Current Psychology
https://doi.org/10.1007/s12144-024-06232-w

Speed and contextual information of a crime-related video bias the responsibility judgments

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Accepted: 3 June 2024
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Abstract
Courts often rely on video evidence, assuming it accurately shows important legal details. Yet, studies suggest that video isn't inherently "objective" and people, including legal professionals, might misinterpret its objectivity due to video quality or context. This study aimed to explore how video speed variations and contextual information affect judgments of responsibility in a video portraying a bus assault. The study employed a 5×3 mixed design, with video speed (Very Slow, 0.88x; Slow, 0.96x; Neutral, 1.00x; Fast, 1.04x; Very Fast, 1.12x) as a between-subject variable, contextual information (Hit, Harm, Kill) attributed to the perpetrator's action as a within-subject factor, and dimensions of accountability, predictability, criminal intent, and severity as dependent variables. ANOVA results from a sample of 300 participants (60 per video speed condition) revealed that the highest levels of accountability, criminal intent, and predictability were attributed when the contextual information was "hit" as compared to the "harm" and "kill" actions. Furthermore, the greatest difference in accountability and criminal intent scores for the kill action was between the very fast and very slow conditions. These findings raise significant concerns about the use of video evidence in criminal proceedings, as video speed manipulation and contextual information can have a substantial impact on responsibility judgments.

Keywords Video evidence · Speed bias · Crime · Forensic · Responsibility · Contextual information

Theoretical framework

Law enforcement and court systems have increasingly relied on video as evidence, to both implement the principles of an open trial and strengthen the credibility and legitimacy of justice (Dodge, 2018; Ellison & Munro, 2014). Video evidence is considered more vivid and cognitively stimulating compared to verbal descriptions (Granot et al., 2018). It provides a more accurate and detailed representation of events and allows for multiple reviews, enabling a more comprehensive judgment by judges (Underwood et al., 2009).

In the realm of attributing responsibility, video evidence plays a crucial role, often offering invaluable contributions to the resolution of criminal cases (Gerell, 2020; Jung & Wheeler, 2023; Morgan & Dowling, 2019). Responsibility judgments, crucial in everyday evaluations of harm and legal proceedings alike, pin around comprehending an individual's mental state, particularly their intent (Borum & Fulero, 1999). Video evidence serves as a unique lens, especially in scenarios marked by absent or contradictory testimonies (Granot & Igliozzi, 2023), shedding light on crucial aspects of responsibility judgments, such as perceived agency (Haggard & Tsakiris, 2009; Moore & Haggard, 2008), criminal intent (Veresha, 2016), and injury severity (Robbennolt, 2000). These aspects are also pivotal in establishing culpability and assigning appropriate reparations (Robbennolt, 2000; Greene et al., 1999).

Nevertheless, employing video evidence in courtrooms presents significant challenges. Individual perspectives and biases can substantially influence the interpretation of the same footage, even among individuals made aware of these potential biases (Carter & Pritchard, 2016). Despite thorough reviews, critical details might be overlooked, leading to erroneous conclusions (Underwood et al., 2009). Additionally, a tendency among legal decision-makers to

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Published online: 24 June 2024

prioritize visual evidence could result in a naïve realism or overconfidence bias, assuming the video's infallibility even in the presence of flawed interpretations (Feigenson & Spiesel, 2009; Tenney et al., 2019a). For instance, Ware and colleagues (2008) observed that when participants focused on a suspect's behavior, they were more inclined to perceive the suspect's confession as sincere. Similarly, viewers tend to attribute greater causal responsibility to characters emphasized by the camera in a scene, a phenomenon linked to increased empathy towards those characters, whether they are victims or perpetrators (Lassiter et al., 2001; Ware et al., 2008).

Research has indicated that varying video presentation speeds can influence subjective judgments of actions (Caruso et al., 2016; de'Sperati & Baud Bovy, 2017; Rossi et al., 2018; Spitz et al., 2018). This phenomenon, termed speed bias, refers to the tendency for individuals to misjudge the speed of visual stimuli, leading to either overestimation or underestimation of their actual speed (de'Sperati & Baud Bovy, 2017; Rossi et al., 2018). When actions occur at an exceptionally slow pace or when motion signals are inadequately conveyed, viewers may experience a discrepancy between their anticipated expectations and what is observed, significantly influencing their judgments (Kaiser et al., 2009). Moreover, individuals might exhibit heightened sensitivity to specific types of biological motion, either through visuomotor coupling or purely visual mechanisms (de'Sperati & Stucchi, 1995, 1997, 2000; de'Sperati & Viviani, 1997). In complex motion scenarios involving human movements, visual environment (Carrozzo & Lacquaniti, 2013), previous experience on spatiotemporal tasks (e.g., practicing some sports; Sgouramani & Vatakis, 2014), or apparent motion paths (Viviani & Stucchi, 1992) may also affect speed estimates.

Interestingly, individuals may not always recognize the influence of altered video speeds, particularly slow-motion, on their judgment, potentially neglecting necessary corrections (de'Sperati & Baud Bovy, 2017). Research investigating the utilization of slow-motion footage in football match analyses reveals that actions displayed in decelerated motion are often perceived as more intentional or purposeful than their actual execution (Caruso et al., 2016; Spitz et al., 2018). This alteration in dynamics might create an illusion of extended time for decision-making, potentially resulting in harsher judgments of aggressive behavior or physical contact.

