1. Introduction

Information from witnesses is, in many cases, the cornerstone of a criminal investigation (Milne & Bull, 1999, 2006; Sarwar, Allwood & Innes-Ker, 2014). Nonetheless, cases of mistaken identification have questioned the reliability of eyewitness memory. Research over the last few decades has contributed to recognise that, contrary to common beliefs, memory is fallible (Simons & Chabris, 2011). Research based on estimator variable has aided criminal justice practitioners to estimate, post hoc, the likelihood of obtaining an accurate testimony from a particular witness (Wells, 1978; Wells & Olson, 2003). With that aim, a substantial amount of literature reports the various effects upon eyewitness testimony of a range of variables such as (i) gender (Areh, 2011; Herlitz & Rehnman, 2008; Horgan, Mast, Hall, & Carter, 2004; Rehnman & Herlitz, 2007; Vredeveldt, Knol, & Van Koppen, 2015); (ii) age (Bartlett & Memon, 2007; Granhag, Ask, & Giolla, 2014; Wright & Holiday, 2007); (iii) own-group bias (Rehnman & Herlitz, 2006; Rhodes & Anastasi, 2012); and (iv) the duration of the event (Fahsing, Ask, & Granhag, 2004; Memon, Hope, & Bull, 2003; Palmer, Brewer, Weber, & Nagesh, 2013) (For an overall review see Meissner, Sporer, & Schooler, 2007). Although this extant literature has provided scientific knowledge of the influence that these variables may have on memory, there are two variables that are rarely researched together in the area of eyewitness testimony: violence and personality.

1.1. Violence

A scarce number of experimental studies have studied the effect of violence on eyewitness memory. These studies have tended to find that memory is less accurate for those criminal acts in which physical injury takes place (Clifford & Hollin, 1981; Clifford & Scott, 1978; Milne & Bull, 1999). Furthermore, physical violence appears to influence the effect that the sex of the protagonist and the number of perpetrators may have on memory accuracy (Clifford & Hollin, 1981; Clifford & Scott, 1978; Milne & Bull, 1999). Contrary to these results, Wagstaff et al. (2003) carried out an archival study and found a weak but positive correlation between level of violence and accuracy in the description of some of the offenders' physical characteristics. This discrepancy in the results between experimental (Clifford & Hollin, 1981; Clifford & Scott, 1978) and archival (Wagstaff et al., 2003) studies can be due to differences in the sample and the crime. Whereas Clifford and Hollin (1981) and Clifford and Scott (1978) used a student

sample to examine memory performance for robberies and fights, Wagstaff et al. (2003) examined memory performance with real victims of robbery, sexual assault and rape. Both rape crimes and sexual assaults are considered to involve higher levels of stress than a robbery or a fight (Kilpatrick et al., 1985; Please, 1988) and therefore, discrepancies in results may be due to the differences in the level of violence witnessed.

1.2. Personality

Previous studies have found that some individual differences in personality traits such as memory, attention to detail, intellectuality curiosity or self-control influence memory performance in areas such as offender identification and suggestibility (Andersen, Carlson, Carlson, & Gronlund, 2014; Liebman et al., 2002; Pires, Silva, & Ferreira, 2013; Ward & Loftus, 1985). Nonetheless, just a few studies have examined the effect of personality domains on memory performance. Extraversion is one of the most studied domains but research has found mixed results. Ward and Loftus (1985) and subsequently, Areh and Umek (2004) found that personality traits of extraversion increased memory performance. In contrast, Madsen and Holmberg (2015) found that extraversion decreased the quantity of information recalled, whereas Liebman et al. (2002) found no relationship between both variables. Similarly, mixed results are also found for the personality domains of Openness and Neuroticism (Liebman et al., 2002; Madsen & Holmberg, 2015). These discrepancies in results may be due to either the nature of event examined or the instruments used to measure personality.

