**Investigating the impact of top-down cognitive control on distracters: A behavioural and psychophysiological study**

**University of Central Lancashire**

**School of Psychology**

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**Matthew Kershaw**

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**1 – Abstract**

Task-irrelevant auditory stimuli can break through selective attention and impair performance of visually based focal tasks. There is an active debate concerning whether the disruption to visual short-term memory produced by auditory sequences containing a series of changing-items (e.g., ‘mlkv’; the changing-state [CS] effect), or a deviant item *vs.* a sequence of steady-state items (e.g., “mmvm” *vs.* ‘mmmm’; the deviant effect) is underpinned by the same or qualitatively distinct mechanisms. The unitary account (e.g., Bell et al., 2012) proposes both forms are underpinned by attentional capture, but the duplex account (e.g., Hughes 2014) argues that the CS effect arises due to an interference-by-process. Modern research revealed manipulations of top-down cognitive control (e.g. foreknowledge provision) can provide a resounding distinction between the two forms of distraction (supporting the duplex account). However, foreknowledge provision has also been evidenced to reduce the disruption sentences (the “complex” CS effect; Bell et al., 2017); taken to support the unitary account. Furthermore, research employing psychophysiological methods have also shown that auditory deviants, but not simple changes in a sequence, trigger attentional capture - indexed by orienting responses (Marois et al., 2019). The present study seeks to combine behavioural and psychophysiological methods to further contribute to the unitary *vs.* duplex account debate. Participants undertook a set of tasks, a serial recall task in which foreknowledge or no foreknowledge of auditory sequences was provided, with behavioural (task performance) and physiological (heart rate, pupillary response and skin conductivity) responses recorded. Behaviourally, whilst no deviation effect was apparent, evidence of dissociation between simple and complex-CS distracter was. Foreknowledge eliminated additional disruption from complex-CS distracters over their simple counterparts, thereby supporting sentential distracters elicit cognitively controllable attentional capture superimposing a simple-CS effect. Physiological data failed to provide this latter distinction, but evidence emerged for orienting responses to deviant distracters in skin conductivity and pupillary measures despite their ineffectiveness at the behavioural level. working memory capacity appeared unrelated to both behavioural and physiological responses. Implications of these results for the unitary and duplex accounts are discussed.

**2 - Introduction**

Due to the prevalence of sound within society, it is unlikely that one can escape the presence of background sound when undertaking mental work. Moreover, even when one’s visual attention is focused elsewhere, the surrounding auditory environment is automatically and pre-attentively processed. Unlike the eyelids that act as shields to prevent the processing of unwanted material, there is no such mechanism that prevents the ears for receiving and processing unwelcome sound. Current research in cognitive psychology has sought to understand how and why such processing of irrelevant sound can impact, usually negatively, the performance of a concurrent focal task and whether different types of auditory distraction exist that are characterised by different physiological responses or signatures (e.g., Marois, Marsh, & Vachon, 2019). Previous work has established that background sound has a pronounced disruptive effect on short-term memory tasks, particularly those involving covert serial rehearsal of visual-verbal material (e.g., digits or letters) such as the serial recall task (see Colle & Welsh, 1976; Hughes, Vachon, & Jones, 2005; Jones & Macken, 1995; Lange, 2005; Sörqvist, 2010). There is a consensus that some types of auditory distracter elicit an orienting response (OR; Sokolov, 1990), an involuntary shift of attentional focus to the source of the distracter. The OR is a biological mechanism necessary for survival and is evidenced through a panoply of responses including motor (e.g., head and eye movements) and physiological (e.g., increased skin conductance, heart rate deceleration (Potter, Sites, Jamison-Koenig & Xia Zheng, 2018) and pupil dilation (Marois, Labonté, Parent & Vachon; 2018; Marois, Marsh & Vachon, 2019).

Further, a recent wave of interest concerns whether some forms of auditory distraction are tempered by the influence of top-down cognitive control, or are indomitable (e.g., Halin, Marsh Hellman, Hellström & Hughes, 2014; Hughes, Hurlstone Marsh, Jones & Vachon, 2013; Marsh, Campbell, Vachon, Taylor & Hughes, 2019). The current study proposes to investigate whether auditory distraction effects are attributable to attentional capture. If this is the case, the disruption caused should be indexed by the physiological response (e.g. increased skin conductance, heart rate deceleration and dilation of the pupil), resistible upon provision of foreknowledge (Marois, Labonté, Parent & Vachon; 2018; Marois, Marsh & Vachon, 2019; Potter, Sites, Jamison-Koenig & Xia Zheng, 2018) and modulated by working memory capacity: thought to index trait capacity for cognitive control (Sörqvist, Nöstl, & Marsh, 2013; Marsh, Vachon, & Sörqvist, 2017)

The main empirical platform from which the impact of background sound on task performance has been observed involves the (usually visual) presentation of supra-span lists of seven-to-nine verbal items (e.g., digits or letters) one at a time on a computer screen in the presence of various background sound conditions. There is typically also a quiet condition. The requirement of the participants is to recall the visual items in their original order of presentation, sometimes after a short retention interval (typically 7-10 s) or immediately following the presentation of the last item in the sequence. Participants are told about the presence of background sound, usually delivered over headphones, and are instructed to ignore the sound because it is irrelevant to the serial recall task that should be their focus. The presence of extraneous sound typically produces an increase in the number of errors committed in serial recall performance and this occurs regardless of whether sound is presented during the presentation of the to-be-remembered (TBR) items, their retention, or both periods (Colle & Welsh, 1976; Jones, Madden, & Miles, 1992; Jones & Macken, 1993; LeCompte, 1996; Salamé & Baddeley, 1982, 1989; Tremblay & Jones, 1998). This phenomenon has been coined the *irrelevant sound effect* (Beaman & Jones, 1997). The chief empirical signature of the irrelevant sound effect is the changing-state effect (Hereon CS effect); whereby a series of sounds in which there is a physical change between each successive item (changing-state sounds, e.g., “fsbxp”) invariably produces more disruption of serial recall than sounds that convey no physical changes between items (steady-state sound; e.g., “fffff”; Hughes, 2014; Hughes, Tremblay, & Jones, 2005; Jones, Madden, & Miles, 1992; Jones & Macken, 1993). This has frequently been contrasted with the deviation effect whereby focal task performance is hindered by the infrequent occurrence of an irrelevant item that deviates from the others (e.g., “aaaba”).

While several alternative accounts have been offered to explain the irrelevant sound effect (Colle & Welsh, 1976; LeCompte, 1996; Neath, 2000; Page & Norris, 1998; Salamé & Baddeley, 1982), a current lively debate exists between two primary accounts. One account—the unitary account—proposes that both the CS effect and the deviation effect are produced by attentional capture (Bell, Röer, Marsh, Storch & Buchner 2017; Cowan, 1995, 1999), while a second—the duplex mechanism account—does not deny a role for attentional capture in the deviation effect, but purports that the CS effect is a product of an interference-by-process, rather than attentional capture (Hughes, 2014). Specifically, the CS effect is argued to be driven by the pre-attentive processing of order cues yielded by the acoustical changes in the auditory sequence which competes with the similar process of ordering the TBR items engaged in the serial recall task through rehearsal using covert (inner) speech (Jones & Tremblay, 2000; Hughes et al., 2013).

*2.1 – Primary accounts of the mechanism of auditory distraction*

The unitary account proposes that all forms of auditory distraction in the domain of short-term memory result from attentional capture. The unitary account evolved from the embedded process model of memory (Cowan, 1999). Its central tenet is that unexpected changes between successive sounds produce an OR (Sokolov, 1963). This reflexive response that individuals show to unexpected stimuli results in both somantic and cognitive orientation towards the stimulus. This is indexed behaviourally through disruption of focal task performance but also physiologically through increased skin conductance, transient reduction in heart rate (Potter et al., 2018) and pupil dilation (Marois, Marsh & Vachon, 2019). Specific event-related potentials have also been linked to the OR including the mismatch negativity (MMN; Näätänen, Paavilainen, Rinne & Alho, 2007) and the P3 or P3a (Näätänen, 1992). The OR to acoustically deviant sounds (e.g., ‘aaaba’) is assumed to arise because of the violation of an expectancy-based mental model of the physical invariance characterising the prevailing auditory stimulation (e.g., a sequence of a’s). The account explains the CS effect by assuming that each sound in a CS sequence acts as an acoustical deviant therefore producing a repetitive capture of attention (Bell et al.,2019a; Bell, Röer, Dentale, & Buchner, 2012).

Conversely, the duplex account of distraction (Hughes, 2014) within the context of short-term memory, proposes that the CS effect and the deviation effect are distinct types of auditory distraction underpinned by different mechanisms. The duplex account, like the unitary account, proposes that unexpected changes within otherwise predictable auditory stimuli, gives rise to attentional capture whereby attention is oriented to the sound and back again, resulting in an impairment in focal task performance (Hughes, Vachon, & Jones, 2005, 2007). On the other hand, the CS effect is argued to be produced by an interference-by-process. Crucially then, the duplex mechanism account assumes that the CS effect is not explicable through attentional capture and refutes the notion that each change produces an OR leading to repetitive attentional capture. Therefore, unlike the auditory deviation effect, the CS effect should not be associated with physiological or psychophysiological correlates of the OR.

