p<.05)
	Anxiety	(t(80)=3,880, p<.05)
	Nervous	(t(80)=9.338, p<.05)
	Worry	(t(80)=4.277, p<.05)
Relaxation	Chilled out	(t(80)=-5.789, p<.05)
	Calm	(t(80)=-6.191, p<.05)
	Relaxation	(t(80)=-5.253, p<.05)
Happiness	Happy	(t(80)=-4.078, p<.05)
	Satisfaction	(t(80)=-5.868, p<.05)
	Enjoyment	(t(80)=-6.199, p<.05)
	Liking	(t(80)=-7.104, p<.05)

Desire	Desire	(t(80)=-3.649, p<.05)
	Longing	(t(80)=-2.702, p<.05)

Differences between presentation and coding in Turkey.

Authors find the same pattern in Turkish subjects. In this case, the differences between both the tasks reach to twenty words of emotion. Turkish participants report more anger (t(45)=-2.458, p<.05); rage (t(45)=-2.607, p<.05); mad (t(45)=-2.660, p<.05) and pissed off (t(45)=-2.372, p<.05) in coding. However, they also feel more relaxation and more happiness in coding: easygoing (t(45)=-2.178, p<.05); chilled out (t(45)=-3.409, p<.05); calm (t(45)=-2.396, p<.05), and relaxation (t(45)=-3.064, p<.05); happiness: (happy (t(45)=-3.528, p<.05); satisfaction (t(45)=-3.427, p<.05); enjoyment (t(45)=-4.398, p<.05) and liking (t(45)=-4.149, p<.05). Also, Turkish respondents feel more desire in coding: wanting (t(45)=-3.719, p<.05); desire (t(45)=-3.686, p<.05); craving (t(45)=-3.159, p<.05); longing (t(45)=-2.626, p<.05). On the contrary, they report more fear in presentation: scared (t(45)=2.598, p<.05); anxiety (t(45)=3.338, p<.05); nervous (t(45)=2.720, p<.05); worry (t(45)=2.036, p<.05).

TABLE VI.   TURKEY: DIFFERENCES BETWEEN PRESENTATION & CODING

	Emotion words	Presentation vs. coding
Anger	Anger	(t(45)=-2.458, p<.05)
	Rage	(t(45)=-2.607, p<.05)
	Mad	(t(45)=-2.660, p<.05)
	Pissed Off	(t(45)=-2.372, p<.05)
Fear	Scared	(t(45)=2.598, p<.05)
Anxiety	Anxiety	(t(45)=3.338, p<.05)
	Nervous	(t(45)=2.720, p<.05)
	Worry	(t(45)=2.036, p<.05)
Relaxation	Easygoing	(t(45)=-2.178, p<.05)
	Chilled out	(t(45)=-3.409, p<.05)
	Calm	(t(45)=-2.396, p<.05)
	Relaxation	(t(45)=-3.064, p<.05)
Happiness	Happy	(t(45)=-3.528, p<.05)
	Satisfaction	(t(45)=-3.427, p<.05)

	Enjoyment	(t(45)=-4.398, p<.05)
	Liking	(t(45)=-4.149, p<.05)
Desire	Wanting	(t(45)=-3.719, p<.05)
	Desire	(t(45)=-3.686, p<.05)
	Craving	(t(45)=-3.159, p<.05)
	Longing	(t(45)=-2.626, p<.05)

Considering the results from three cultural groups, although coding tasks may provoke more anger than presentation tasks, coding is also a source of relaxation, joy and satisfaction. On the contrary, presentation tasks produce mainly fear and anxiety. Therefore, there aremore positive aspects attributed to coding than presentation, such as relaxation, happiness and desire.

Differences among the three countries in regards to presentation tasks.

Regarding the comparison of the three countries in presentation tasks, significant differences are found in 12 out of 32 emotions (grossed out; nausea; sickened; revulsion; panic; sad; grief; lonely; empty; easygoing; calm and relaxation):

TABLE VII.   PRESENTATION: ANOVA AMONG COUNTRIES

	Emotion words	**ANOVA**
Disgust	Grossed out	F (2)=3.066, p<.05
	Nausea	F (2)=9.489, p<.05
	Sickened	F (2)=9.122, p<.05
	Revulsion	F (2)=4.019, p<.05
Fear	Panic	F (2)=4.124, p<.05
Sadness	Sad	F (2)=9.414, p<.05
	Grief	F (2)=9.043, p<.05
	Lonely	F (2)=3.892, p<.05
	Empty	F (2)=7.438, p<.05
Relaxation	Easygoing	F (2)=5.854 p<.05
	Calm	F (2)=3.105, p<.05