1.3. Aims and objectives

From previous studies examining violence and personality it is difficult to draw a clear picture of how either of these variables may influence memorial performance. Furthermore, research on violence suggests that the relation between violence and memory accuracy may be affected by other estimator variables such as the sex of any protagonist or the number of perpetrators involved (Clifford & Hollin, 1981; Clifford & Scott, 1978). As such, it seems reasonable to hypothesise that the relationship between violence and memory performance could be also influenced by some personality traits. Unfortunately, there is no existing study, as far as we know, that has examined the possible relationship among these three variables. The main aim of the present investigation is to palliate these three research gaps. As such, the present study will examine (i) the possible effects that physical violence has on eyewitness memory

performance; (ii) any relationship between personality domains and memory performance; and (iii) any inter-relationships between physical violence, personality and memorial performance. Because of the different definitions of the term 'violence' (Larsson & Gill, 2013), it is necessary to clarify that in this study, criminal acts that involve actual physical aggression will be considered as violent crimes whereas those events in which acts of physical aggression are not present will be referred as non-violent crimes. Considering previous research, it is hypothesised that the presence of such violence in a crime will be associated with a decline of memory performance (Clifford & Hollin, 1981; Clifford & Scott, 1978; Milne & Bull, 1999). It is also hypothesised that personality traits will influence eyewitness memory (Areh & Umek, 2004; Madsen & Holmberg, 2015; Ward & Loftus, 1985). Finally, it is hypothesised that the relationship between witness' personality and memory accuracy will be influenced by the presence of violence.

2. Methodology

2.1. Material

2.1.1. HEXACO Personality Inventory Revised (HEXACO-PI-R) (Lee & Ashton, 2004)

First, an instrument was used to measure personality of the participants. This instrument is a 100-item auto administrated questionnaire that, using a five-point Likert scale (were 1=strongly disagree and 5= strongly agree) assesses the six major dimensions of personality: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness and Openness to Experience. Four different facets compose each dimension. The Honesty-Humility domain gathers the following facets: sincerity, fairness, greed avoidance and modesty. The Emotionally domain gathers the following facets: fearfulness, anxiety, dependence and sentimentally. The Extraversion domain gathers the following facets: expressiveness, social boldness, sociability and liveliness. The Agreeableness domain gathers the following facets: forgiveness, gentleness, flexibility and patient. The Conscientiousness domain gathers the following facets: organization, diligence, perfectionist and prudence. Finally, the Openness to

experience domain gathers the following facets: Aesthetic appreciation, inquisitiveness, creativity and unconventionality[1].

2.1.2.Videotape

As stimuli research participants viewed two different videotapes of the same crime. Both videotapes recorded the argument between two groups. Three young males composed one of the groups while two girls and two boys composed the other group. The only difference between the two videotapes was that, in one of them, physical aggression appeared (violent) whereas, in the other one, there was no physical aggression (non-violent). Therefore, whereas in the non-violent videotape, of 1'08'' duration, the two groups were having a verbal dispute and displaying threats towards each other, in the violent videotape, of 1'23'' duration, two of the males involved in the argument physically assaulted (i.e. punches and kicks) one of the other males involved in the fight.

2.1.2. Self-Administrative Interview (SAI)

In order for the research participants to record their memory of the 'criminal incident' they were asked to complete the SAI. The SAI is an evidence-based investigative tool to be completed by the eyewitness in a paper format, enabling them to provide and capture, in their own words, a full account of what they have just witnessed (Gabbert, Hope, Fisher, & Jamieson, 2012). The SAI follows a similar structure of the Cognitive Interview (CI) and shares the same principles (Gabbert et al., 2012). The SAI has been tested in both field and laboratory studies proving to be an effective tool that obtains similar results with regard to memory recall as the CI (Gabbert, Hope, & Fisher, 2009; Gabbert et al., 2012; Hope, Gabbert, & Fisher, 2011). The tool is composed of the following eight parts:

1. Physical and personal contextual reinstatement.
2.Free recall of the incident and instructions to do not guess.
3.Description of the perpetrator
4.Encouragment to sketch the scene as they remember.
5.Identification and description of any other person involved in the crime or any other potential witness.