Recent studies that have recorded psychophysiological measures in tandem with behavioural task performance have revealed evidence that an auditory deviation (e.g., an unexpected pink noise burst in a sequence of letters) produces a pupil dilation response (PDR; Marois, Marsh & Vachon, 2019). Similarly, the introduction of production sounds (such as laser sound effects) and changes in voice within an auditory stream produce a temporary slowing of heart rate and increased galvanic skin response (Potter & Choi, 2006; Potter, Sites, Jamison-Koenig, & Zheng, 2018). Of relevance to the current study, Marois, Marsh, and Vachon (2019) demonstrated that an auditory deviation (e.g., pink noise) produced a PDR but an auditory change from one to-be-ignored item to the next, did not. This undermines the unitary account (Bell et al., 2019a) which supposes that each token-to-token change within a CS sequence should produce an OR. However, the results are easily reconciled within the duplex account since on this approach only the deviation should produce an OR as indexed by the PDR.

The duplex account’s predictions also cohere with the adaptive gain theory (Aston-Jones & Cohen, 2005), which proposes stimuli with relevance or potential relevance to the organism violate the neuronal model of the auditory environment produced by the prefrontal cortex, leading to neuronal response from the Locus Coeruleus noradrenalin system (Miller & Cohen, 2001; Sara & Bouret, 2012). Triggering this system results in marked physiological responses such as pupil dilation, changes in heart rate and respiration. The duplex account coheres with this model as the presence of a pupil response (Marois, Marsh & Vachon, 2019), or heart rate change (Potter & Choi, 2006; Potter, Sites, Jamison-Koenig, & Zheng, 2018) when a deviant is presented suggests a violation of the auditory neuronal model, due to the attention capturing properties of the auditory stimuli. However, CS sequences do not elicit such a response, suggesting they do not violate the auditory neuronal model in the same way (Marois, Marsh & Vachon, 2019; Marsh, Röer, Bell & Buchner, 2014). This is also incoherent with the unitary account (Bell et al.,2017; Cowan, 1995, 1999), as it suggests each change in sound in an auditory sequence elicits attentional capture.

Psychophysiological recordings of PDR, heart rate and GSR will be important components of the current study, permitting investigation of whether CS material (simple letters or sentences) or material containing acoustic deviants, elicit OR as indexed by PDR, heart rate and GSR measures. As will be seen, recent attempts to decide between the unitary and duplex accounts have exploited manipulations of top-down control that are also the focus of the current research. Equally however, is the importance of other key classical findings which test the veracity of the unitary and duplex accounts, with habituation of the orienting response being arguably one of the most significant.

*2.2 - Habituation of the Orienting Response*

During the undertaking of a serial recall experiment, the participant can be exposed to the same items (tokens) repeated during or across trials in the context of distinct irrelevant sequences. The unitary account (Bell et al., 2019a; Cowan, 1995; 1999) supposes that such repeated exposure to identical tokens should give rise to the rapid assembly of a neuronal model for those stimuli. Incorporation of those stimuli in the neuronal model would mean that those tokens lose their capability to capture attention during the time course of the experiment: In other words, the OR to those tokens should be reduced although the lessening of distraction is likely to be gradual. At first glance such an attentional account could easily explain why steady-state relative to CS sequences produce little, if any, disruption: The multiple presentation of a single token provokes an OR that would rapidly habituate whereas CS token produce multiple ORs and require many presentations of each different token before habituation of the OR to each token prevails.

The evidence for habituation is mixed. Several studies have shown that the irrelevant sound effect does not habituate within experimental sessions (Hellbrück, Kuwano, & Namba, 1996; Jones et al., 1997; Tremblay & Jones, 1998), or between experimental sessions (Ellermeier & Zimmer, 1997; Hellbrück et al., 1996) in which the same irrelevant tokens are repeatedly presented a number of times over. Typically, however, habituation has failed to obtain for designs in which irrelevant sound is presented concurrently with the serial recall task. Assuming that “habituation…requires central processing capacity, little habituation of the OR would occur in situations involving heavy processing demands because of subsidiary tasks” (Öhman, 1979, p. 466). According to this stance, engagement in the serial recall task usurps central processing capacity—for the encoding and maintenance of to-be-remembered stimuli within working memory—that could otherwise be used for habituation. Although consistent with results of several studies (Beaman & Röer, 2009; Ellermeier & Zimmer, 1997; Hellbrück et al., 1996; Jones et al., 1997; Röer et al., 2011; Tremblay & Jones, 1998), this analysis is inconsistent with data from other studies (Röer et al., 2013, 2014). Furthermore, the approach holds that habituation should occur if the OR occurs during a period of passive listening without concomitant task demands; habituation of the OR would thereafter manifest when the same auditory material was presented concurrently with the serial recall task. Some data supports this assumption (Bell et al., 2012; Morris & Jones, 1990; Röer et al., 2014) but the picture is not entirely clear (Beaman, Marsh, & Campbell, 2019).

Following sections will highlight the importance of the neuronal model and OR constructs for determining modulation of the magnitude of auditory distraction effects in relation to factors related to top-down cognitive control. Top-down cognitive control (often referred to as executive control) supports flexible behaviour, adaptive responses and complex goal-directed thought, can inhibit automatic responses and influence working memory (Engle & Kane, 2004; Hughes et al.2013).

*2.3 - Manipulations of top-down control adjudicate between unitary and duplex accounts*

Investigations concerning the manipulation of factors relating to top-down cognitive control, and the influence of these on disruption produced by auditory distracters, have become central in work attempting to adjudicate between unitary and duplex accounts of auditory distraction. In general, this line of work has considered top-down control in terms of response to contextual factors such as the difficulty (or perceived difficulty) of the focal task and dispositions for attentional control (as indexed by Working Memory Capacity). The crux of this work involves establishing whether different forms of auditory distraction are tempered by differences concerning top-down control (Hughes et al., 2013).

The manipulation of top-down cognitive control is therefore a powerful tool in discerning between the duplex and unitary accounts. Since the duplex account attributes the CS effect to an interference by process, the disruption it produces is therefore inevitable due to the process necessitated by the task (serial rehearsal) coming into direct conflict with the preattentive processing of the serial order of sounds within the distracter sequence (Hughes et al., 2013). However, the duplex account suggests that a second form of distraction—attentional capture—explains the deviant effect. Thus, factors that relate to top-down cognitive control that may, for example, increase the steadfastness of attention on visually presented items should reduce the deviant effect, whilst leaving the CS effect unaffected. Alternatively, the unitary account holds that both the deviant and CS effects are produced by attentional capture, and that therefore, both should be tempered by manipulations of top-down cognitive control.

*2.4 - Working Memory Capacity*

Individuals differ in their Working Memory Capacity (henceforth WMC): a capacity measured with complex span tasks that is associated with (among other capabilities), an increased ability to active maintain goal-relevant/task-goal representations within a high activated and thus accessible state within the cognitive system (Kane & Engle, 2003) and volitional control over attention and amount of available attentional resource. (See, Conway, Cowan, & Bunting, 2001; Kane, Bleckley, Conway, & Engle, 2001; Kane & Engle, 2000; Rosen & Engle, 1997). The unitary account (Bell et al.,2017; Cowan, 1995, 1999), which supposes that both the CS effect and the deviant effects are attributable to attentional capture, would appear to predict a relationship between the distraction produced by CS distracters and that produced by deviants and participants’ WMC. If one assumes that attentional capture can be tempered by active maintenance of task-goal representation and/or the capacity to voluntarily control attention, then WM could facilitate an overriding of ORs/attentional capture by auditory events.

Some evidence that high WMC was associated with reduced auditory attentional capture has been gleaned from the “own-name effect” (Moray, 1959; Wood & Cowan, 1995). Participants with higher WMC are less likely to recognise their own name in an unattended channel (e.g., auditory information presented to a to-be-ignored ear) while repeating back a message presented to an attended channel (e.g., information presented to a to-be-attended ear; Conway, Cowan, & Bunting, 2001; for a related finding, see Beaman, 2004, Experiment 4 and Marsh et al., 2018). The “own-name effect” can be considered an indication of attentional recruitment. Given that one instance of habituation to the OR is thought to require central processing capacity (Öhman, 1979, p. 466), it might be expected that individuals with high WMC show more habituation during the time-course of an experiment. Consistent with this, Sörqvist, Nostl and Halin (2012) reported that individuals with high WMC demonstrated faster habituation to deviant distracters in the context of a cross-modal oddball task wherein participants were required to categorise a visual target.

However, despite these observations, data in relation to other forms of auditory distraction paradigms are less clear. In their Bayesian-meta-analysis in the context of auditory distraction of serial-short-term memory, Sörqvist, Nöstl, & Marsh (2013) concluded that, across studies, data supported a relationship between WMC and the deviation effect (with participants possessing higher WMC showing smaller effects) but not between WMC and the CS effect. Clearly, this finding supports the duplex mechanism account over the unitary account as the duplex account proposes that deviants disrupt performance by capturing and redirecting the attention of a participant, whilst CS distracters cause disruption due to a conflict between the voluntary processing of rehearsed digits and the involuntary processing of items in a CS sequence. It is argued that individuals with a high WMC can overrule the undesired switch in attention to the deviant, due to a more steadfast locus of attention from greater engagement in the task (Sörqvist, 2010; Sörqvist, Nöstl, & Marsh, 2013). Unlike encoding-load manipulations that trigger greater task-engagement from a top-down cognitive control in response to experienced task difficulty, WMC reflects a stable disposition for attentional control.