	Relaxation	F (2)=4.400, p<.05

Turkish participants show higher values regarding the emotions of grossed out, nausea, sickened and revulsion. Thereby, they are feeling a greater degree of rejection linked to the notion of "disgust" in presentation tasks in comparison to Spaniards and Norwegians. Also, Turkish participants also obtain higher values in emotions such as sad, grief, lonely and empty, which are associated with the notion of "sadness". However, they also get a higher value in positive emotions such as easygoing, calm and relaxation which can be interpreted as a kind of "relaxation" in regards to the rest of participants. Finally, Turkish participants get also a high value in the "panic" emotion, when facing presentations. In general, it is possible to conclude that Turkish participants show higher scores in negative emotions such as disgust and sadness, but also experience positive emotions such as relaxation to a greater extent compared to Norwegians or Spaniards.

Then, the following question arises: *How could we explain these differences in positive and negative emotions among the three cultural groups in the presentation task?* In fact, the differences are mainly found in three high order emotions: disgust, sadness and relaxation. The Norwegian and Spaniard participants do not exhibit significant differences in their results. As it is presented in later sections, there are few significant differences between Norwegians and Spaniards in most of the emotions for presentation task while Turkish participants have higher scores in the specific emotions that designate disgust, sadness and relaxation. It is possible to conclude that Turkish participants are more disgusted and saddened by this type of task, but they do not associate these experiences with negative feelings. A possible interpretation could be that the arousal that they experience is rather relaxed, although some of the experiences they feel are negative. These results are similar to the findings in other studies. Indeed, some studies have revealed that emotions such as sadness and disgust are associated with reduced arousal states in Western cultures (Casado, 2006).

Differences among the three countries in regards to coding tasks.

Regarding the comparison of the three countries, we find more significant differences in coding than in presentation. While in presentation tasks there are differences in 12 items, in coding tasks, differences emerge in 20 emotions. Therefore, there are greater differences in coding among the three cultural groups than in presentation.

TABLE VIII.   One-way ANOVA analysis for Coding in Norway, Spain and Turkey.

	Emotion words	*ANOVA*
Disgust	Nausea	F (2)=5.489, p<.05
Fear	Terror	F (2)=3.561, p<.05
	Scared	F (2)=4.983, p<.05
	Panic	F (2)=12.715, p<.05
	Fear	F (2)=8.165, p<.05
Sadness	Sad	F (2)=3.273, p<.05
	Grief	F (2)=6.270, p<.05

	Lonely	F (2)=7.256, p<.05
	Empty	F (2)=9.679, p<.05
Relaxation	Easygoing	F (2)=7.456, p<.05
	Chilled out	F (2)=7.573, p<.05
	Calm	F (2)=6.735, p<.05
	Relaxation	F (2)=4.757, p<.05
Happiness	Satisfaction	F (2)=9.590, p<.05
	Enjoyment	F (2)=9.036, p<.05
	Liking	F (2)=7.312, p<.05
Desire	Wanting	F (2)=7.646, p<.05
	Desire	F (2)=7.244, p<.05
	Craving	F (2)=5.544, p<.05
	Longing	F (2)=4.935, p<.05

Again, it is necessary to study why these differences arise, answering the following questions: *Why do coding tasks raise greater emotional differences? Is coding a more demanding task?* An initial answer is probably positive. Coding requires a high degree of concentration and attention to details, as well as time and effort. A task of these characteristics can trigger a number of emotions.

As previously stated in the case of presentation, the Turkish participants also report higher scores than the other two cultural groups in coding. In particular, they score higher in terror, scared, panic and fear, which suggests that the Turkish participants feel more fear than Norwegians and Spaniards. In addition, Turkish also score higher in sad, grief, lonely and empty, which indicates that they experience greater sadness than Norwegians and Spaniards. However, Turkish participants also experience more relaxation (easygoing, chilled out, calm, relaxation), happiness (satisfaction, enjoyment and liking) and desire (wanting, desire, craving and longing), than Norwegians and Spaniards. In conclusion, the Turkish participants present higher scores in coding tasks in the following emotions: fear, sadness, relaxation, happiness and desire.

These results also show that although coding tasks make Turkish participants feel fear and sadness, they also feel happiness and desire, accompanied by a reduced level of arousal or relaxation. Likely, these emotional differences between positive and negative emotions are due to the "demanding" nature of coding: indeed, as mentioned before, a task that requires high attention and concentration, in addition to a significant investment in time and effort, with long-term results, can generate feelings of anger and frustration.

In general, results exhibit that Turkish participants score higher in all the emotions, showing significant differences in both tasks. Furthermore, they also get higher scores in the remaining emotions, not representing significant differences between the three cultures. However, regarding the notion of nervous

in the task of presentation, although there are no significant differences between the three countries, the Turkish participants score slightly lower.