Altered video speed can have important implications in the forensic field, too. For example, in a study by Caruso and colleagues (2016), participants watched surveillance footage of a robbery where the perpetrator shot the store clerk. The jury believed that the crime was more premeditated when watching the video in slow motion, resulting in a first-degree murder conviction.

Furthermore, the contextual information surrounding video evidence of recorded events can significantly influence judgments. Verbal contextual information holds substantial sway in shaping perceptions and possibly introducing biases into decision-making processes (Saks et al., 2003). Classic studies, such as Loftus and Palmer's (1974) research on post-event information bias, showcased how the choice of words significantly influenced participants' estimations of car crash speeds. Participants who were asked how fast the cars were traveling when they "smashed into each other" provided higher speed estimates than those asked with different verbs such as "collided," "bumped," "contacted," or "hit." Similar findings have been observed in other studies on post-event information bias (Jacoby & Galak, 2016; Tenney et al., 2019b). Consequently, when evaluating a video related to a crime, the judgment outcomes may vary based on post-event information, such as whether the action attributed to the perpetrator is described as "hitting," "harming," or "killing" the victim.

When it comes to responsibility judgments, biases—whether stemming from perceptual distortions like those related to video speed or contextual information—can significantly impact the fairness and accuracy of assessments (Carter & Pritchard, 2016). Presently, empirical studies investigating the impact of altering video speed and manipulating contextual information on responsibility judgments from video evidence within legal contexts are limited. This study stands out by focusing on this unexplored area, highlighting its novelty. Responsibility judgments in legal contexts necessitate a thorough and fair evaluation of an individual's mental state, intent, and the circumstances surrounding a particular act (Bagaric et al., 2022). The challenge lies in discerning these nuanced elements objectively, as biases can influence how individuals perceive intent, foresee consequences, and weigh the severity of an offense. This notable research gap underscores the pivotal significance of our study.

Aim and hypotheses

The current study aims to investigate the impact of video speed and contextual information on viewers' judgments of responsibility toward the perpetrator of a crime (i.e., a bus fight). Video speed was manipulated to examine how speed bias affects judgments of responsibility for the perpetrator's action. Different post-event information (contextual information) concerning the perpetrator's action (i.e., hit, harm, and kill) was given. To gain a comprehensive understanding of the impact of video speed and contextual information

on responsibility judgments, the responsibility variable was subdivided into the following items: Accountability, Predictability, Criminal Intent, and Severity. Drawing upon the theoretical and empirical framework previously presented, we hypothesized that:

H1: A speed bias effect will be observed: Participants who watched slower videos tend to attribute to the perpetrator a higher action responsibility as compared with those who watched neutral and faster videos.

H2: A contextual information effect will be observed: Participants tend to attribute to the perpetrator a higher action responsibility when the contextual information concerning the perpetrator's action was expressed by the word 'kill' as compared to when the information was 'harm' or 'hit'.

H3: The effect under H2 will be enhanced when participants watch slower videos than faster ones.

Methods

Participants and design

The study was given ethical approval by the Ethics Committee of the Department of Educational Science, Psychology and Communication of University of Bari "Aldo Moro", and executed according to the Declaration of Helsinki (No. ET-20-14). Participants signed informed consent before participating in the experiment. We used G*Power (Faul et al., 2007) to run an a priori power analysis for ANOVA with five groups, given $\alpha = 0.05$, a power of 0.95, and effect size $f = 0.25$ (Correlation among repeated measures = 0.50) indicating a sample of 205 participants was needed for the main effect of speed, 45 for the main effect of contextual information and 65 for the interaction speed x contextual information. A total of 300 participants were recruited (51.3% women) and assigned to the five-speed groups ($n = 60$ each). The average age of the sample was 36.15 years ($SD = 14.00$, range = 18–60), with an average level of education of 14.75 years ($SD = 2.06$; range = 8–22). Out of the participants, 30.9% were students, with 7.3% being working students and 2.3% being trainees. Additionally, 32.3% were dependent workers, while 17.7% were autonomous workers. 15.3% were unemployed, 3.0% were retired, and 0.7% were unable to work. 55.7% of participants indicated that they have studied or are currently studying disciplines related to law and jurisprudence in their educational journey, either in the past or ongoing, but only 25.7% of them reported that the profession they practice involves themes and disciplines related to law and jurisprudence. All participants described themselves as experts on a scale from 0 (not at all expert) to 10 (completely expert) in topics related to law and jurisprudence, with an average score of 3.74 ($SD = 2.47$). These questions were conducted to ensure an adequate understanding of participants' familiarity with legal concepts.

Participants were sourced through the experimenters' acquaintances, employing a snowball sampling method. All participants self-reported normal or corrected-to-normal vision and hearing. No specific inclusion or exclusion criteria were implemented to ensure the incorporation of individuals from diverse backgrounds, experiences, and perspectives, thereby enriching the depth and scope of the collected data.