However, since publication of the Bayesian meta-analysis, the results of recent studies concerning the relation between WMC and the magnitude of different forms auditory distraction are mixed. Whilst Sörqvist, Vachon, and Marsh (2017) replicated the finding that WMC was associated with the deviation effect, they did not compare WMC with the CS effect. A recent well-powered study (n=138) failed to replicate the finding that WMC dissociates the CS effect and the deviation effect, reporting that both auditory distraction effects were equally unrelated to WMC (Körner et al., 2017). However, it should be noted that in this latter study the number of participants demonstrating a deviation effect was low which necessarily obscures the appearance of any potential relationship between the measures of interest. Another top-down manipulation that has attracted a plethora of recent studies concerns foreknowledge about the ensuing sound sequence.

*2.5 - Forewarning*

As previously mentioned, while attention is being directed to a task, a neuronal model of the auditory environment is fashioned. This neuronal model is generated using expectations in the sounds that would occur in the auditory environment as well as processing the current background sounds. When new unexpected sounds are introduced to the auditory environment repeatedly, the neuronal model incorporates the new information into the model, leading to habituation of the OR (Miller & Cohen, 2001; Sara & Bouret, 2012). As a result, a recent growing interest has developed on whether providing foreknowledge to participants. foreknowledge is clearly a top-down factor since providing participants with information about an impending sound sequence enables an opportunity to incorporate the information into a forward (predictive) model of that ensuing sound. Such incorporation of information regarding the sound into a neural model should therefore render that information ineffective at capturing attention since it no longer violates that neural model (Hughes et al., 2013).

The duplex and unitary models differ in their predictions regarding the role of foreknowledge in tempering the disruption produced by a given auditory sequence. The duplex mechanism model (e.g., Hughes, 2014) proposes that foreknowledge should reduce any effect of auditory distraction for which the underpinning mechanism is attentional capture (Hughes & Marsh, 2019). One such effect is caused by an auditory deviant that can be viewed as a behavioural consequence of the violation of expectation generated by the neuronal model (Nöstl, Marsh, & Sörqvist, 2012; Röer, Bell, & Buchner, 2014b; Vachon, Hughes, & Jones, 2012). The auditory deviant effect should be reduced by foreknowledge because pre-exposure to an auditory sequence containing a deviant would enable a neural model of that sequence to be developed that includes the deviant. Therefore, the deviant is no longer unexpected and the likelihood of it producing an OR is greatly diminished. On the duplex mechanism account pre-exposure to a changing sequence of auditory items will not lessen their disruption of serial recall because there is nothing within the sequence that triggers attentional capture and the processing of auditory changes, responsible for the disruption, proceeds automatically without volitional control. On the other hand, the unitary account (Cowan 1995, 1999), which asserts that each element-to-element auditory change within a CS sequence captures attention, just like an auditory deviant, suggests that both auditory CS and auditory deviant effects should be diminished by the presentation of foreknowledge.

The competing predictions of the duplex mechanism account and the unitary account have spawned a raft of studies investigating the nature of the foreknowledge (auditory vs. written) and the nature of the to-be-ignored sequence (letters, words, sentences; Bell et al.,2017; Hughes et al.,2013; Hughes & Marsh, 2019; Marsh, Kershaw, Vachon, & Hughes, in preparation ; Röer et al.,2015). Initial work by Hughes et al.(2013) found that when participants were presented unspecific forewarnings about the content of distracters prior to the visual presentation of the to-be-remembered sequence (e.g. “Deviant” vs. “No Deviant” or “Changing-state” vs. “Steady-state” printed on-screen prior to digit presentation) significantly reduced the deviant effect but failure to reduce the changing-state effect. At first glance this work supports the duplex account, however, further work in this area has complicated this notion. For example, Röer et al. (2015) provided participants with the exact content of the impending auditory distractors by means of a written transcript, paired with auditory presentation, printed on-screen prior to presentation of the to-be-remembered list. In their first two experiments the presentation of even the mere transcripts of the distracter sequence (without the auditory accompaniments) resulted in a significant reduction of the disruption sentences produced to serial recall performance. A third experiment showed this benefit to disappear when non-specific foreknowledge such as “Deviant” was presented (cf. Hughes et al., 2013).

The authors supposed that the findings from their first and second experiments directly challenge the duplex account, as this account predicts that CS distracters (sentences) should not benefit from foreknowledge, as their disruptive properties are generated through interference-by-processes, not attentional capture. However, the third experiment complicated this suggestion, as non-specific foreknowledge provided no reduction in the disruption CS sequences produced, in line with Hughes et al.(2013). Roër et al’s (2015) fourth experiment demonstrated that foreknowledge reliably reduced the disruption from sentential material presented as auditory distracters but had no impact on the reduction of distraction by sequences of discrete words. A debate has since centred on the nature of auditory distraction produced by sentential material. Röer et al. (2015) describe this material as “complex speech”, however, Bell et al. (2017) terms sentential auditory material a “complex changing-state distracter” and refers to a list of random words, letters, digits or tones as a “simple-changing-state distracter” (pg. 5; Bell et al. 2017). Thus, although complex changing-state distracters comprise coherent spoken sentences in a language a participant understands, it is the acoustic properties as opposed to lexical-semantic or syntactic properties, that Röer et al. (2015) suppose drives the additional disruption produced by complex over simple changing-state (hereon “simple CS”) material. Thus, Röer et al. (2015) propose that the reduction of distraction produced by complex changing-state (hereon “complex CS”) material following foreknowledge is at odds with the duplex mechanism account that proposes disruption from the acoustic variability of sound is inviolable and therefore not amenable to top-down control.

While advocates of the unitary account (Bell et al.,2017; Röer et al.,2015) suppose that the reduction of disruption produced by complex-CS material via the presentation of foreknowledge is at odds with the duplex mechanism account, this claim might be premature. In Röer et al’s studies (Bell et al., 2017; Röer et al., 2015) complex-CS distracters were presented in a participant’s native language. Therefore, it is possible that familiarity with features of the to-be-ignored sentence such as its syntax and semantic properties, rather than its acoustics, are attributable for its additional disruption relative to simple-CS sequences. Moreover, if those syntactical or semantic properties had a potency to capture attention, then it is possible that foreknowledge attenuates this power of sentences to divert attention from the focal task. As Röer et al. (2015) note, the disruption attributable to complex-CS distracters was not eliminated entirely by foreknowledge: they were still as disruptive as simple-CS distracters relative to steady-state distracters (which show little to no disruption compared to silence). Thus, there are elements within the complex-CS sequence that produce disruption over those in simple-CS sequences that are rendered ineffective by foreknowledge, thereby leaving the residual (simple) CS effect. One possibility is that the lexical-semantic/syntactical components of the complex-CS material (i.e., sentences) govern its additional disruption over simple-CS sequences and that these features produce some attentional capture or attentional diversion that is attenuated through specific foreknowledge. On this view, the disruption by complex-CS sequences is a qualitatively distinct form of distraction from simple-CS distracters, having more in common with the deviant effect. If correct, then the findings would fall perfectly in line with the duplex mechanism account (Hughes, 2014).

The idea that the complex-CS sequences were more disruptive than simple-CS sequence due to their familiar lexical-semantic/syntactical components capturing participants attention from the focal task was dismissed by Bell et al. (2017). They proposed that the explanation was unlikely since meaningful as compared with meaningless narrative speech (foreign or reversed) has been shown to be equally disruptive of serial recall (Jones, Miles, & Page, 1990) and sequences of categorised words (e.g., apple, orange, pear) presented as normal speech produced no more disruption than the same sequences presented in reverse (Röer, Körner, Buchner, & Bell, 2017). However, the disruption produced by a continuous background narrative speech may be qualitatively different from that produced by single discrete sentences as in Bell et al. (2017). Moreover, a concatenation of words taken from a taxonomic category (Röer et al., 2017) lacks the lexical-semantic/syntactical component that might capture attention. Recent work (Marsh, Kershaw, Vachon, & Hughes, in preparation) provided a more compelling test of whether the lexical-semantic/syntactic component of complex-CS sequences produce disruption. English monolinguals and Swedish-English bilinguals were presented with English, Swedish and reversed speech sentences with or without foreknowledge. Without foreknowledge, English sentences were significantly more disruptive than Swedish and reversed sentences for English monolinguals and Swedish and English sentences were more disruptive than reversed sentences for Swedish-English bilinguals. This suggests that meaningful or familiar lexical-semantic/syntactical components within a complex-CS sequence are indeed disruptive. Crucially, the presence of auditory foreknowledge abolished this effect. That is, the additional disruption from English sentences over Swedish and reversed was eliminated by foreknowledge for English monolinguals and the extra disruption that Swedish and English sentences produced over reversed sentence was extinguished for Swedish-English bilinguals. This would appear to cohere better with the duplex mechanism account (e.g., Hughes, 2014) than the unitary account (Bell et al.,2017; Röer et al.,2015): meaningful sentences comprise a component that diverts attention away from the focal task, akin to a deviant effect, and this is ameliorated by the top-down factor of foreknowledge with the residual impairment reflecting the typical, inviolable CS effect, attributable to interference-by-process (Hughes et al.,2013).