3.4.2. Comparison between countries

Norway and Spain

Regarding the comparison between Norway and Spain, we observed that significant differences are smaller in presentation than in coding. In fact, we have only found significant differences in nausea (t (126) = 2.814, p <.05), worry (t (126) = - 2.056, p <.05) and easygoing (t (126) = - 2.736, p <.05) in presentation. Spaniards score lower than Norwegians in nausea, indicating that they associate this experience to a lesser extent with the presentation task; and also score higher in easygoing, which would indicate that the task of presentation represents a task that arouses a more relaxed or tolerant attitude among Spaniard participants. Therefore, Spaniards present a more positive attitude toward presentation than Norwegians.

However, significant differences emerge in coding. For Spaniards, coding does not generate as much panic as for Norwegians, who additionally associate more feelings of pain (grief) and loneliness (lonely) with this task than Spaniards. Likewise, the Spaniards seem to feel more relaxed (easygoing, chilled out and calm) and happier (happy, satisfaction, enjoyment and liking) than Norwegians while coding. Therefore, Spaniards seem to have a more positive attitude in coding than Norwegians.

TABLE IX.   SIGNIFICANT DIFFERENCES BETWEEN NORWEGIAN AND SPANIARD PARTICIPANTS IN BOTH TASKS

	Presentation		**Coding**
Disgust	*Nausea (t (126)=2.814, p<.05)*	*Fear*	Panic (t (126)=2.116, p<.05)
Anxiety	Worry (t(126)=-2.056, p<.05)	*Sadness*	Grief (t (126)= 2.011, p<.05)
Relaxation	Easygoing (t(126)=-2.736, p<.05)		Lonely=(t (126)= 2.426, p<.05)
		Relaxation	Easygoing=(t (126)=-2.098, p<.05)
			Chilled out= (t (126)=-3.553, p<.05)
			Calm=(t (126)= -3.331, p<.05)
		Happiness	Happy= (t (126)=-2.527, p<.05)
			Satisfaction=(t (126)= -4.044, p<.05)
			Enjoyment= (t (126)= -3,317, p<.05)
			Liking=(t (126)= -3,462, p<.05)

Turkey and Spain

The comparison between Turkey and Spain shows many more differences in both the tasks than between Norway and Spain. More specifically, in presentation, differences have been found in 15 items, and in coding there are other 18 emotions that present differences between Spaniards and Turkish.

In presentation tasks, Turkish participants assign higher scores to disgust and sadness than Spaniards. However, they feel less nervous than the Spaniards. Likewise, they also assign higher scores in positive emotions such as relaxation (calm and relaxation), happiness (enjoyment) and desire (longing). Therefore, Turkish participants seem to feel more disgust and sadness than Spaniards when it comes to presentation activities, but they also feel more relaxation, enjoyment and desire than Spaniards.

In general, in regards to presentation, Turkish participants score higher in all emotions compared to Spaniards. With the exception of nervous, where Turkish participants seem to feel less nervous than Spaniards during the presentation.

Regarding coding, the Turkish participants feel more disgust (grossed out, nausea, sickened and revulsion), fear (panic) and sadness (sad, grief, lonely and empty) than spaniards, and also feel angrier (anger) and awe (dread). However, Turkish participants feel more easygoing and with more desire (desire).

TABLE X.   SIGNIFICANT DIFFERENCES BETWEEN TURKISH AND SPANIARD PARTICIPANTS IN BOTH TASKS.

	Presentation		Coding
Disgust	Grossed out (t (125)=-2.218, p<.05)	*Anger*	Mad (t (125)=-2.013, p<.05)
	Nausea: (t (125)=-4.038, p<.05)	*Disgust*	Grossed out (t (125)=-2.290, p<.05)
	Sickened (t (125)=-3.600, p<.05)		Nausea (t (125)=-3.230, p<.05)
	Revulsion (t (125)=-2.619, p<.05)		Sickened (t (125)=-2.032, p<.05)
Fear	Panic (t (125)=-2.968, p<.05)	*Fear*	Terror (t (125)=-2.566, p<.05)
Anxiety	Nervous (t (125)=-2.046, p<.05)		Scared (t (125)=-3.011, p<.05)
Sadness	Sad (t (125)=-3.943, p<.05)		Panic (t (125)=-4.834, p<.05)
	Grief (t (125)=-3.985, p<.05)		Fear (t (125)=-3.655, p<.05)
	Lonely (t (125)=-2.207, p<.05)	*Anxiety*	Dread (t (125)=-2.284, p<.05)
	Empty (t (125)=-3.477, p<.05)		Sad (t (125)=-2.571, p<.05)
Relaxation	Calm (t (125)=-2.350, p<.05)	*Sadness*	Grief (t (125)=-3.474, p<.05)
	Relaxation (t (125)=-2.781, p<.05)		Lonely (t (125)=-3.393, p<.05)
Happiness	Enjoyment (t (125)=-2.078, p<.05)		Empty (t (125)=-3.896, p<.05)