To test the hypotheses, the study adopts a mixed 5 × 3 design with video Speed (Very slow vs. Slow vs. Neutral vs. Fast vs. Very fast) as between-subjects variables and contextual information attributed to the perpetrator's action (Hit vs. Harm vs. Kill) as a within-subjects factor. The dependent variables are a set of variables assessing Responsibility for each action: (a) Accountability, (b) Predictability (c) Criminal intent, and (d) Severity shades. These ratings were assumed to be at ratio and not ordinal scale level.

Materials and procedure

In line with the study by de'Sperati and Baud Bovy (2017), a video clip was shown to five groups of participants at different speeds: 0.88x, 0.96x, 1.00x, 1.04x, or 1.12x. We used the free software VLC (https://wiki.videolan.org/) to modify the original video clip.

The survey was developed to explore different facets of Responsibility, i.e. Accountability, Predictability, Criminal Intent, and Severity—by drawing insights from existing literature. Further, specific questions were adapted from de'Sperati and Baud Bovy's (2017) research. Following a pilot study involving 25 participants, iterative refinements were made based on participant feedback to improve the clarity and relevance of these questions. Once the survey instrument was finalized, the data collection for the present study was run.

Each participant was individually tested and completed the three phases of the experiment in about thirty minutes. The experiment was held online using Google Modules. The survey was distributed electronically from May 2021 to September 2022 through various online platforms, including social media platforms (e.g., Facebook, Twitter), email invitations, and relevant online communities. During the experiment, the experimenter and the participant were connected via video call, with a shared screen to enable the correct administration of the task. The experimenter was unaware of which speed condition was presented to each participant.

Video phase After signing the informed consent and answering some demographic questions, participants were randomly assigned to one of the five-speed conditions (Very Fast, Fast, Neutral, Slow, Very Slow). The procedure for all participants was the same, except for the speed of the video that they watched. The video lasting 45 s (link) shows the shots of a surveillance camera on a bus. A man, sitting near the central door, gets up, holding onto the handrail. While he is waiting, a fight breaks out with another man. The second man repeatedly pushes the first one towards the exit, raising his voice. As the doors open, the second man throws a punch at the first man, who is pushed and falls backward, remaining halfway out of the bus, and hitting his head on the edge of the sidewalk. The aggressor gets off the bus, steps over the body of the first man, who lies senseless, and having cast a last glance at the victim, walks away. The scene ends with the indifference of the passengers. The video frame rate was 15 fps, with a refresh rate of 44.10 kHz.

Responsibility judgments phase Each participant was asked to judge responsibility for three potential actions (post-event information) attributed to the perpetrator, named A.B., (Hit, Harm, and Kill) on scales ranging from 0 to 10. The victim was named M.R. The following dimensions were assessed: (a) Accountability ("*Indicate, on a scale from 0 (no responsibility at all) to 10 (complete responsibility): How much responsibility do you attribute to A.B. for hitting/hurting/killing M.R.?*"); (b) Predictability (Predictability of the action; *"Indicate, on a scale from 0 (not expected at all) to 10 (completely expected): How much do you think A.B. predicted that he could hit/hurt/kill M.R.?"* + Predictability of the consequences *"Indicate, on a scale from 0 (not at all predictable) to 10 (completely predictable): How predictable were A.B.'s consequences in hitting/hurting/killing M.R.?"); (c)* Criminal intent *(Intentionality; "Indicate, on a scale from 0 (no intention) to 10 (maximum intention): How much intention did A.B. have to hit/hurt/kill M.R.?"* + Willful Conduct; *"Indicate, on a scale from 0 (not at all) to 10 (completely): How willful was A.B.'s conduct in hitting/hurting/killing M.R.?*"), and (d) Severity (*"Indicate, on a scale from 0 (not at all severe) to 10 (very severe): How severe was A.B.'s choice to hit/hurt/kill M.R.?"*).

Additionally, participants were tasked with roughly assessing the perpetrator's grasp of responsibility in the action. This assessment method mirrored the legal classification system for various degrees of crimes, like first-degree, second-degree, or manslaughter. (i.e., "D*o you think A.B. is accountable for / predicted / intended / understood the severity of his actions towards M.R.? Yes, completely/ Yes, but not completely / Not at all*"). The Final judgment scores were summed together (see Supporting information).

Manipulation check phase To assess the emotional intensity of the video and consider its ecological validity concerning a real-life crime, participants were asked to rate, on a scale from 0 (not at all) to 10 (completely), the extent to which the video they had just viewed was (a) shocking and (b) emotionally arousing. This allowed us to gather valuable data regarding the emotional impact and engagement evoked by the video. Furthermore, we checked if participants watched the video carefully asking for a free and cued memory recall after watching the video clip. Finally, participants were asked to rate their level of attention while watching the video on a scale from 1 (not at all) to 10 (completely).

Speed judgments phase. To test perceptual sensitivity to altered video speed, participants had to tell whether the video was slow, normal, or fast. If participants supposed that the video speed had been altered, they were then asked to rate the extent of the perceived speed alteration on a scale ranging from slow = 1 (slow at all) to 7 (too slow) or fast = 1 (fast at all) to 7 (too fast).

Results

The main results are described in this section. Results concerning the Final judgments, Memory, Emotion, Attention, and Perceived Speed measures about the video are reported in Supporting information.