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[1] For a detailed definition of each dimension and facet see http://hexaco.org/scaledescriptions

6.Descritpion of any vehicle present in the scene.
7.Description of the contextual conditions in which the crime was witnessed.
8.Ecouragement to give any other detail that the witness may think it is relevant[2].

2.2. Sample

After being given ethical clearance from the authors' home University to carry out this research, the first author (during a lecture to Undergraduate Criminology students) explained to the 53 students, who agreed to take part in the study, the purpose of the research. They were asked for their participation without receiving any kind of incentive.

2.3. Procedure

Research participants were asked to complete the HEXACO-PI-R, being instructed not to look at their neighbour's answers. The first author ensured that participants complied with this request. Once the inventory had been completed by all participants, they were randomly divided in two groups, Group A and Group B. Participants were told that they were about to watch a videotape, but none of them were advised of the content of the videotape in order to eliminate the sense of expectation. Group A were asked to stay in the classroom, while Group B were asked to wait outside the classroom. Group A watched the non-violent videotape and once it was finished, they were also asked to wait outside. They were advised of the importance of not discussing the content of the videotape with their student colleagues. Group B were then asked to return and participants from that group watched the 'violent' videotape. Once Group B had watched the videotape, Group A were asked to return to the class and participants of both groups were then given the SAI to complete. As such, all participants were unaware, beforehand, what details the SAI would require them to recall. Once again, the group was instructed not to look at their neighbour's answers and as the first author was present, it was again ensured that participants complied with this request. Once all the participants completed the SAI, the instruments were collected.

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[2] SAI's instructions and questions can be visualised in greater detail in the following link:
http://www.gmp.police.uk/live/Nhoodv3.nsf/WebAttachments/C81EBBB143CBDB3280257B970033A5EB/$File/SAI%20Form%20Dec%202009.pdf

2.4. Analysis

2.4.1. Recall coding

Memory recall was coded following the scoring template used by Wright and Holliday (2007) in their study. Objective Information (OI) was classified into four different categories: Actions (A), Persons (P), Objects (OB) and Settings (S). The first author, highly familiar with the literature (through her academic studies) undertook to be the primary scorer of the data, measuring how many objective details were recalled for each category. Subjective information was not scored and repeated information was collected just once. An independent coder, previously trained by the first author to be familiar with the measurements used in the study, scored 10% of the sample and inter-reliability was calculated using Cohen's Kappa for all categories. Kappa values were significant for all categories ($p < .001$). Memory accuracy was calculated as the sum of correct and objective recalled details, divided by the total number of objective details.

3. Results

Of the 53 participants, 58.5% of the participants were females (n=31) and 41.5% were males (n=22), with an average age of 23.62 years old (SD= 8.13). In order to examine the information recalled by each participant, the objective information (OI) was categorised in four main categories: Action (A), Person (P), Setting (S) and Object (O). Three categories were used to examine memory performance: total information recalled (T), that is, both correct and incorrect information, correct information recalled (C) and memory accuracy (MA), that is, the correct details divided by the total number of details.

3.1. Descriptive analysis

Examination was turn made of (i) total information recalled, (ii) correct information recalled, and (iii) memory accuracy. In each of these analysis, where differences between gender where examined of A, P, S, OB and OI items, no significant differences were found between males and females concerning these five items when measuring along these three scales.

3.2. Violence and memory performance

The effects of physical violence on memory recalling and memory accuracy were analysed. Results found that physical violence has little effect on the quantity and the accuracy of the information recalled. When comparing the quantity of information recalled for violent and non-violent conditions with the general sample, as Table 1 displays, the mean of total and correct Objective Information recalled in violent conditions were above the mean of total and correct information recalled for the total sample, while in non-violent condition, the mean of total and correct OI recalled were less than the mean figure for the total information recalled and also the correct information recalled. The higher mean value of information recalled in the violent condition and the lower mean value of information recalled in the non-violent condition compared with the general mean was a pattern repeated in all the categories except for S. In each of the categories (i.e. A, P, OB, and S) where differences between violent and non-violent conditions where examined, no significant differences were found except for Actions in which participants recalled significantly more correct and total details in violent conditions than in non-violent. Examining memory accuracy, no significant differences were observed between violent and non-violent conditions. Neither were significant differences found between genders for each of the experimental conditions, nor between violent and non-violent conditions when examining males and females separately.