Desire	Desire (t (125)=-2.092, p<.05)	Relaxation	Easygoing (t (125)=-2.283, p<.05)
	Longing (t (125)=-2.477, p<.05)	Desire	Wanting (t (125)=-3.535, p<.05)
			Desire (t (125)=-2.601, p<.05)
			Craving (t (125)=-2.729, p<.05)
			Longing (t (125)=-2.944, p<.05)

Therefore, the next question arises: *How can we interpret the highest overall scores of Turkish participants?* The results clearly show that Turkish participants feel more anger, disgust, fear, anxiety and sadness than Spaniard participants. Since coding is sometimes an individual task (although there are trends towards pair or mob programming), these negative emotions can negatively influence the development of the activity, reducing its quality, delaying its completion, affecting the subject's ability to cope with difficulties, minimizing the pace of work, etc. However, Turkish participants seem to feel more desire than Spaniard participants, which could indicate a greater interest in the development of the task.

Norway and Turkey

The differences between the Norwegian and Turkish participants are smaller than those found between Spaniard and Turkish participants. They show differences in 9 items in presentation and 14 items in coding. Again, as stated before, coding tasks show the greatest differences.

Turkish participants feel more disgust (grossed out (t (91) = - 2.092, p <.05); sickened (t (91) = - 2.469, p <.05) and more sad (sad (t (91) = -2.239, p <.05); grief (t (91) = - 2.226, p <.05); lonely (t (91) = - 2.339, p <.05); empty (t (91) = - 2,346, p <.05) in presentation, but they also feel more relaxed and happier. In fact, with regards to the sadness emotion, they show significant differences in the four words that comprise the high order emotion. The differences are also greater in positive emotions, such as relaxation (easygoing (t (91) = - 3,263, p <.05); chilled out (t (91) = - 3.436, p <.05); calm (t (91) = -3.180, p <.05), relaxation (t (91) = - 2.273, p <.05)), happiness (happy (t (91) = - 2.295, p <.05); satisfaction (t (91) = - 3.548, p <.05); enjoyment (t (91) = - 4.153, p <.05); liking (t (91) = - 3.349, p <.05) and desire (wanting (t (91) = - 3.597, p <.05); desire (t (91) = - 3.905, p <.05); craving (t (91) = - 3.130, p <.05); longing (t (91) = -2.497, p <.05)), showing differences in all of the high order emotions. This situation can indicate that the Turkish participants feel more relaxation, happiness and desire during the development of coding tasks.

TABLE XI.   SIGNIFICANT DIFFERENCES BETWEEN NORWEGIAN AND TURKISH PARTICIPANTS IN BOTH TASKS

	Presentation		Coding
Disgust	Grossed out (t(91)=-2.092, p<.05)	*Fear*	Panic (t(91)=-2.266, p<.05)
	Sickened (t(91)=-2.469, p<.05)	*Sadness*	Empty (t(91)=-2.324, p<.05)
Sadness	Sad (t(91)=-2.239, p<.05)	*Relaxation*	Easygoing (t(91)=-3.774, p<.05)

	Grief (t(91)=-2.226, p<.05)		Chilled out (t(91)=-3.436, p<.05)
	Lonely (t(91)=-2.339, p<.05)		Calm (t(91)=-3.180, p<.05)
	Empty (t(91)=-2.346, p<.05)		Relaxation (t(91)=-3.269, p<.05)
Relaxation	Easygoing (t(91)=-3.263, p<.05)	*Happiness*	Happy (t(91)=-3.963, p<.05)
	Relaxation (t(91)=-2.273, p<.05)		Satisfaction (t(91)=-3.548, p<.05)
Happiness	Happy (t(91)=-2.295, p<.05)		Enjoyment (t(91)=-4.153, p<.05)
			Liking (t(91)=-3.349, p<.05)
		Desire	Wanting (t(91)=-3.597, p<.05)
			Desire (t(91)=-3.905, p<.05)
			Craving (t(91)=-3.130, p<.05)
			Longing (t(91)=-2.497, p<.05)

3.4.3. Gender differences

Before reviewing gender data, authors want to underline two aspects. Firstly, the uneven sample among genders. Secondly, the lack of consideration of social environment in the study that could, for instance reward extraverted behaviour in men and introverted behaviour in women.

INTERCOUNTRY DIFFERENCES

Regarding the analysis of gender differences, we will first analyse the three countries in both tasks, using a one-way ANOVA. Secondly, we will compare genders of the three countries as a whole. Finally, we will compare men and women in both tasks in each of the three countries.