Responsibility judgments

Accountability

We ran a mixed-design ANOVA with Speed (Very Slow vs. Slow vs. Neutral vs. Fast vs. Very Fast) as a between-subject factor and Contextual Information attributed to the perpetrator's action (Hit vs. Harm vs. Kill) as a within-subjects factor, on Accountability scores as dependent variables (see Tables 1 and 2; Figs. 1 and 2).

The main effect of Speed was not statistically significant ($F_{(4, 295)} = 1.09$, $p = 0.36$, partial $\eta^2 = 0.01$), while the main effect of Contextual Information was statistically significant ($F_{(2, 590)} = 44.69$, $p = 0.001$, partial $\eta^2 = 0.13$). Polynomial contrast showed a significant linear trend ($F_{(590)} = 46.87$, $p = 0.001$; partial $\eta^2 = 0.14$), with attributed Accountability decreasing linearly from "Hit" ($M = 8.47$, $SD = 1.98$) to "Harm" ($M = 8.36$, $SD = 2.01$) and to "Kill" actions ($M = 7.27$, $SD = 3.33$).

A significant interaction effect was observed ($F_{(8, 590)} = 2.28$, $p = 0.02$, partial $\eta^2 = 0.03$). Simple effect analysis indicates that Contextual Information has a significant effect on Accountability scores for all Speed conditions

Table 1 Descriptive analysis of single responsibility scores

Action responsibility	Contextual information	Video speed				
		Very slow Mean (***SD***)	Slow Mean (***SD***)	Neutral Mean (***SD***)	Fast Mean (***SD***)	Very fast Mean (***SD***)
Responsibility	Hit	8.68 (1.77)	8.50 (2.05)	8.15 (2.24)	8.40 (2.03)	8.63 (1.80)
	Harm	8.62 (3.03)	8.47 (2.17)	8.07 (2.14)	8.47 (2.00)	8.20 (2.06)
	Kill	7.80_{a} (0.48)	7.58 (3.27)	7.15 (2.99)	7.53 (3.30)	6.27_{a} (3.86)
Predictability	Hit	5.53 (1.96)	5.58 (2.31)	5.73 (1.92)	5.08 (2.12)	4.75 (2.16)
	Harm	5.24 (2.09)	5.45 (2.34)	5.20 (2.22)	5.12 (2.08)	4.54 (2.24)
	Kill	2.55 (2.21)	2.74 (2.61)	2.53 (2.42)	2.78 (2.19)	2.21 (1.95)
Criminal Intent	Hit	$6.49_{b,d}$ (1.95)	6.94 (1.58)	7.17_{d} (1.18)	7.07 (1.65)	7.30_{b} (1.78)
	Harm	7.17_{c} (1.84)	6.85 (2.01)	6.39_{c} (1.87)	6.57 (1.86)	6.75 (1.84)
	Kill	5.93_{d} (2.14)	5.36 (2.39)	5.13 (2.28)	5.38 (2.39)	4.88_{d} (2.48)
Severity	Hit	8.43 (2.05)	8.28 (1.71)	7.70 (2.27)	7.88 (2.10)	7.87 (2.01)
	Harm	8.60 (1.73)	8.50 (2.00)	8.05 (2.33)	7.50 (2.72)	7.43 (2.45)
	Kill	8.33 (2.88)	8.30 (3.31)	7.98 (3.35)	7.50 (3.49)	6.53 (4.03)

Table 2 Mixed-design ANOVAs for the single responsibility scores

	Speed (a)	***p***	Contextual information (b)	***p***	a x b	***p***
	F_4 (partial η^2)		F_8 (partial η^2)		$F_{8, 590}$ (partial η^2)	
Accountability	1.09 (0.02)	0.36	44.69 (0.13)	0.001	2.28 (0.03)	0.02
Predictability	1.52 (0.02)	0.20	348.89 (0.54)	0.001	1.02 (0.01)	0.42
Criminal intent	0.50 (0.01)	0.73	80.15 (0.21)	0.001	3.51 (0.05)	0.001
Severity	3.79 (0.05)	0.005	1.85 (0.01)	0.16	1.36 (0.02)	0.21

(Fs > 4.85, *ps* < 0.01, partial $\eta^2 > 0.02$), although the highest difference was between the Very fast and the Very Slow condition for the Kill action: Indeed, the Accountability scores were significantly higher for the Kill Action presented at the Very slow condition as compared with the Very Fast condition ($t_{(295)} = 2.54$, $p = 0.01$). Table 1 displays the planned comparisons among the mean values of Accountability scores for each of the three Actions across the five Speed conditions.

Findings partially support the hypothesis (3). Contextual information significantly influenced participants' attributions of accountability to the perpetrator, with the highest scores for the "hit" action and the lowest for the "kill" action. Furthermore, although the main effect of speed on accountability scores was not significant, the highest attribution of accountability for the "kill" action was for the slowest video condition as compared with the fastest one (partial $\eta^2 = 0.10$).

Predictability

We ran a mixed-design ANOVA with Speed (Very Slow vs. Slow vs. Neutral vs. Fast vs. Very Fast) as a between-subject factor and Contextual Information attributed to the perpetrator's action (Hit vs. Harm vs. Kill) as a within-subjects factor, on Predictability scores as the dependent variable (see Tables 1 and 2; Figs. 1 and 2).