A task-process analysis has provided further evidence that meaningful sentences produce attentional diversion. Hughes and Marsh (2019; Experiment 2) demonstrated that complex-CS sequences (meaningful sentences) disrupted performance on a task that does not require retention of serial order, the missing-item task. Crucially, within the same study simple-CS sequences did not produce disruption relative to steady-state sequences. Furthermore, foreknowledge removed the disruption produced by the meaningful sentence material. This task-process invariance in susceptibility to the complex-CS effect gels with the duplex mechanism account which assumes that the effect is driven by attentional diversion and therefore should, like the deviant effect, be observed equally for tasks that do, and do not, require short-term memory for serial order (see also Marsh et al., 2018). Notably, the absence of a CS effect for the missing-item task fits with the notion—on the duplex mechanism account—that the task does not require serial rehearsal and is therefore immune to the disruption typically produced from automatically encoding the serial order of changes within the acoustic elements of a sound (interference-by-process). The failure to find a CS effect in the context of the missing-item task within that study is, of course, contrary to the expectation of the unitary model, according to which acoustic changes within sound draw attention away from the focal task (Bell et al.,2017; Röer et al.,2015).

While the picture painted here in relation to foreknowledge would appear relatively straightforward, there are a few inconsistencies within the literature that deserve comment. For example, although Hughes et al. (2013) observed that unspecific foreknowledge in the form of a written cue (e.g., “Deviant”) reduced the deviant effect relative to the no foreknowledge condition, Röer et al. (2015) found that specific foreknowledge (e.g., written and auditory presentation of the sequence containing a deviant) did not reduce the deviant effect. This observation does not fit with either unitary or duplex mechanism accounts that assume foreknowledge should give rise to the fashioning of a deviant-containing neural model and should, therefore, diminish the likelihood of an OR and attentional capture. However, it should be noted that the magnitude of the deviant in the no foreknowledge condition of Röer et al. (2015) was small and therefore there was little room for a benefit of foreknowledge to be observed.

While many studies have investigated the independent influences of top-down control in response to contextual factors (e.g., high task difficulty), stable disposition for attentional control (e.g., WMC) and forewarning on auditory distraction, a few studies have investigated the influence on auditory distraction of a combination of these variables. For example, the greater magnitude of deviant effect experienced by low WMC compared to high WMC participants (e.g., Marsh et al., 2017; Sörqvist, 2000; but see Körner et al., 2017) is abolished when participants are presented with foreknowledge (e.g., “Deviant”) concerning an impending to-be-ignored sequence (Hughes et al., 2013; Experiment 2) or are presented with degraded stimuli so as to increase task-difficulty (Hughes et al., 2013; Experiment 1). Thus behaviourally, participants with low WMC perform akin to those with high WMC in conditions of high task-difficulty or when foreknowledge is presented (for a similar finding, see Halin, Marsh, Hellman, Hellström, & Sörqvist, 2014). Thus, low WMC participants may not spontaneously adopt top-down control to focus their attention and shield their performance against the disruption produced by a deviant. However, when top-down control is encouraged—through high task-difficulty and foreknowledge—low WMC can shield their performance against deviant distraction. Manipulations of high task-difficulty and foreknowledge thus “level the playing field” between low and high WMC participants, with the former now able to resist auditory attentional capture.

*2.6 - Summary*

Overall, the implication from consideration of previous work concerning top-down control of distraction suggests that further research within this area may shed further light on the debate between the unitary and duplex approaches. Of specific interest is the nature of disruption produced by so-called “complex-CS” sequences. The literature suggests that this effect may, like the deviant effect, may be underpinned by auditory attentional capture as opposed to acoustic variation. Further investigation of the underpinnings of the disruption produced by complex-CS sequences is important as it informs the debate between the duplex account (e.g., Hughes, 2014) and unitary account (Bell et al.,2017; Cowan, 1995, 1999) of distraction. To reiterate, proponents of the unitary account (Bell et al.,2017; Cowan, 1995, 1999, Röer et al.,2015) propose that complex-CS sequences, like simple-CS sequences, produce attentional capture due to their acoustic variation and that disruption from this additional acoustic variation can be tempered by foreknowledge. Alternatively, on the duplex account (e.g., Hughes, 2014) the lexical-semantic/syntactic components of the complex-CS sequences capture attention and foreknowledge shields performance against this effect. This debate is not resolved, and further work is thus needed to adjudicate between the duplex mechanism and unitary accounts of the disruption produced by complex-CS sequence.

It is possible that recordings of psychophysiological measures in combination with manipulation of top-down factors may shed light on the underpinnings of the complex-CS effect and its attenuation. Recent work has shown that the OR can be indexed by physiological measurements such as pupil dilation and heart rate change (Marois, Labonté, Parent, & Vachon, 2018; Potter & Choi 2006) and the duplex and unitary accounts make different predications concerning the appearance of an OR according to the type of irrelevant sequence.

*2.7 - The Present Study*

The present study is an attempt to provide further insight into the debate between the duplex and unitary accounts of auditory distraction. This will be achieved by exploring the relationship different forms of distracters (steady-state, simple-CS, complex-CS and deviants) have with manipulations of top-down cognitive control: the provision of foreknowledge and the individual difference of trait capacity of cognitive control (measured by working memory capacity). Of primary interest is the impact that these manipulations have on both behavioural response (task performance on a serial recall task) and physiological responses in pupil dilation, galvanic skin response and heart rate. This convergent mixed-method analysis design therefore aims to attempt to answer whether there truly are two qualitatively distinct forms of distraction (as the duplex account proposes) or a single form (as in the unitary account). Therefore, the present study’s hypotheses are as follows:

Behaviourally, it is expected that regardless of approach, steady-state distracters should produce minimal disruption in comparison with the other three forms of distracters. Otherwise, observations are expected to fall in line with the duplex mechanism account (Hughes, 2013). Complex changing-state sequences should produce greater disruption that changing-state sequences (e.g. Hughes & Marsh, 2019), with this difference being tempered by the provision of foreknowledge, with disruption not unlike the simple changing-state effect enduring. The deviant effect should also be tempered by the provision of foreknowledge as well, the expectation being that disruption should be all but eliminated - like the disruption shown by the steady-state effect. Disruption from the simple changing-state effect should remain unaffected, regardless of foreknowledge provision.

Physiologically, responses are expected to be more complicated. Since the unitary account proposes all forms of distracters produce attentional capture, it is expected that physiological differences will be seen between all the distracter types when compared to the steady-state distracters. Alternatively, however, it is hypothesized that psychophysiological responses to distracters will fall in line with the duplex mechanism account (Hughes et al., 2014). Therefore, complex-CS sequences should produce a physiological response, but simple-CS sequences should not (Marois, Marsh, & Vachon, 2019). Both accounts propose that a physiologically indexed orienting response should be observed for deviant sequences, manifesting as a sharp increase in galvanic skin response and pupil diameter, and a decrease in heart rate following the presentation of an auditory oddball (cf. Marois et al., 2019).

The predictions of the unitary and duplex accounts can be further teased apart when top-down factors are considered. Since the presence of foreknowledge provides participants with a neural model concerning the auditory sequence—that facilitates habituation of the OR (Nöstl, Marsh, & Sörqvist, 2012; Vachon, Hughes, & Jones, 2012)—it follows that physiological-indices of the OR should diminish or disappear on trials for which specific auditory foreknowledge concerning a sequence is presented. On the duplex mechanism account (Hughes et al.,2014) it is therefore hypothesized physiological responses associated with the complex-CS effect, as for the deviant effect, should be eliminated following the presentation of foreknowledge.

Finally, the vulnerability of the responses shown to trait capacity for cognitive control (via working memory capacity) was of interest, especially as a function of foreknowledge. To this end, participants will be grouped using a median split into high and low working memory capacity groups (High WMC and Low WMC hereon). Behaviourally it is hypothesized that High WMC individuals will show lessened disruption to their performance from deviants presented in the serial recall task when compared to Low WMC individuals, whilst the simple changing-state effect should show no significant differences in performance between the groups (Sörqvist et al., 2013; but see Körner et al., 2017). Moreover, if the complex-CS effect is produced by attentional diversion, as the duplex mechanism account might predict, then high against low WMC participants should be less susceptible to this effect. With foreknowledge, however, the difference between high and low WMC participants would be expected to disappear. For psychophysiological measures, one would expect high against low WMC to show reduced physiological indices of attentional capture for the deviant and complex-CS conditions in the no foreknowledge condition, according to the duplex mechanism account, and those differences should disappear in the foreknowledge conditions.

**3 - Methods**

*3.1 - Design*

The present study employed a 4×2×2 mixed design for the behavioural data, with 2 within-participant factors: distracter type with 4 levels (CS, complex-CS, steady-state vs. deviant), foreknowledge with 2 levels (foreknowledge versus no foreknowledge) and the between-participants factor of working memory capacity (high versus low). Physiological measures of heart rate and galvanic skin response employed a 4×2×2×2 mixed design, involving the previously mentioned variables of foreknowledge, distracter type and working memory capacity alongside a third within-participant factor: exposure period (pre-exposure vs. exposure). Measures of tonic pupil response employed a 4×2**×**2×2 mixed design, with foreknowledge, exposure and distracter type as within-participant factors and working memory capacity as a between-participants factor (with the same levels as described previously). Meanwhile, measures of phasic pupil response employed a 3×2 ×2×2 design, incorporating foreknowledge and exposure as within-participant factors alongside distracter type (deviant, complex-CS and simple-CS - relative to the steady-state baseline), and working memory capacity as a between-participants factor.