Among the three countries, we have found gender differences in both tasks, with the exception of scared (f (2) = 5.506, p <.05) and wanting (f (2) = 5.606, p <.05) for presentation tasks, and the emotion of wanting (f (2) = 4.752, p <.05) for coding.

The application of Student's t-test is then used to confirm these results comparing all men to all women in the three countries. The results indicate that significant differences are only found in scared and wanting for presentation tasks, and differences in wanting for coding tasks. The mean comparison between groups also reveals that males feel less frightened (t (172) = - 2,347, p <.05) and with more desire (t (172) = 2,629, p <.05) in presentation. However, women show more desire or interest in coding tasks (t (172) = - 2.180, p <.05).

INTRACOUNTRY DIFFERENCES

Gender differences in Norway

In the case of Norwegians, significant differences between genders in both tasks can be observed. In presentation, Norwegian males score higher in anger, rage, mad and pissed off (all under high level emotion

anger). It is the only emotion that presents differences between genders for presentation in this culture. In regards to coding, significant differences are presented in pissed off, disgust (in two variants: sickened and revulsion), terror, anxiety and desire. Therefore, coding tasks generate more pissed off, sickened, revulsion, terror, anxiety and desire for Norwegian males than for Norwegian women. Thus, this task produces more negative emotions in males than in females.

TABLE XII.   DIFFERENCES BETWEEN NORWEGIAN MEN AND WOMEN IN BOTH TASKS

	Presentation		Coding
Anger	Anger (t (45)= 2.605, p<.05).	*Anger*	Pissed off (t (45)= 3.072, p<.05).
	Rage (t (45)= 2.036, p<.05).	*Disgust*	Sickened (t (45)= 2.698, p<.05).
	Mad (t (45)= 3.005, p<.05).		Revulsion (t (45)= 2.912, p<.05).
	Pissed off (t (45)= 3.628, p<.05).	*Fear*	Terror (t (45)= 2.580, p<.05).
		Anxiety	Anxiety (t (45)= 2.371, p<.05).
		Desire	Desire (t (45)= 2.085, p<.05).

Gender differences in Spain

Spaniard present less significant differences between genders than Norwegians. In regard to presentation, Spaniard men and women differ only in scared. Spaniard women feel more scared in this type of task (t (79) = -2.662, p <.05). Regarding coding tasks, they mainly differ in two emotions: wanting (t (79) = -3.254, p <.05) and longing (t (79) = -2.101, p <.05), which indicates that Spaniard women express greater desire for this task than Spaniard men.

TABLE XIII.   DIFFERENCES BETWEEN SPANIARD MEN AND WOMEN IN BOTH TASKS

	Presentation		Coding
Fear	Scared (t (79)= -2.662, p<.05).	*Desire*	Wanting (t (79)= -3.254, p<.05).
			Longing (t (79)= -2.101, p<.05).

Gender differences in Turkey

In regards to coding, Turkish men and women differ in the emotion of terror, which indicates that Turkish men feel more fear or terror than Turkish women. Regarding presentation tasks, the differences are greater: Turkish women feel more fear (t (44) = - 2,720, p <.05) and worry (t (44) = 3,351, p <.05), than Turkish men. However, Turkish males feel more Calm (t (44) = 2.611, p <.05); more happiness-happy (t (44) = 2.074, p <.05); more satisfaction (t (44) = 2.349, p <.05); more enjoyment (t (44) = 2.365, p <.05).) and wanting (t (44) = 2.404, p <.05) than Turkish women.

TABLE XIV.   DIFFERENCES BETWEEN TURKISH MEN AND WOMEN IN BOTH TASKS.

Presentation	Coding

Fear	Fear (t (44)=-2.720, p<.05).	Fear	Terror (t (44)= 2.628, p<.05).
Anxiety	Worry (t (44)= 3.351, p<.05).		
Relaxation	Calm (t (44)= 2.611, p<.05).		
Happiness	Happy (t (44)= 2.074, p<.05).		
	Satisfaction (t (44)= 2.349, p<.05).		
	Enjoyment (t (44)= 2.365, p<.05).		
Desire	Wanting (t (44)= 2.404, p<.05).		

In general, Norwegian and Turkish participants exhibit the bigger differences between genders. On the contrary, Spaniard participants present just a few differences. In Norwegian participants, men show more negative emotions than women and they get angrier in both tasks, presentation and coding. Furthermore, they also feel more disgust, fear and anxiety than women. The only positive emotion in which they stand out is in *Desire*, which indicates that they feel more desirous in coding tasks than women. Finally, Turkish men feel more fear or terror in coding tasks than women. However, they also feel more fear and concern about presentation tasks. Finally, Turkish males present lower scores in other positive emotions, such as calm, happy, satisfaction, enjoyment and wanting.