The main effect of the Contextual Information attributed to the perpetrator's action was statistically significant ($F_{(2, 590)} = 44.69$, $p = 0.001$, partial $\eta^2 = 0.54$). Polynomial contrast showed a significant decreasing trend ($F_{(1)} = 397.13$, $p = 0.001$, partial $\eta^2 = 0.57$), indicating that participants deemed less predictable both "Hit" ($M = 5.33$, $SD = 2.11$) and "Harm" actions ($M = 5.11$, $SD = 2.20$) as compared to "Kill" ($M = 2.21$, $SD = 2.28$). The other main and interaction effects were not statistically significant ($F_{\text{Speed}(4, 295)} = 1.52$, $p = 0.20$, partial $\eta^2 = 0.02$; $F_{\text{SpeedxAction}(8, 590)} = 1.02$, $p = 0.42$, partial $\eta^2 = 0.01$, respectively).

These findings partially support the hypothesis (2). Results show that as the seriousness of contextual information about the perpetrator's actions increased from "hit" to "harm" to "kill", participants rated as less predictable the perpetrator's action.

Criminal intent

We ran a mixed-design ANOVA with Speed (Very Slow vs. Slow vs. Neutral vs. Fast vs. Very Fast) as a between-subject factor and Contextual Information attributed to the perpetrator's action (Hit vs. Harm vs. Kill) as a within-subjects factor, on Criminal Intent scores as the dependent variable (see Tables 1 and 2; Figs. 1 and 2).

The main effect of Speed was not statistically significant ($F_{(4, 295)} = 0.50$, $p = 0.73$, partial $\eta^2 = 0.01$), while the main effect of Contextual Information was significant

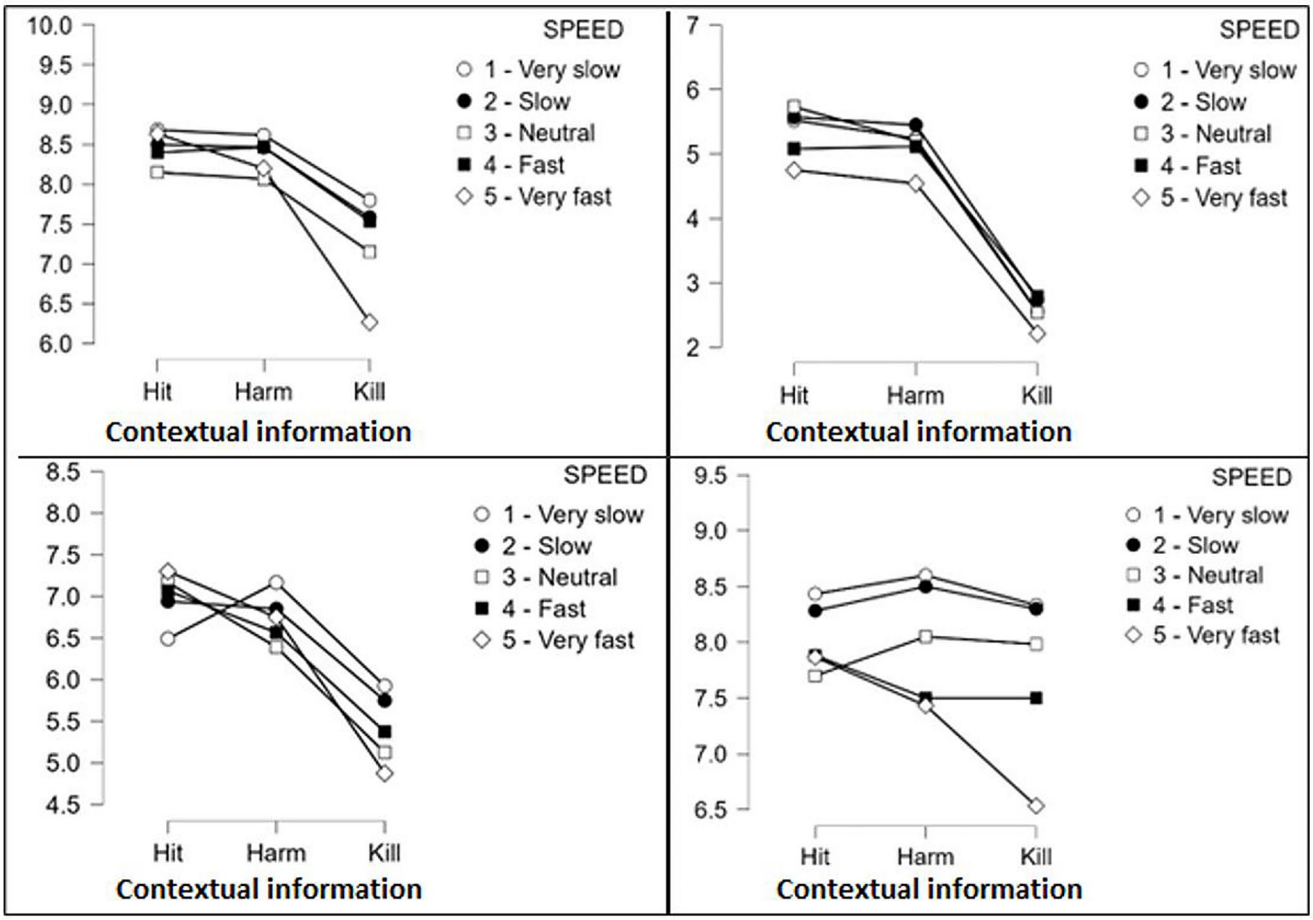

Fig. 1 Descriptive plots for contextual information with single responsibility scores (From high-left: Accountability, Predictability, Criminal Intent, Severity). Symbols represent means