*3.2 - Participants*

Forty-four participants volunteered to participate in the current study. Participants were staff and students at the University of Central Lancashire (38 participants) and adults recruited from the community in Preston (7 participants). All participants reported normal hearing and normal or corrected-to-normal vision, had no diagnosed neurological diseases and were fluent in English. No participants reported using any psychoactive substances for up to 12 hours prior to participation, and none reported consuming any caffeine/nicotine products up to 6 hours prior, which could have affected baseline pupil diameter, heart rate or skin conductivity (Abokyi, Owusu-Mensah,& Osei, 2017; Erdem, Gundogan, Dinc, Yolcu, Ilhan, & Altun, 2015). No formal priori power analyses were performed to establish a target sample size, rather the present study employed a similar size to those used in prior research (For example, see Hughes & Marsh, 2019 (N = 28); Marois, Marsh & Vachon, 2019 (N = 34); Röer et al, 2015 (N = 44))

*3.3 - Apparatus*

The experiment was performed in the UCLan eye tracking lab on a PC computer running E-Prime (Psychology Software Tools). The program presented auditory and visual stimuli during the tasks alongside instructions and recording the participant’s behavioural responses. This program also communicated with the BIOPAC Data logger and the Tobii TX300 eye tracker (Tobii Technologies), to record the participants heart rate and galvanic skin response, as well as their pupil diameter respectively.

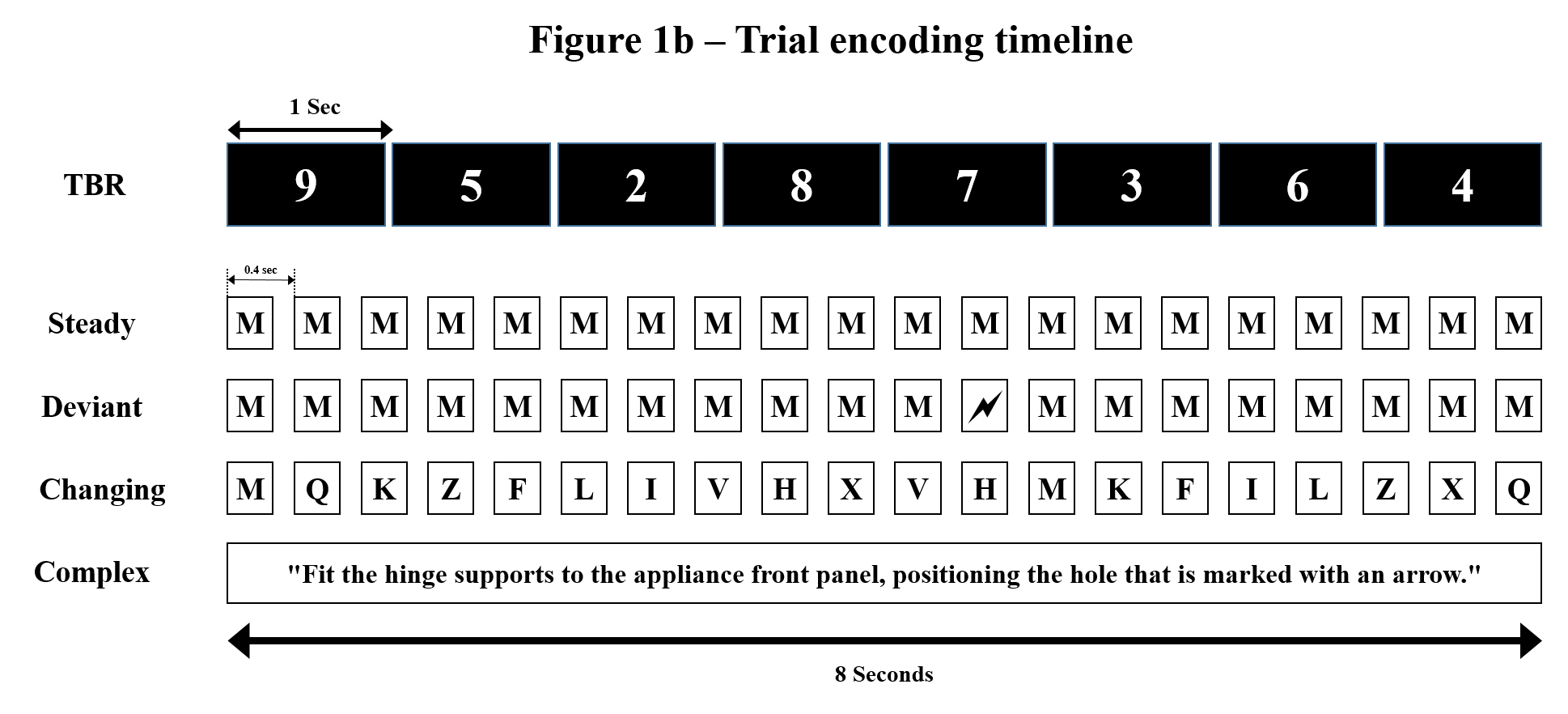
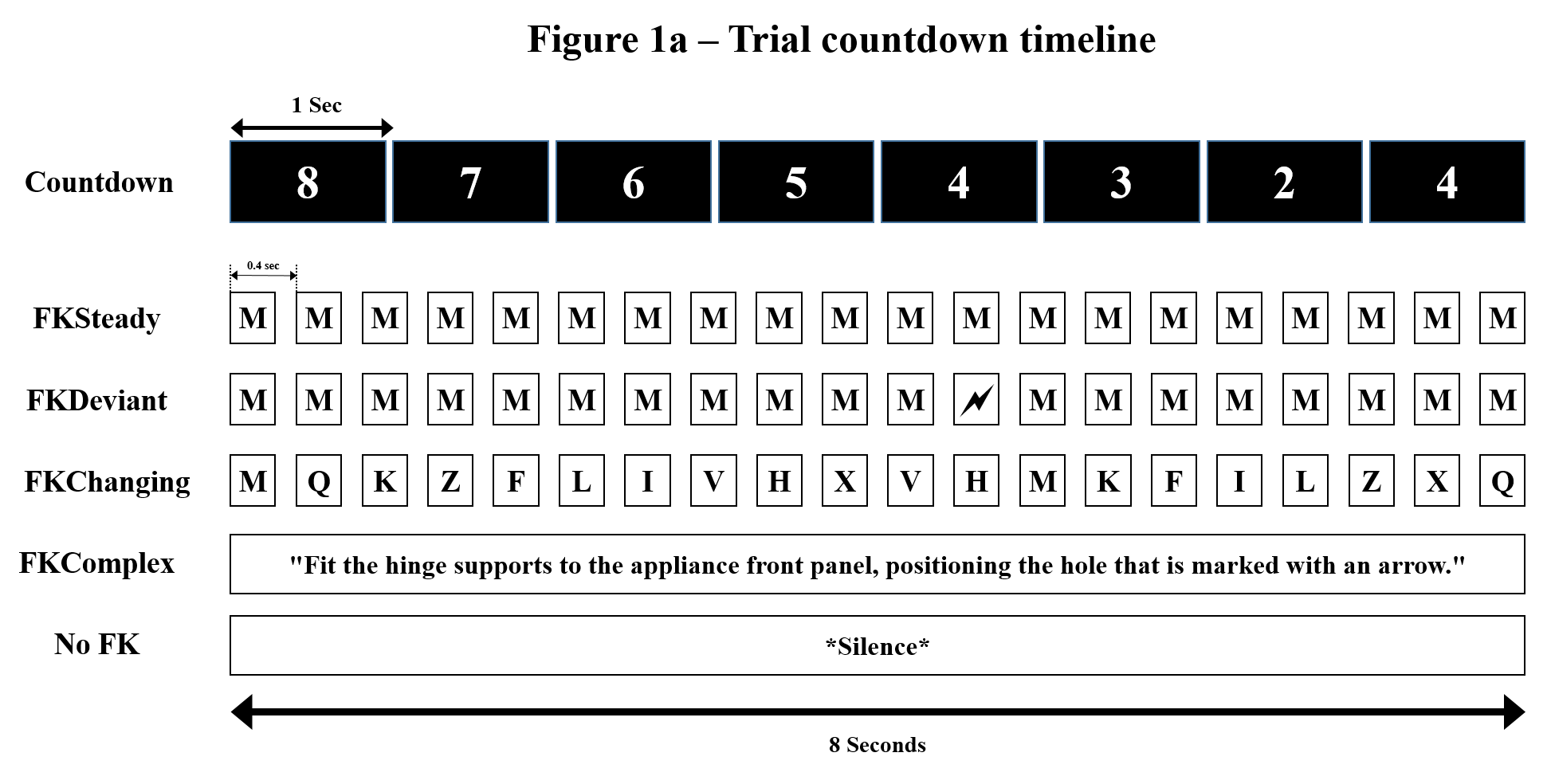
The eye tracker’s cameras were mounted within the monitor displaying the task, recording binocularly at 120Hz. Participant’s heart rate and galvanic skin response were recorded using a BIOPAC data logger at 1000hz. Heart rate was recorded using three electrodes filled with NuPrep skin gel. The participant’s skin was lightly wiped using an abrasive pad to remove any dead skin cells, then two electrodes were attached on either side of the participant’s chest, just below the collar bone. A third electrode was attached to the participant’s non-dominant wrist to act as a ground. Galvanic skin response was recorded using two electrodes filled with NuPrep skin gel. These were attached securely to the participant’s index and middle fingers on their non-dominant hand, to prevent interference with mouse usage in their responses (Potter et al; 2018, Potter & Choi; 2006). Prior to application of the gel, participants were asked whether they had any reactions with cosmetic products in the past or whether they had sensitive skin to avoid any potential allergic reactions to the gel.