Table 1. Comparison of memorial performance among general sample, non-violent conditions and violent conditions

	General sample Mean (SD)	**Non-violent Mean (SD)**	**Violent Mean (SD)**
Action			
C	13.46 (8.11)	10.79 (6.77)*	16.67 (8.55)*
T	14.19 (8.24)	11.517 (7.02)*	17.42 (8.58)*
MA	.94 (.09)	.93 (.10)	.95 (.07)
Person			
C	23.17 (10.54)	22.14 (10.84)	24.42 (10.26)
T	24.11 (10.92)	23.00 (11.31)	25.46 (10.52)
MA	.96 (.05)	.96 (.05)	.96 (.05)
Setting			
C	14.98 (8.28)	16.14 (9.83)	13.58 (5.82)
T	15.25 (8.40)	16.41 (9.93)	13.83 (5.98)
MA	.99 (.03)	.99 (.03)	.99 (.04)
Objects			

C	7.30 (5.88)	7.04 (5.28)	7.63 (6.64)
T	7.94 (6.15)	7.52 (5.38)	8.46 (7.06)
MA	.87 (.23)	.88 (.21)	.87 (.26)
Objective Information			
C	59.11 (26.00)	56.10 (28.56)	62.75 (22.58)
T	61.49 (26.51)	58.45 (29.40)	65.17 (22.60)
MA	.96 (.04)	.96 (.04)	.96 (.44)
	N=53	**n=29**	**n=24**

*p< .05

3.3. Personality and memory performance

The second aim of the present study was to examine the relationship between personality and memory performance. Personality was classified in six major domains, Honesty (H) (M=3.36, SD= .57), Emotionality (EM) (M=3.22, SD= .59), Extraversion (EX) (M= 3.09, SD= .56), Agreeableness (AG) (M= 2.87, SD= .53), Conscientiousness (C) (M= 3.53, SD= .55), Openness (OP) (M= 3.18, SD= .60), plus the domain of Altruism (AL) (M= 3.68, SD= .68). When examining personality differences between genders, the only significant difference were found for the OP domain were males (M= 3.273, SD= .417) presented significantly more OP traits than females (M=3.112, SD= .704). No significant differences were found for personality domains between either of the experimental conditions. When examining the relationship between personality domains and memory performance, as Table 2 shows, only the Honesty domain was correlated with both correct and total information recalled for S.

Table 2. Spearman's correlation personality and memory performance

	H.	**EM.**	**EX.**	**AG.**	**C.**	**OP.**	**AL.**
ACTION							
Correct	.21	-.24	-.04	-.14	.12	-.025	-095
Total	.20	-.22	-.05	-.12	.1	.012	-.097
Accuracy	.17	-.06	.05	.00	.08	-.125	-.054
PERSONS							
Correct	.11	.01	-.08	-.06	.02	.001	.067
Total	.09	.05	-.07	-.09	.02	.034	.187
Accuracy	.06	-.13	.00	.27	-.01	-.241	.086
SETTING							
Correct	.28*	-.05	-.01	.04	.00	.168	.075
Total	.31*	-.05	-.01	.03	.00	.146	.075
Accuracy	-.14	.08	.01	-.03	.00	.080	.094

OBJECTS							
Correct	.06	.01	-.02	-.13	.07	-.017	-.046
Total	.05	.07	-.05	-.16	.049	-.003	-.039
Accuracy	.10	-.15	.03	.07	.015	-.137	-.119
OBJECTIVE INFORMATION RECALLED							
Correct	.23	-.09	-.05	-.07	.074	.073	.037
Total	.20	-.07	-.06	-.07	.057	.097	.032
Accuracy	.14	-.12	-.02	.15	.120	-.229	.068
N=53							