4. Discussion

In general, our study shows that presentation is associated with negative emotions like nervous or worry in the three countries. These results are in line with previous findings inside the computing field (Nazligul et al., 2018) or outside it (García-Pastor and Miller, 2019; Tóth, 2019). In these works, anxiety is the emotion reported and in the same line, in our study, Anxiety is the high-level emotion that gathers the two aforementioned low level emotions (nervous and worry). However, it is also true that positive aspects like, for instance, satisfaction, enjoyment and calm are also reported by respondents. Subjects describe presentation tasks like hard challenges in which they feel anxiety, and by contrast, they also report satisfaction. This finding indicates that, although doing a presentation is a task that could lead to anxiety, at the same time represents a happy experience, especially when the result is positive. In previous works, in this case in the second language teaching, Tóth (2019) reported anxiety as one of the main emotional responses during presentation tasks, but also combined with positive feelings and emotions like, for instance, achievement and joy.

With regards to coding activities, the highest scores are assigned to satisfaction and enjoyment, which indicates that this task is associated to a greater extent with the emotion of higher order happiness. The effects of happiness in software engineering have been studied recently in the literature (Graziotin et al., 2014, 2017a, 2018). In our study, positive emotions under happiness are reported by subjects, meaning a positive sigh of alignment of the expectations of students with the coding task. However, there are also emotions with negative valence reported as intense by respondents. This is the case of mad or anger.

Previous research (Gachechiladze et al., 2017) showed the importance of anger feelings for software workers. Thus, authors understand that it is necessary to deeply assess the role of intense negative emotions in software practice such as anger and "frustration", which is an emotion word absent in this chosen list. Frustration was the most reported negative emotion in a previous study by Wrobel (2013). This author points at anger as the second most reported negative emotion by software practitioners. Authors underline the need to investigate the effects of the use of a specific emotion measurement scale in results and their interpretation. Given that frustration was not among the list of emotions in the DEQ, authors believe that, although more research is needed, there must be a connection between frustration and anger in the responses provided by subjects. Nevertheless, it is interesting to analyze the role of anger and frustration in software engineers' job processes with more detail. A first conclusion can be that a high satisfactory activity such as coding, with high scores in happiness and relaxation, is compatible with emotions such as anger, because although we are enjoying a certain activity, we may feel anger and frustration too.

With regards to differences among countries, there are few significant differences between Norwegians and Spaniards in seven of the emotions for presentation task while Turkish participants have higher scores in the specific emotions that designate disgust, sadness and relaxation. Results show that Turkish participants score higher in all the emotions. Therefore, we can conclude that Turkish participants intensely experience different emotions, more than the other two cultural groups, when it comes to presentation. Moreover, the Turkish participants also report higher scores than the other two cultural groups in coding. In particular, they score higher in terror, scared, panic and fear, but also the experiences of relaxation, happiness and desire are greater in Turkish participants than in the other two cultural groups. In conclusion, the Turkish participants present higher scores in coding tasks in fear, sadness, relaxation, happiness and desire. In the cultural comparison, authors would like to underline that there are not antecedents in the literature to analyse and compare. However, being Turkey a collectivistic country in cultural terms (Hofstede et al., 2010), these findings are not aligned with previous studies. Individualism-collectivism is an accurate dimension for predicting differences in the way people report emotional reactions. In individualistic countries, results show in average higher levels of reported emotional intensity (Fernández et al., 2000). As a consequence of this lack of fit, authors would like to devote more research in the topic to dig deeper into this apparent contradiction.

Finally, with regards to gender differences, our results indicate that significant differences can be only found in scared and wanting for presentation tasks, and differences in wanting for coding tasks. Although these differences are found in just 2 of the 32 emotions, it is important to not there are differences. This finding is in line with previous literature on the topic, that reported differences among men and women in the reporting of intensity of emotions (Brebner, 2003), reporting higher intensities among men. Focussing on coding, literature also reported differences in self perceptions between men and women (Beyer, 2008; Busch, 1995). However, recent literature reported higher intensities in emotions like frustration in programming between genders (Lishinski et al., 2017), an aspect that is not supported by our results (in spite we are not asking for frustration as an emotion in the DEQ questionnaire).