*3.4 - Serial recall task*

The participants were presented with an adapted version of the serial recall task used by Marois, Marsh and Vachon (2019). The task was produced using E-Prime version 2.0 Service Pack 2 and was executed on a desktop PC.

Prior to the trials beginning the experiment, instructions for the upcoming serial recall task are displayed on screen. By pressing the spacebar, the participant could then continue onto the serial recall trials. When a trial begins, a fixation cross is displayed for two seconds before they are presented a descending, eight-second countdown (8 to 1), followed by another fixation period lasting 8 seconds. This is followed by the presentation of to-be-remembered digits, in which numbers were drawn from a set of 2-9 and presented in a quasi-random (ensuring no sequential runs of digits greater than 2) order at a rate of one per second (No gaps of blank space are presented between any digits). Presentation of these digits was on a grey background in 100pt bold black equidistant Monaco font in the centre of the computer screen. A final 8-second fixation period is provided following digit presentation before participants are presented the array of digits (2-9) in which they can click in order to input an answer. It was not possible to change a digit once it was input and once all the digits have been selected, the experiment automatically continued to the next trial.

Participants were first given two practice trials to familiarise themselves with the task, before beginning the experimental trials, consisting of two blocks of 40 trials each. In one of these blocks, in the 8 second countdown prior to the digits being displayed, participants received auditory foreknowledge of the distracter that would be presented during the digit presentation. In the other block, silence is presented instead. The presentation of these blocks was counterbalanced between participants. The fixation periods following the countdown and to-be-remembered digit presentation therefore allowed retention periods following the presentation of sound (such as during the countdown in the foreknowledge block and all TBR digit presentations hereon pre-exposure and exposure respectively), for physiological measures such as heart rate and skin conductivity to manifest. Figure 1a shows the composition of the trial during the countdown/pre-exposure period, including examples of distracters (which are discussed in the next section). Figure 1b shows the composition of the trial in the same way, but during the digit encoding/exposure phase of the trial.



Unlike prior studies (e.g. Röer et al.2015), no written transcript of distracter audio was provided to the participants. This was due to the potential impact eye movements during reading could have on pupillary measures during the task. Performance in the serial recall task was scored in accordance with the strict serial recall criterion in which digits are scored correct if they are recalled in the correct serial position, which results in a score between 0 and 1. A mean score for each of the participant’s scores was calculated for each condition (8 separate scores, one for each distracter type: Steady, Changing, Complex, Deviant, with or without the presentation of foreknowledge) and analysed.

Raw pupil data was recorded beginning with the start of each trial and ending following the presentation of the recall screen in the trial. An average pupil diameter between each eye was calculated to produce a single measure. Raw data in which the eye-tracker software rated as not perfectly valid was removed, then, alongside any missing data caused by blinking or eye tracker malfunction, was linearly interpolated in MATLAB (MathWorks). Epochs within trials with greater than 50% interpolation were then removed from the data (See Marois, et al.2018; Marois, Marsh & Vachon, 2019). Nine participants’ data were rejected from the sample in this manner, due to greater than 50% interpolation of pupil data throughout the experiment.

Heart rate and galvanic skin response, however, were recording beginning the onset of the countdown or presentation of digits, ending following the presentation of the digits/countdown ended. AcqKnowledge software calculated the average heart rate in beats per minute and galvanic skin response in microsiemens (μS) for each trial, which was then analysed. One participant was omitted from the sample due to an error with the galvanic skin response recorded during the trial. Steady-state distracters were employed as the baseline measure for the psychophysiological data, due to reflecting the participant’s baseline heart rate, skin conductivity and pupil diameter whilst performing the task and being presented sound. The usage of a baseline which involved the participant at resting would not accurately reflect conditions whilst performing the task. Notably would be the impact of memory load of cardiac, skin and pupil response (e.g. Marois & Vachon, 2018; Marois et al., 2019) as well as the pupillary response to changes in light on the screen displaying the task (see, Marois & Vachon, 2018; Trygon, 1975).

*3.5 - Irrelevant auditory sequences*

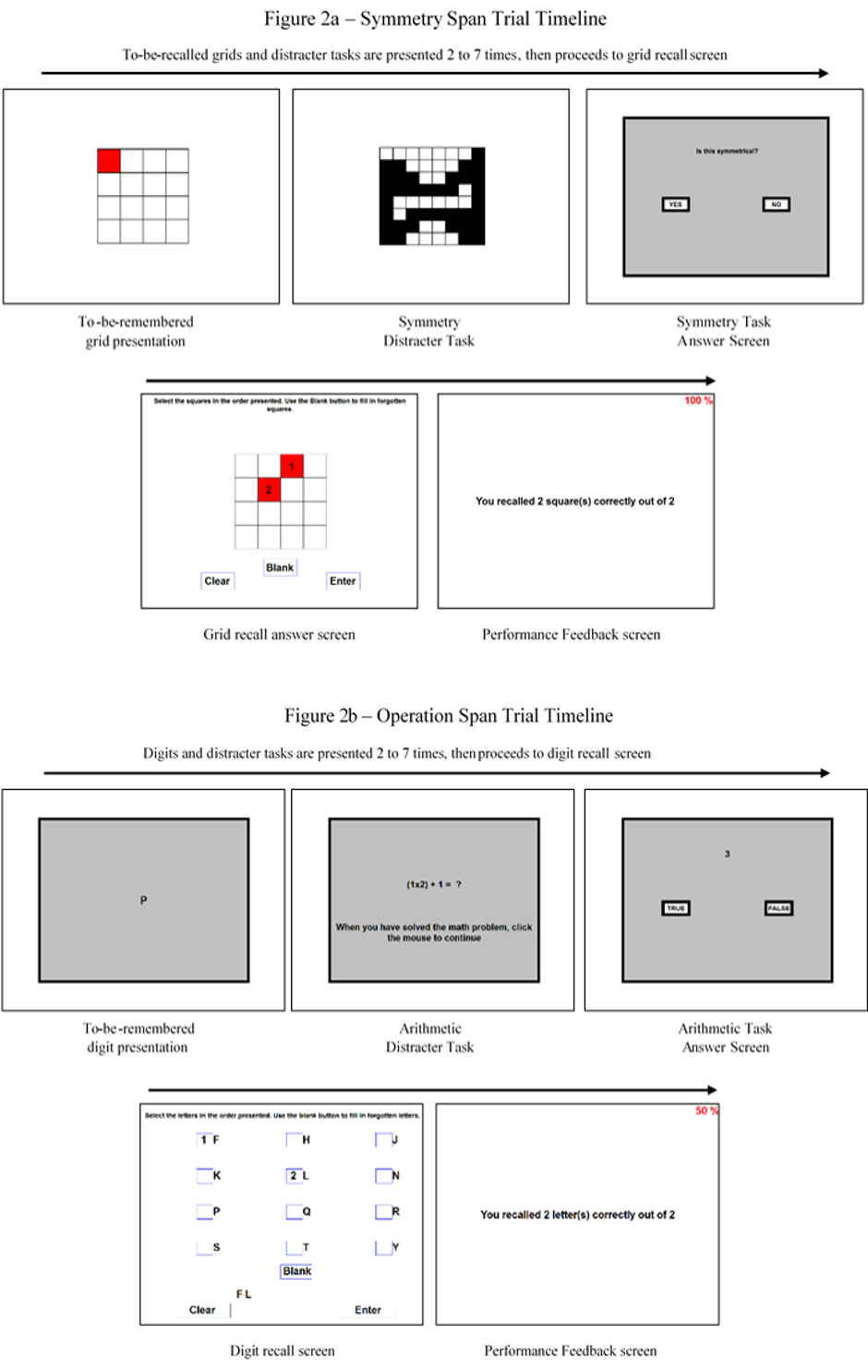
Sixty irrelevant sound sequences were record for usage in the present study. All sequences lasted 8 seconds and were spoken in the same female voice. As Figure 1a and 1b shows, onset of the irrelevant sound sequences began once either the countdown (the pre-exposure period) or to-be-remembered digits (the exposure period) are first presented and they end concurrently with the last digit presented. These sequences were presented at about 65dB(A), approximately normal conversation volume, via noise cancelling headphones the participant wore throughout the task.

Twenty unique complex-CS sequences were recorded for the serial recall task. These consisted of task irrelevant sentences detailing various topics, such as excerpts from cooking books and manuals, amongst others (example transcripts can be found in Appendix 1). The other forty sequences consisted of a sequence of twenty spoken letters, drawn from a set of ten (M, K, Z, I, L, F, Q, X, V and H). Within each sequences each letter was presented 250ms, with a gap of 150ms of silence between letters. Ten of these sequences were steady-state sequences, consisting of a repeating sequence of one of these letters. Ten were deviant sequences, also composed of a repeating sequence of one letter. However, the 12th digit within this sequence (4.8 seconds into the distracter) was replaced with a deviant stimulus: a 250ms burst of pink noise. The remaining twenty sequences were simple-CS sequences, in which letters from the set of ten were presented in a semi-random order. The sequences were generated by producing two 10-letter sequences and chaining one to the next, ensuring no digit repetitions occurred during the sequence. The same ten steady-state and deviant sequences were used between the foreknowledge and no foreknowledge blocks; however, unique simple-CS and complex-CS sequences were employed between foreknowledge blocks.