*p< .05

3.3.4. Personality, violence and memory performance

A further examination regarding the possible relationship between personality and memory performance in each of the experimental conditions was conducted. Table 3 shows that in non-violent conditions correlational results were in accordance with the ones presented in Table 2, that is, H positively correlated with correct and total information recalled for S, nevertheless, these correlation were stronger than the ones considering the total sample (Table 2). Contrarily, in the violent condition the positive correlation between H and S ceased to exist. Instead, under the presence of violence, personality domains correlated with memory accuracy rather than with the quantity of correct or total information recalled. Table 3 shows that, in violent conditions, OP negatively correlated with memory accuracy for P, OB and OI. EM was the other personality domain that, in violent conditions, negatively correlated with memory accuracy for OB. Instead, in violent conditions the domain of C was the only one that positively correlated with memory accuracy for OI. All the mentioned correlations were moderate except for the correlation between P and OB that were weakly correlated.

Table 3. Spearman's correlation personality and memory performance for non-violent and violent conditions

	H		EM		EX		AG		C		OP		AL	
	NV	**V**	**NV**	**V**	**NV**	**V**	**NV**	**V**	**NV**	**V**	**NV**	**V**	**NV**	**V**
A														
C	.30	.14	-.35	-.18	.03	.09	-.19	-.11	.25	.01	-.03	-.08	-.23	-.07
T	.29	.12	-.26	-.21	.02	.05	-.12	-.11	.23	.00	.05	-.05	-.20	-.11
MA	.10	.27	-.29	.21	.06	.09	-.09	.06	-.08	.27	-.16	-.13	.24	.18
P														
C	.23	-.02	-.22	.30	-.14	.05	.06	-.11	.03	-.04	.00	-.01	-.02	.16
T	.20	-.03	-.17	.31	-.14	.11	-.09	-.13	.05	-.08	.02	.06	-.04	.16
MA	-.04	.13	-.25	.02	.09	-.13	.32	.26	-.14	.16	-.11	-.14*	.18	.21
S														
C	.38*	.17	-.34	.33	.07	-.11	.00	.07	.03	-.02	.27	-.02	-.05	.29
T	.40*	.18	-.36	.33	.06	-.10	-.02	.10	.03	.01	.26	-.04	-.06	.29
MA	-.25	-.04	.11	.04	-.01	.07	.11	-.20	-.04	.01	.12	.08	.03	.10
OB														
C	.09	.05	-.21	.22	.06	-.11	-.13	-.13	.21	-.06	-.07	.06	-.09	-.02
T	.12	.00	-.22	.32	.06	-.16	-.14	-.20	.27	-.14	-.09	.13	-.06	-.05
MA	-.12	.29	.01	-.42*	.14	-.05	-.03	.19	.25	.24	.11	-.45*	-.24	-.07
OI														
C	.32	.12	-.35	.27	-.06	.07	.02	-.11	.08	-.07	.12	.04	-.05	.18
T	.33	.05	-.32	.25	-.08	.04	.02	-.15	.08	.10	.14	.09	-.04	.12
MA	.05	.25	-.30	.04	.05	-.09	.13	.21	-.22	.44*	-.07	-.49*	-.09	.20

*p< .05

4. Discussion

Over the last few years, a substantial amount of research has examined the effect that estimator variables may have on memory. Nonetheless, there is little research that has examined how violence and personality influence memory performance. The present study aimed to lessen gaps in our understanding by examining the effects of both variables. Considering previous research, it was hypothesised that the presence of violence would decrease memory performance (Clifford & Hollin, 1981; Clifford & Scott, 1978; Milne & Bull, 1999). It was also hypothesised that personality would

influence memory performance (Areh & Umek, 2004; Madsen & Holmberg, 2015; Ward & Loftus, 1985).