In this paper, authors are presenting results with a significance for software practitioners and students alike. Although it is true that the sample is composed by students, as underlined in the next section, our results could be applicable for practitioners. National cultures lead to different expressions of emotion and, although personal differences are not considered in this work, results show clear trends worth to note. These differences, for instance in emotional intensity, must lead to managerial considerations in the composition of teams containing workers from these three cultures or judging students coming from these three countries. This is important in the design of Global Software Development teams, but also in the duties of software engineering academics with diverse alumni (for instance in the composition of classes with high presence of exchange students e.g. Erasmus Students). In the professional field, globalization and workers' mobility have been a trend in the whole IT sector and increasing diversity is one of the consequences of this fact. Managing a diverse workforce in an effective way implies a broader understanding of the emotional responses of professionals. A lack of understanding could lead to cultural discrimination in the

workplace. This work is aimed to shed some light into the different emotional responses to bridge the gap in both directions towards a common understanding, one of the cornerstones of diverse work environments.

With regards to gender issues, authors are aligned with the previous observations on the cultural side of the study. Although the limitations in sample size are important in our study, results show differences between genders. In the study there is also a need to expand the sample to include also non-binary gender subjects. In spite of these limitations, there are tangible differences in the emotional responses between men and women. These differences combined with the ones coming from the different cultures are making the management of diverse teams even more complicated. However, in order to build sound managerial procedures for both practitioners and students, these aspects must be taken into account.

5. Limitations

There are several limitations worthy of mention. First, the small number of participants in the three samples, and the uneven sample distribution: while the Spaniard sample is the biggest (N = 81), the samples from Norway (N = 47) and Turkey (N = 46) are smaller. With these differences in numbers, the comparisons are less conclusive. Likewise, the differences between men and women in each sample are also important, although aligned with trends in gender balance in the discipline (Carver et al., 2018; Gorbacheva et al., 2019): in all cases, the female representation is much smaller. This aspect also complicates comparisons and conclusions. Also, it is true that the size of the three samples is not homogeneous.

Furthermore, it is difficult to generalize contexts and population: the participants are university students in computing, and although they know the discipline, they are not professionals. As a consequence, we have to ask ourselves if these results would be similar in the case of software practitioners and be cautious on the generalization of results to professionals. Another aspect to consider is the fact that the sample was obtained by means of random sampling. A possible threat of validity comes from this random sampling. Authors assume that a stratified random sampling with proportional allocation using the University as a stratum could be adopted instead.

Other aspect to consider in the assessment of internal validity is the fact that this study compares two treatments among each other but without a baseline to get a "true" measure of the emotions in the two tasks. In other words, the differences are considered in absolute terms rather than as a difference between the actual emotion and what the participant perceives during a task. Authors assume that taking a first measurement on a baseline for a given emotion could reduce internal validity threats. However, we also believe that the current setup is acceptable for the nature of this study.

We can also point out other types of limitations, linked to the instrument used, namely, the DEQ. This questionnaire presents remarkable reliability and validity, according to the authors´ tests. However, it is also true that some aspects of emotions are not reflected in the questionnaire, such as the experience of frustration related to the emotion of anger, and the generic notion of arousal. However, these more specific aspects will be mentioned in greater detail in the following section.

Digging deeper into construct validity, the survey was not administered after or during the presentation and coding task and subjects were asked to recall their emotions. This approach could bias results in a variety of ways, being the fading affect bias (Walker and Skowronski, 2009) maybe the most prominent one. In this bias, memories associated with negative emotions tend to fade away compared to positive ones. Authors assume this threat but, in order to reduce it, assured that questionnaires were administered in a course in which both coding and presentation occur. Moreover, the questionnaire was administered by the end of the course, ensuring that presentation and codification activities have been experienced by subject in recent times. More specifically, the questionnaire was circulated among students right after the final presentation, ensuring that, at least one of the two activities was recent and that affect bias was minimized in this case. However, authors assume the threat of validity coming from the fact that one of the two activities was performed not just before students filled the questionnaire. Nevertheless, taking into account

that sample is composed by students in the third year of a computing bachelor, respondents are exposed to coding tasks in a regular basis.

Another aspect to consider in construct validity is the fact that participants answer 64 Likert-type questions and this could be boring and could lead to fatigue in the last set of questions. In order to reduce this threat, authors assisted students in the task, who volunteer themselves for the task. A way to tackle this aspect in a radical way is the administration of the questionnaire in two different times connecting questionnaires with tasks (coding or presenting). Another effect in this approach is the reduction of the fatigue of respondents.

Finally, the authors want to underline the limitation assumed in the description of emotional experiences with isolated words describing complex emotions. The real nature of the emotional relationship of people with tasks is complex enough so that this procedure, although informative, is limited.