*3.6 - Complex span tasks*

Shortened versions of operation span (OSPAN) and symmetry span (SYMSPAN; see Foster et al., 2015) were adopted to measure the working memory capacity of participants. In the present study a single block of both these complex span tasks were administered to participants to maximise the predictable variance in working memory measured, whilst keeping with time constraints to minimize the impact of order effects such as fatigue or boredom during the tasks. As a result, performing these tasks took 30 minutes on average.

Each block in both tasks consisted of 18 trials of varying length (including 2-7 iterations of the task), presented in a random order. These complex span tasks otherwise followed the procedures of Unsworth et al. (2005), requiring participants to maintain their response times for each distracter item in the task, which reduces an individual’s ability to rehearse the to-be-remembered items during the task (Foster et al., 2015). Participants are provided with practice trials, serving twofold purpose; to allow them to familiarise themselves with the task as well as calculate an average response time. In the experimental trials, they are then required to maintain this response time to with 2.5 standard deviations this average.

In the SYMSPAN task, trials begin with participants being presented a 4×4 grid with a single square filled in red, which they are tasked to recall the position of. The task then automatically moves on based on their response time (as detailed above), displaying an 8×8 grid with numerous squares filled in black. For each grid, the participant must assess whether the pattern shown is vertically symmetrical or not, answering either true or false. Upon answering, a second 4×4 grid with a filled square is shown, followed by another 8×8 pattern grid. This presentation of continues for 2-7 iterations before participants are then given a blank 4×4 grid. The participant must recall, in serial order, the positions of the red squares on the 4×4 grids, by clicking the position on the blank grid in the order the squares were presented. In the OSPAN task, a similar structure is followed, however, participants are first presented with a letter to recall. Following the response period, a simple arithmetic problem is shown, with a potential answer following. Participants must answer whether the displayed answer is correct, answering true or false. This repeats for 2-7 iterations, following which, a prompt for participants to serially recall the letters shown between arithmetic problems is presented. A timeline of an OSPAN trial is shown inFigure 2b. In both tasks, participants are given performance feedback screens following each trial, detailing their memory performance in the trial, as well as their overall distracter task performance (as a percentage correct).

Complex span tasks are used over the alternate simple span tasks (for example digit span) since these tasks allow for individual differences working memory capacity , such as capacity for focal task-engagement (associated with working memory capacity ), to be measured (Hughes et al., 2013; Kane & Engle 2003), whereas simple span tasks focus on the measurement of short-term memory. Working memory performance was scored using an absolute score on the SYMSPAN and OSPAN tasks; comprising of a sum of each trial in which all items were recalled in the correct serial order. This absolute score was then averaged between the two tasks producing a composite working memory capacity score. The Median score amongst all participants was calculated and used to separate the participants into the high WMC and low WMC groups. Although the use of median splits is not without challenge (McClelland, Lynch, Irwin, Spillerd, & Fitzsimons, 2015) they are nonetheless used very frequently within the working memory literature (e.g., Kane & Engle, 2000; Rosen & Engle, 1997) and for the interests of comparability, are the method of choice here.

*3.7 - Procedure*

Participants arrived at the lab, being greeted by the researcher. Participants were then provided with a briefing form to read paired with a verbal brief of the upcoming tasks and were requested to sign an informed consent form. Participants then either performed the OSPAN/SYMSPAN tasks, or serial recall task, the order performed being counterbalanced between participants.

Prior to performing the serial recall task, the researcher set up the psychophysiological measures. The researcher applied the electrodes for the heart rate, attaching one electrode on either side of the participant's upper chest, just below their collar bone. This allowed heart rate measurements to be taken from the Subclavian arteries that supply the arms with blood. A third electrode is attached behind the participants ear, on the mastoid process. This electrode acted as a ground for the measurement. For galvanic skin response, two additional electrodes are attached to the participant's non-dominant hand, on their index and middle fingers. Participants then worked with the researcher to calibrate the eye tracker. Once an accurate calibration was achieved, the participants were free to begin the task. Throughout the task, participants wore noise-cancelling headphones which were plugged into the computer the experiment ran on. Participants had the option to take a short break between the two blocks (although they were not permitted to leave the lab or remove the electrodes). Upon completion of the serial recall task, the researcher then assisted the participant in removing the electrodes from themselves and was given alcohol wipes to remove any remaining NuPrep Gel left on their skin.

After completion of both tasks, participants are provided with a written debriefing form, alongside an oral debrief by the researcher, concerning the study aims, their right to withdraw and reassurance of anonymity of results. In addition, the written debrief contained contact details for the researcher and their supervisory team, as well as the University of Central Lancashire's ethics committee and help services (details highlighted upon by the researcher).

**4 - Results**

*4.1 - Task Performance*

At a behavioural level, the present study aims to provide a distinction between the degree of distraction caused by 4 types of distracter (steady-state, deviant, simple changing-state and complex changing-state). Furthermore, any distinction in the tempering (or lack thereof) shown by the distracters, caused by directly manipulating top-down control (via provision of distracter foreknowledge) or individual differences in trait capacity for top-down cognitive control (via working memory capacity differences), was also of primary interest.

A 2(working memory capacity group) × 2(foreknowledge) × 4(distracter type) mixed ANOVA revealed a main effect of distracter type (F (1, 38) =15.542, MSE=0.146, p < 0.001, ηp2=0.29) as well as interactions between both distracter type and foreknowledge (*F* (1, 38) =2.932, *MSE*=0.017, *p*=0.043, *ηp2*=0.072) and foreknowledge with working memory capacity (*F* (1, 38) =7.942, *MSE*=0.127, *p*=0.008, *ηp2*=0.173). The 3-way interaction failed to achieve significance. Simple effects analysis (LSD) of the significant interactions revealed the following pattern of effects:

First, regardless of the foreknowledge provided, no significant differences were observed between steady-state and deviant distracters, suggesting that deviants employed in the present study were ineffective at capturing attention (MD=-0.011, SE=0.019, p=0.586; 95% CI [-0.050, 0.028]), regardless of if foreknowledge was provided (*MD*=0.013, *SE*=0.015, *p*=0.398; 95% CI [-0.018, 0.044]). As a result, there also appeared to be no scope for foreknowledge to modulate the attentional capture effect, and no impact of foreknowledge was observed for deviant distracters (MD=0.008, SE=0.024, p=0.757; 95% CI [-0.041, 0.056]). It is unusual to observe no significant differences between steady and deviant distracters, as the latter is thought to elicit attentional capture, which should disrupt memory performance. Therefore, follow-up Simple Effects Analysis (LSD) of this interaction was performed, to discern whether habituation could explain the lack of a deviant effect observed. However, no significant differences were observed between trial 1 and 10 of the no foreknowledge block, suggesting habituation was not a suitable explanation for this observed effect. Further details of this analysis are available upon request.

Secondly, it was revealed that simple changing-state distracters disrupted performance to a much greater degree than both steady-state (*MD*=0.062, *SE*=0.02, *p*=0.003; 95% CI [0.022, 0.102]) and deviant trials *(MD*=-0.073, *SE*=0.018, *p* < 0.001; 95% CI [-0.109, -0.037]). The same was also true for complex changing-state distracters (Steady-state: *MD*=0.109, *SE*=0.021, *p* < 0.001; 95% CI [0.067, 0.152]); Deviant: *MD*=-0.12, *SE=*0.021, *p* < 0.001; 95% CI [-0.163, -0.077]). Complex-CS trials performance was observed to be significantly lower than simple-CS trials as well (*MD*=-0.120, *SE*=0.021, *p* < 0.001; 95% CI [-0.163, -0.077]), demonstrating that spoken sentences (complex changing-state distracters) were the most disruptive to serial recall performance.

Third, provision of foreknowledge failed to impact the disruption caused by the simple changing-state effect (MD=-0.025, SE=0.021, p=0.240; 95% CI [-0.068, 0.018]). However, the complex changing-state distracters showed a significant improvement to performance when foreknowledge was provided (MD=-0.063, SE=0.02, p =0.003; 95% CI [-0,103, -0.023]). Notably, the difference in disruption caused by the complex changing-state effect compared to the simple changing-state was eradicated once foreknowledge was provided (MD=0.010, SE=0.020, p=0.633; 95% CI [-0.031, 0.050]). However, the disruption from complex changing-state distracters was not eliminated completely, when compared to steady-state distracter trials (*MD*=0.063, *SE*=0.019, *p*=0.002; 95% CI [0.024, 0.102]). This demonstrates a modulation of the complex changing-state effect by foreknowledge, whilst the changing-state effect is unaffected. Furthermore, it also indicates that the disruption from the complex changing-state effect is split into an attentional capture component (which is mitigated by foreknowledge) and a changing-state effect, which is not.

Finally, decomposition of the interaction between working memory capacity and foreknowledge with Simple Effects Analysis (LSD) revealed that performance of individuals grouped into high working memory capacity benefitted to a significant degree when provided foreknowledge, compared to a lack of foreknowledge (MD=-0.064, SE=0.020, p=0.030; 95% CI [-0.105, -0.24]). This was not the case with the low working memory group however, who appeared to receive no significant benefit or detriment from the provision of foreknowledge (MD=0.016, SE=0.020, p=0.439; 95% CI [-0.025, 0.056]). Comparing between the low and high groups, no significant differences between the two were observed in the no foreknowledge condition (MD=0.046, SE=0.062, p=0.457; 95% CI [-0.079, 0.171]), suggesting at a baseline, working memory capacity did not temper the disruption from any type of distracter. However, when foreknowledge was provided, high working memory capacity individuals appeared to receive a significant benefit compared to the low group (MD=0.126, SE=0.060, p=0.043; 95% CI [0.004, 0.248]). However, since the 3-way interaction was revealed to be non-significant, it suggests that this was regardless of the distracter type. The means and statistics tables for this analysis are available in Appendix 2.