4.1. Violence and memory performance

Contrary to what was expected, physical violence did not decrease the quantity and the quality of the information recalled but instead, participants under violent conditions recalled more information. Regarding memory accuracy, results showed no differences between both experimental conditions. These findings contradict previous experimental research, which observed that memory accuracy was decreased with the presence of violence (Clifford & Hollin, 1981; Clifford & Scott, 1978). This contradiction to prior studies might be explained by the 'violent' videotape used in the present study containing more elements of physical aggression than the ones that were used in those two earlier studies. Wagstaff (2003) conducted an archival study considering different crimes and different levels of violence and observed that information of the offender description increased as the level of violence increased. As such, the higher level of violence watched in the videotape of the present study, compared with scenarios used in previous research, could be the reason why, contrary to previous experimental investigations, the present study found that violence increased the information recalled in most of the categories in which information about the event was classified. Although it cannot be concluded that physical violence implies higher stress levels, as arousal levels differ between individuals in response to the same crime (Valentine & Mesout, 2008), results from the present study seem to be in accordance with the research that has examined the effect of stress on eyewitness memory.

Previous research found that under stressful conditions participants tended to recall more central details at expenses of peripheral details (Loftus, Loftus, & Messo, 1987; Safer, Christianson, Autry, & Österlund, 1998). This trend was also observed when examining the results of the present study. Central details, such as actions, were found to be, significantly more recalled under violent conditions than under non-violent conditions. By contrast, information codified as setting, that is, peripheral details, is the only category that under violent condition the quantity of information recalled is lower than for non-violent conditions. Considering that, although the present study did not establish a link between anxiety and violence, it revealed that results obtained when examining violence are in accordance with results from investigations examining stress levels and its effect on memory performance.

4.2. Personality and memory performance

A scarce number of studies have examined the relationship between personality and memory and it has been observed that personality traits of extraversion or openness appeared to influence memory performance (Areh & Umek, 2004; Liebman, et al., 2002; Ward & Loftus, 1985). The present investigation enables to draw another relationship between personality and eyewitness memory performance that is, the relationship between high scores of Honesty and the increase of information recalled for Setting.

4.3. Violence and the relationship between personality and memory performance

No previous research, as far as we are aware, has examined the effect of the level of violence on the relationship between personality and eyewitness memory. The present study found that physical violence appears to influence this relationship. Whereas in non-violent conditions the relationship between Honesty and Setting was maintained, under the violent condition this relationship disappeared and in its place relationships between Openness, Contentiousness and Emotionality domains and memory accuracy appeared. Whereas Openness and Emotionality negatively correlated with memory accuracy, Contentiousness positively correlated with memory accuracy.

Previous research in the realm of personality has enabled an understanding as to why violence seems to influence these associations between personality domains and memory accuracy. Emotionality domain refers to the tendency to experience anxiety, fear and emotional bonds with others (Lee & Ashton, 2004). As such, in the case of violent condition, individuals with higher scores of emotionality traits would experience more emotionality for the criminal event than individuals scoring lower in emotionality. Toffalini, Mirandola, Drabik, Melinder and Cornoldi (2014) observed that anxious personality traits recalled more incorrect details and therefore, the accuracy of the testimony decreased. Correspondingly, Safer, Levine and Drapalski (2002) observed that anxious personality traits increased the negative effect that emotionality had on memory performance. It was found across the sample that the more anxiety personality traits a participant tends to possess, the more anxious they felt and the more distorted was the information recalled concluding that, anxious personality traits act as moderator factors in the relationship between violence and memory (Safer et al., 2002). While more research is needed, this theory could explain the finding of the present study.

As has already been noted, violence did not influence memory accuracy but instead, increased the quantity of total information recalled. Nonetheless, when examining personality and violence together, it is observed that whereas in non-violent conditions high scores of emotionality had no effect on memory accuracy, in violent conditions emotionality negatively influenced memory accuracy. This finding suggests that, in violent conditions, the proportion of incorrect detail recalled compared with the proportion of correct details recalled, is larger particularly for those individuals scoring higher in emotionality. Therefore, alike Safer et al. (2002), from the results obtained in the present investigation, it can be hypothesised that traits of emotionality act as moderator factors in the relationship between violence and memory performance.