($F_{(2,\ 590)}=80.15$, $p=0.001$, partial $\eta^2=0.21$). Polynomial contrast showed a significant linear trend ($F_{(1)}=108.08$, $p=0.001$, partial $\eta^2=0.27$), with Criminal Intent attributed to the perpetrator decreasing from "Hit" ($M=6.99$, $SD=1.75$) to "Harm" ($M=6.74$, $SD=1.89$), and to "Kill" actions ($M=5.41$, $SD=2.28$).

A significant interaction effect was observed ($F_{(8,\ 590)}=2.28$, $p=0.02$, partial $\eta^2=0.03$). Simple effect analysis indicates that Action has a significant effect over Criminal Intent scores for all Speed conditions ($Fs>8.53$, $ps<0.01$, partial $\eta^2<0.03$), although the highest difference was between the Very Fast and the Very Slow condition for the Kill action. The scores of Criminal Intent were significantly higher for the Kill Action presented at the Very Slow condition as compared with the Very Fast condition ($t_{(295)}$ = -2.54, $p=0.02$). Moreover, there is a significant difference between Very Fast and Very Slow speeds for the Hit condition, showing an inverted trend. Specifically, Criminal Intent scores were significantly lower for the Hit Action presented at the Very Slow condition as compared with the Very Fast condition ($t_{(295)}=2.55$, $p=0.02$). Table 1 displays the planned comparisons among the mean values of Criminal Intent scores for each of the three Actions across the five Speed conditions.

Findings partially support the hypothesis (3). Contextual information significantly influenced participants' attributions of criminal intent to the perpetrator. The highest criminal intent was assigned to the "hit" and "harm" actions, while the lowest scores were given to the "kill" action. The action had a significant effect on criminal intent scores across all speed conditions, with the strongest effect observed in the very fast speed condition (partial $\eta^2=0.10$). The difference in criminal intent scores for the "kill" action was significant between the slowest and fastest video conditions. However, the main effect of speed on responsibility judgments was not significant, indicating that video speed did not directly impact overall assessments of criminal intent.

Severity

We ran a mixed-design ANOVA with Speed (Very Slow vs. Slow vs. Neutral vs. Fast vs. Very Fast) as a between-subject