To sum up, regarding internal validity, although students present a comparable level of knowledge, it is true that a previous check devoted to assure a similar level of knowledge would alleviate this internal threat of validity. With regards to external validity, authors assume, as underlined before, the limited number of subjects complicates generalization of the results. With respect to subject representativeness, the sample was not taken in a random way and it is not including software workers. In this regard, recent works point out that students can be a valid simplification in experiments (Falessi et al., 2018). However, given that the sample is made of students, the generalization of results to software workers might present a threat of interaction of selection and treatment as stated by Fucci et al. (2020). Moreover, authors have not tackled the fact that emotions of students might differ from the emotions that practitioners experience in the workplace. In any case, authors believe that this study could be used as a pilot to investigate how emotions change from students to professionals. Furthermore, with regards to the Interaction of Setting and Treatment threat, this can impact the results of our work given that both tasks are non-real-world tasks and are performed by students.

6. Conclusions and future works

Authors have obtained a different emotional evaluation of coding and presentation, that is, these two tasks provoke different emotional experiences. And these differences have been found in the three cultures analysed. In the case of coding, it has been described as a task that provokes anger in different intensities, but also arouses joy and satisfaction, and even relaxation. On the contrary, presentation produces, above all, fear and anxiety. Therefore, although at first, we could think that coding is a more demanding task, positive emotional qualities are attributed to it too. Results show that both the tasks (presentation and coding) are judged as important activities because they are described with intense emotion words. Moreover, although presentation is assessed as an anxious activity, participants emphasize the positive experience when they manage to handle the task successfully. As a consequence, authors would like to underline the importance of the development of public speaking skills among bachelor and master students in the field. In addition, authors aim to develop more studies focusing on the role of negative intense emotions such as anger, rage or frustration in software practice, to minimize its negative effects in software development.

Regarding the second research question, our study reveals that there are differences in the perception of emotions among cultures. Authors have found differences both in the global comparison among the three cultures and in the dual comparisons between them. In general, Turkish participants assign higher scores to all emotions, whether or not they present significant differences. That is, Turkish subjects seem to experience more intense emotional experiences than Norwegians and Spaniards, in both positive and negative emotions. These aspects need to be studied and backed up with bigger samples.

With respect to dual comparisons, Spaniards and Norwegians present fewer differences between them, however, Spaniards show more positive emotions towards both tasks, feeling more relaxed and happier,

and also feel less fear and sadness than Norwegian participants. On the other hand, as we have already pointed out, the Turkish participants outnumber the other two cultural groups in emotional intensity. This intensity can be beneficial for the development of work if the emotion is positive, as in the case of happiness and satisfaction, but counterproductive, as in the case of anger. Therefore, knowing the emotional profile of people and cultural groups can be relevant in the work context for assigning tasks and organizing teams. In general, Spaniards represent an emotional relationship with the selected tasks more balanced than Norwegians and Turkish. As stated before, these conclusions must be studied in deep in future works with bigger samples.

Regarding the third research question: Are there differences between genders in the perceptions of emotions in these tasks? The answer is equally affirmative, that is, differences have been found between men and women in the emotional consideration of both the tasks.Regarding the overall comparison of the three countries, the differences between men and women indicate that men feel less frightened and more comfortable in presentation tasks, and it is women that like coding more. These general results are also observed in the analysis of Norwegian and Spaniard cultures. Norwegian women feel less anger in the tasks of presentation, and less negative emotions such as anger, fear or anxiety towards coding. The Spaniards feel more frightened in the tasks of presentation, but with more openness for coding. Similarly, in the Turkish sample, men also feel less fear and concern about the presentation task than women, but they feel less negative emotions while coding.Therefore, men seem to have a more positive attitude toward presentation, even if it generates more anger, and it is women who show a more positive attitude towards the task of coding.

After all of the analyses, authors can obtain several relevant conclusions:

(i) In general, coding is considered more satisfactory, despite its level of demand and being a source of anger. This result suggests that in both academic and professional contexts, it is important to provide psychological training to manage the experiences of anger and frustration that seem inevitable in tasks like this.

(ii) In general, presentation generates fear and anxiety. This result suggests that it is necessary to improve the training of future and current professionals in tasks that require communication skills.

(iii) According to the results of gender differences analysis, women are more likely to feel more comfortable and less negative emotions, such as anger, in coding tasks. With respect to presentation, males are more likely to feel more comfortable speaking in public.

It is also interesting to note that, although in our study we have not connected emotions with outcomes, the moderate intensity of Spaniards compared to the other cultures deserves further investigation.

In future research, this procedure of emotional task analysis can be extended to other activities and to other cultures, obtaining a broader knowledge of the spectrum of activities involved in software development from a multicultural perspective. In addition, in future studies, it is convenient both to increase the number of participants and include a greater percentage of women. Balancing the number of men and women will favour the validity of the results. But undoubtedly one of the most important aspects is to apply this procedure to the professional population, to minimize the biases represented by the population of students.

Finally, our medium and long-term intention is to establish a solid procedure for evaluating the emotions of software professionals, in order to favour the assignment of tasks and the management of both local and global teams in the workplace.

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