The second personality domain that correlated with memory accuracy was Openness to Experience and, similarly to Emotionality, the correlation was negative. Openness domain gathers personality traits such as inquisitiveness, creativity, or unconventionality (Lee & Ashton, 2004). Previous research examining personality has found mixed results concerning Openness and memory performance. Whereas some have also found a negative relationship between Openness and memory accuracy (Madsen & Holmberg, 2015), others have found a positive one (Liebman, et al., 2002). Nonetheless, none of them examined if this relationship changed with or without the presence of violence. Therefore, as with the Emotionality domain, differences in associations between both variables may be due to the specific characteristics and circumstances of the event in which they have been studied. It might be that Openness traits affect memory performance differentially depending on the characteristics of the situation. Nevertheless, there is no research that has examined this issue and therefore further research needs to consider how these personality traits can be negatively or positively influenced by characteristics of the crime in order to support this hypothesis.

The final personality domain that correlated with memory accuracy was the Contentiousness domain and, contrary to personality traits of Openness and Emotionality, personality traits of Contentiousness appeared to have positive effects on memory performance under violent conditions. The Contentiousness domain gathers personality traits of organization, diligence, prudence and perfectionism (Lee & Ashton, 2004). Although there is no research that proves that any of these traits are associated with a better memory accuracy under violent conditions, in the study conducted by Trapnell and Campbell (1999), it was found that attentiveness was positively associated with this personality domain, whereas social anxiety was not correlated with

contentiousness. Such as, the reason why under violent conditions individuals scoring higher in Contentiousness outperform those scoring lower may be do to either the predominance of traits such as attentiveness (Trapnell & Campbell, 1999), which have been found previously to increase memory performance (Wheeler, Stuss, & Tulving, 1997) or the negative association that Contentiousness has with traits of anxiety (Trapnell & Campbell, 1999), which have been found to reduce memory accuracy (Toffalini et al., 2014). Nevertheless, once again, previous research can assist in developing a working hypothesis concerning the reasons as to why these correlations can be only observed under violent conditions. Therefore, further research is needed to further examine (i) the reasons why personality is correlated with memory; (ii) under which circumstances it is correlated; (iii) and the moderator or mediator factors that may influence these relationships.

4.4. Limitations

The present study, like others, possesses certain methodological limitations that need to be considered when analysing the results. First, the sample is relatively small, and therefore, a larger sample may increase the validity of the results. Secondly, the sample was exclusively of university students and, while some studies suggest that such samples do not differ that much from the young and new adult populations (e.g. Wiecko, 2010), the sample might still be viewed unrepresentative and as such, one must be cautious when extrapolating the results. Finally, although the videotape showed a real crime, it was visualised under experimental conditions. This artificial scenario, while enabling the control of variables that may influence memory performance in real situations, may decreases the external and ecological validity, as individuals could react somewhat differently in real situations (Davies, Pollard, & Archer, 2001). Furthermore, the present study may have oversimplified the different levels and interpretations that violence can have on two different categories, violent (involving acts of physical aggression) and non-violent (referring to those acts with no physical aggression). Such as, whereas this study is able to provide empirical results regarding the effect of physical aggression have on memory performance, it is not able to examine neither the effect that different levels of violence may have on memory performance nor the effect that participants' interpretations of the event regarding the level of violence may have on memory recalling.

5. Conclusion

The present study enables a clearer picture to emerge of the effect that violence and personality has on memory performance and, at the same time, it highlights the need of further research examining both topics. Future research may well need to adopt common definitions of violence and use similar inventories to measure personality. There are not only a huge number of interpretations for violence but there are also different levels (Larsson & Gill, 2013). As such, future research also needs to examine both the effect of the different types and levels of violence as well as the link between each level of violence and stress. It would help clarify to what extent memory performance is affected because of the particular level of violence or because of the stress experienced. The present study is the first to explore how violence may influence the relationship between memory performance and personality. Findings suggest that personality moderates the relationship between violence and memory but, although previous research can help to modestly understand the reason for that, more research is needed to better understand the results. Finally, it is concluded that violence and personality both appeared to influence eyewitness memory. Nonetheless, research in those fields is still in its infancy and there is a need to more deeply examine how these variables are related among them when influencing eyewitness memory, as claiming linear relationships between estimator variables and memory may be somewhat over simplistic.

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