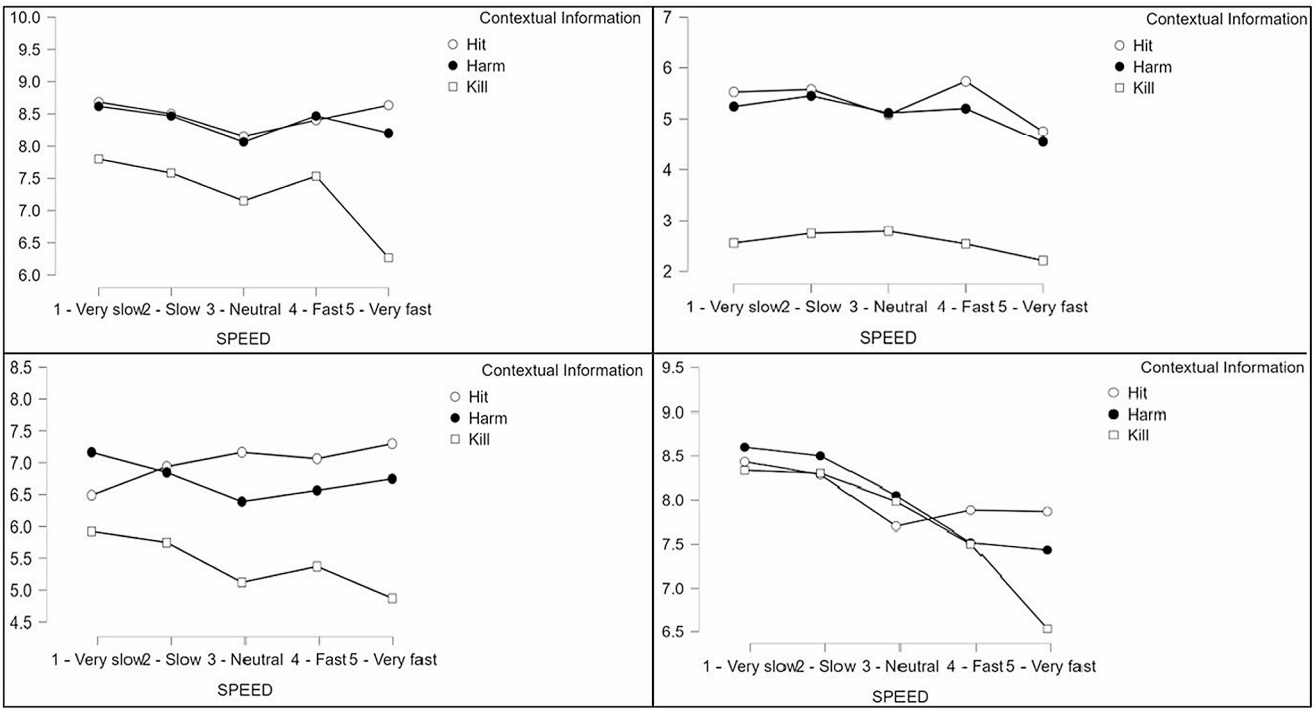

Fig. 2 Descriptive plots for speed with single responsibility scores (From high-left: Accountability, Predictability, Criminal Intent, Severity). Symbols represent means

factor and Contextual Information attributed to the perpetrator's action (Hit vs. Harm vs. Kill) as a within-subjects factor, on Severity scores as the dependent variables (see Tables 1 and 2; Figs. 1 and 2).

The main effect of Speed was statistically significant ($F_{(4)}=3.79$, $p=0.005$, partial $\eta^2=0.05$). Polynomial contrasts show a linear trend in Severity scores across Speed ($F_{(1)}=7.25$, $p=0.007$, partial $\eta^2=0.04$), with significantly higher scores in Very Slow ($M=8.41$, $SD=1.18$; $t_{(295)}=2.33$, $p=0.02$) and Slow ($M=8.41$, $SD=2.12$; $t_{(295)}=2.58$, $p=0.01$) conditions as compared to Neutral ($M=7.57$, $SD=2.47$), Fast ($M=7.97$, $SD=2.24$) and Very Fast ($M=7.39$, $SD=2.51$) conditions. No other main nor interaction effects were statistically significant ($F_{\text{Contextual information (2, 590)}}=1.85$, $p=0.16$, partial $\eta^2=0.01$; $F_{\text{SpeedxContextual information(8, 590)}}=1.36$, $p=0.21$, partial $\eta^2=0.02$, respectively).

These findings partially support the hypothesis (1). Results show that participants tend to attribute less severity to the perpetrator depending on the speed of the video they watched, with participants watching slower videos judging the perpetrator more severely than participants watching the neutral, fast, and very fast videos.

Discussion

The current study aimed to investigate how video speed affects responsibility judgments in watching a crime-related video depicting an assault on a bus, by providing different contextual post-event information concerning the potential actions attributed to the perpetrator ("hit", "harm", and "kill"). Specifically, we hypothesized that participants who watched slower videos would assign higher responsibility - broken up into accountability, predictability, criminal intent, and severity shades - compared to those who watched neutral or faster videos. Furthermore, we expected that the contextual information attributed to the perpetrator's action "kill" would have the highest responsibility judgments while the action "hit" would have the lowest scores and that these effects would be amplified with slower video speed.

Results show that although speed alone didn't directly impact responsibility judgments, the combination of video speed and contextual information exerted a nuanced impact. Participants attributed higher accountability for the "hit" action and lower accountability for the "kill" action. Furthermore, results suggest that slower videos can lead to higher attributions of accountability for the "kill" action. Conversely, a faster video influenced participants' judgments, with contextual information about killing being associated with reduced accountability.

These findings are like results on criminal intent, too. Participants attributed higher criminal intent scores for the "hit" and "harm" actions, aligning with the severity of these actions. In contrast, the "kill" action elicited lower criminal intent scores, suggesting a differential perception of intent for this action. In the context of our study, the provided contextual information based on the action depicted in the video acts as a cue for participants to evaluate and attribute accountability and criminal intent, even in subsequent confrontations with less severe actions (Dror et al., 2006; Rassin, 2017, 2020).

Interestingly, slower videos appeared to amplify participants' attributions of criminal intent for the "kill" action, while faster videos led to decreased attributions of criminal intent for the same action. Furthermore, participants tended to attribute less criminal intent to the perpetrator for the "hit" action at slower speeds, with greater differences in scores between the slowest and fastest video conditions. This finding suggests that slower videos may bias participants' ability to discern subtle nuances in the action when contextual information is provided, resulting in increased attributions of criminal intent for the less severe action of "hit".

Jointly considered, these results are in line with research on how video speed can impact the perception of accountability and intentionality, making action depicted appear as more intentional, severe, and aggressive (Caruso et al., 2016; Mather & Breivik, 2020; Schütz et al., 2021, 2023; Sperl et al., 2021; Spitz et al., 2018). In slow-motion videos, participants have more time to process and evaluate the depicted events, leading to heightened attributions of intentionality (de'Sperati & Baud Bovy, 2017; Mather & Breivik, 2020; Rossi et al., 2018; Spitz et al., 2017, 2018). Conversely, research shows that fast-paced videos may cause viewers to underestimate the actual speed and intention of depicted actions (Mather et al., 2017). This perceptual bias towards underestimation could have influenced participants' judgments, leading them to perceive the action as less impactful or significant than it actually was. Consequently, participants may have attributed lower levels of responsibility and criminal intent for the action of "kill" when presented with faster videos.

Regarding predictability, participants judged the perpetrator's action of "hitting" and "harming" the victim as more predictable, as opposed to "killing" him. However, altering the video speed did not impact participants' judgments about the predictability of the actions. These results suggest that the predictability judgments of actions may depend on the nature of the action, such as its severity, rather than the speed at which it is presented. Moreover, participants may rely on their prior experiences and expectations about the likelihood of certain actions to make predictability judgments (Berthet, 2022). Differences in personal experiences or exposure to situations involving "hit" and "harm" actions can be attributed to the relative frequency of such events in everyday life, such as sports, accidents, or interpersonal conflicts (Iyengar, 2023; Mawby et al., 2020). On the other hand, incidents involving eye witnessing and judging the intentional killing of another person are fortunately rare and typically associated with extreme cases of violence or criminal behavior (Lijtmaer, 2008). The infrequency of such events limits the opportunities for individuals to directly witness or experience them in their personal lives, leading to a disparity in personal familiarity and exposure (Divjak, 2019). This is consistent with studies about availability heuristic, i.e. the cognitive shortcut where people judge the likelihood of an event based on how easily they can recall similar instances (e.g., Tversky & Kahneman, 1973).

The findings from this study on accountability, criminal intent, and predictability judgments are closely linked to the observed results regarding severity judgments. Specifically, participants who watched slower videos tended to attribute greater severity to the perpetrator compared to other speed conditions. Considering the direct link between severity judgments and sentencing, it becomes evident that video speed manipulation can have broader implications for the assessment of responsibility and the determination of culpability if associated with external contextual information. The concepts of the "harm" and "fault" principles, which are seen as complementary, establish the parameters for formal criminal responsibility (Morse, 1999). The harm principle suggests that the only activity that is significant enough to warrant criticism and punishment causes harm. On the other hand, the fault principle stipulates that individuals should be held responsible for their actions if they can understand and control their behavior.

Overall, the inference we could make is that the neutral speed condition, which closely resembles typical visual experiences, may provide an optimal speed for more unbiased judgments. This is supported by studies in sports performance evaluation, where athletes commonly prefer and find an advantage in assessing their performance at a neutral speed (Hall, 2009).

Although the results provided valuable insights, the present research also had some limitations. For example, the study used only one video clip to assess the effect of speed on responsibility judgments, which may not generalize to other types of real-life videos or crime-related situations. Moreover, the video clip was shot at a slow frame rate, thus the present findings cannot be generalized to events displayed at more common frame rates (e.g., 30–60 fps), where visual motion is rendered smoothly. Although this technical aspect is a limitation in terms of the conclusions that can be drawn concerning theories of event perception (de'Sperati & Baud-Bovy 2017; Rossi et al., 2018), it represents a quite

common situation, as in many cases surveillance videos are recorded in slow frame rates to save storage space. Additionally, the study relied on self-reported measures, which may be susceptible to social desirability biases. Although the absence of inclusion and exclusion criteria provides flexibility in participant selection, it introduces significant limitations that must be taken into account when interpreting the study findings. To build upon these findings, future research should examine the impact of video speed on judgments of responsibility in different contexts, such as accidents or legal situations, also adopting behavioral indices as measures of the responsibility construct to evaluate the generalizability of our results.

Conclusions

The findings of this study provide valuable insights into how judgments of responsibility, such as accountability, predictability, criminal intent, and severity, can be influenced by both the speed of crime-related videos and contextual information. By emphasizing the potential impact of speed variations in video footage and the contextual details surrounding perpetrators' actions, this study emphasizes the necessity for stringent standards and protocols in utilizing video evidence within legal contexts. It's important to note the scarcity of prior research that concurrently explores the realms of speed alteration and contextual information. This study stands out by pioneering the exploration of these dimensions together, revealing a gap in the existing literature. This underscores the unique contribution of our research, particularly considering that previous studies have predominantly focused on either speed bias or contextual information in isolation.

Overall, this study's outcomes have important implications for a range of fields, including important legal and ethical issues, like libel and defamation, as well as the study of jury bias and threats. Results are also generalizable to media reporting on criminal activities, and to make advances in the field of psychology of perception and judgment. Media outlets often use video recordings to report on criminal incidents, and the speed at which these videos are presented can influence viewers' perceptions and judgments. In general, slow motion in visual media was positively correlated with higher physiological arousal (Detenber et al., 2021; El Basbasse et al., 2023), and, in journalism, emotional arousal is frequently cited as a key component in eliciting negative emotional responses (Goutier, 2021). Furthermore, according to Roggenkamp (2005), nineteenth-century newspapers are characterized by their innovative nature, commercial focus, sensationalism, and, most notably, their emphasis on dramatic storytelling. This may bring to the introduction the effect of contextual information that can alter the perception of news. Our results can contribute to more ethical and responsible reporting, avoiding any intentional or unintentional distortion of the viewers' perception of the events depicted in the videos.

By providing valuable insights into the complex interplay between media, cognition, and legal decision-making, this research advances not only our insight about the topic but also encourages more thoughtful policymaking for better justice.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12144-024-06232-w.

Funding Open access funding provided by Università degli Studi di Bari Aldo Moro within the CRUI-CARE Agreement.

Data availability All data can be acquired by contacting the corresponding author.

Declarations

Conflict on interest All authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

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