*4.2 - Psychophysiological response*

Much like the behavioural responses, any distinctions in response present at a psychophysiological level towards each type of distracter was of great interest in the present research. Moreover, is whether these responses are tempered by manipulations of top-down cognitive control. Any divergent observations compared to the behavioural findings will also be noted and discussed.

The following sections focus on the heart rate and galvanic skin response measures and are split comparing between two sets of distracters. First, steady-state and deviant distracters will be compared, in order to attempt to index the orienting response from attentional capture that deviants elicit. Second, simple and complex changing-state distracters will be compared in a similar regard, to attempt to observe whether the supposed attentional capture component of complex changing-state distracters provides a distinct response above that of the simple changing-state effect.

*4.3 - Skin Conductivity - Deviant vs. Steady-state*

A 2(foreknowledge) × 2(distracter type) × 8(time, seconds) mixed ANOVA revealed a main effect of time (F (1, 37)=3.731, MSE=1.649, p=0.001, ηp2=0.092) as well as significant interactions between distracter type and foreknowledge block (*F* (1, 37) =6.378, *MSE*=3.808, *p*=0.016, *ηp2*=0.147) and between all three variables (*F* (1, 37) =0.071, *MSE*=3.990, *p*=0.791, *ηp2*=0.002). No other significant interactions or main effects were revealed. Figure 3 displays the mean skin conductivity over time in between foreknowledge blocks for this ANOVA. Simple effects analysis (LSD) of the significant 3-way interaction revealed the following pattern of effects:

First, the response present in the no foreknowledge block was compared between the two distracters. Decomposition of this interaction revealed that whilst significant increases in galvanic skin response occurred following 2 seconds of the deviant being presented (2-5 seconds following deviant presentation; MD=-0.396, SE=0.183, p=0.037; 95% CI [-0.766,-0.025]). However, no significant differences in response were noted between the deviants and steady-state distracters. This suggests that the observed increase, whilst significant, was not significantly distinct enough from the steady-state response to be considered an orienting response.

When foreknowledge block was compared, it is notable that deviant distracters show a significantly higher base skin conductivity prior to the deviant presentation compared to in steady-state trials (*MD*=-0.842, *SE*=0.232, *p*=0.001; 95% CI [-1.321, -0.372]). However, much like without foreknowledge presentation, whilst significant increase in Galvanic skin response was observed (*MD*=-0.361, *SE*=0.169, *p*=0.040; 95% CI [-0.704, -0.018]), no significant differences were observed between steady-state and deviant trials was present, suggesting this change could not constitute as an orienting response. The changes in galvanic skin response over time are shown below in Figure 3, and the means and statistics tables are available in Appendix 3.

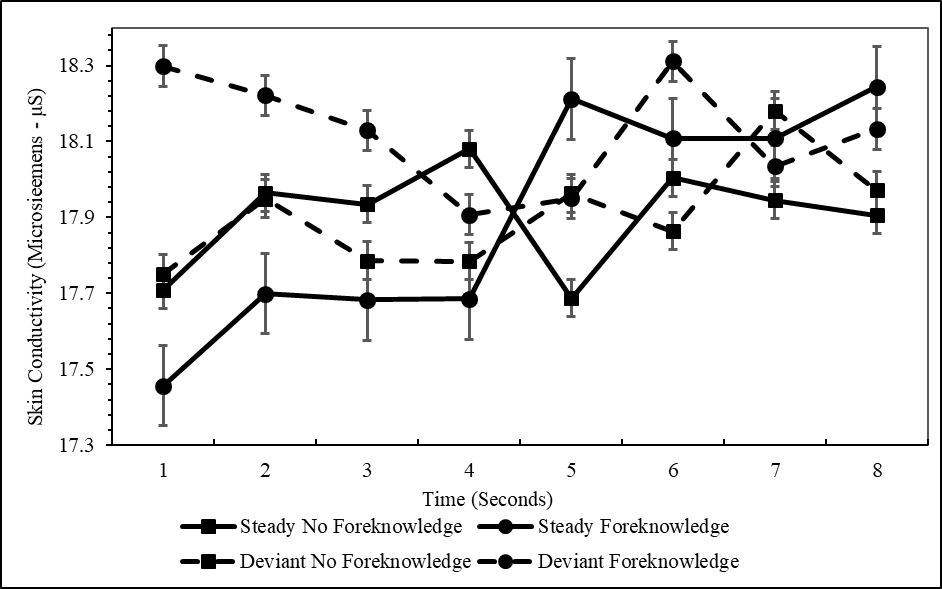


Figure 3 - The changes in galvanic skin response over time, comparing between exposure period of the foreknowledge and no foreknowledge conditions. The deviant foreknowledge condition shows a significant increase over time; however, no significant differences were observed between this condition and the steady foreknowledge condition. Furthermore, no other significant changes were observed between the conditions, suggesting a lack of a psychophysiological orienting response was observed.

A second 2(exposure) × 2(distracter type) × 8(time, seconds) mixed ANOVA was employed to compare between the preexposure (when foreknowledge is presented) and the exposure (When digits are presented) periods. This revealed a significant main effect of distracter type (*F* (1, 37)=9.467, *MSE*=11.363, *p*=0.004, *ηp2*=0.204), and time (*F* (1, 37)=2.993, *MSE*=1.764, *p*=0.005, *ηp2*=0.075). Furthermore, significant interactions between distracter and time (*F* (1, 37) =2.738, *MSE*=1.184, *p*=0.009, *ηp2*=0.069) as well as a 3-way interaction between all three variables (*F* (1, 37) =3.893, *MSE*=2.540, *p* < 0.001, *ηp2*=0.095) was revealed. The main effect of exposure remained non-significant, as did the interactions between exposure and distracter type/time. Simple effects analysis (LSD) of the significant 3-way interaction revealed the following pattern of effects:

First, during pre-exposure, deviant distracters again shown a significant increase in skin conductivity over time following 1 second of the deviant presentation (until timeslot-five; *MD*=-0.546, *SE*=0.166, *p*=0.002; 95% CI [-0.881, -0.210]). This was followed by a significant decrease until the end of the trial (*MD*=0.854, *SE*=0.376, *p*=0.029; 95% CI [0.092, 1.616]). Compared with steady state trials, deviant distracters showed a significantly greater skin conductivity during the previously noted increase (present 3 seconds: *MD*=-0.541, *SE*=0.229, *p*=0.024; 95% CI [-1.005, -0.077] and 4 seconds: *MD*=-0.578, *SE*=0.230, *p*=0.016; 95% CI [-1,043, -0.113] following the presentation of the deviant). This observed difference would suggest that when sound is presented in the preexposure period of a trial, attentional orienting occurred towards the deviant distracters but, did not for steady-state distracters. The changes in galvanic skin response over time are shown below in Figure 4, and the means and statistics tables are available in Appendix 4.

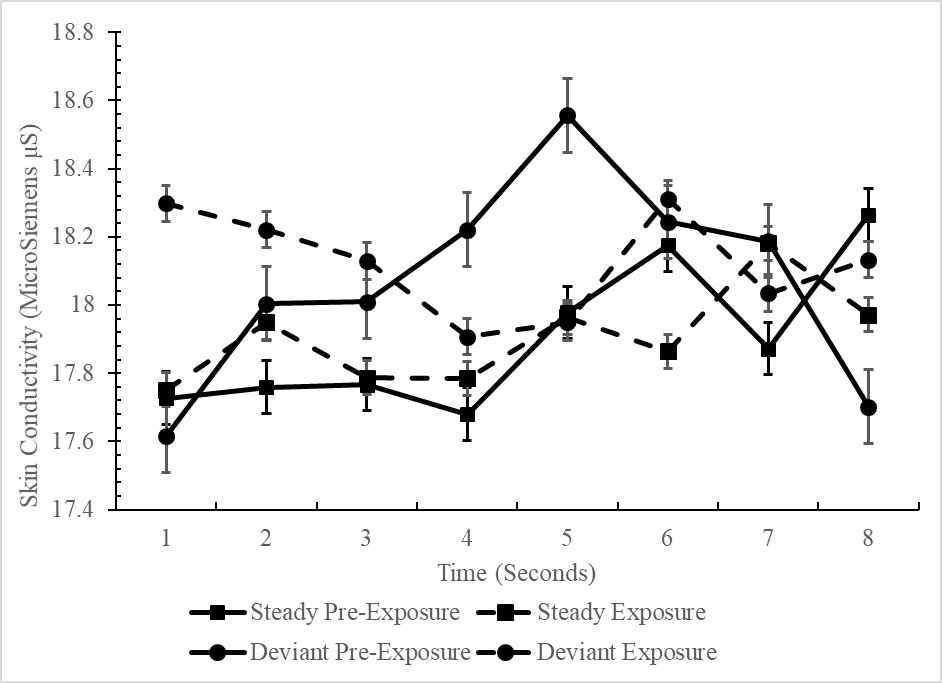


Figure 4 - The changes in galvanic skin response over time, comparing between pre-exposure and exposure periods of the foreknowledge condition. The pre-exposure phase of deviant trials displays a significant increase one second following the presentation of the deviant, skin conductivity being significantly greater than in the pre-exposure of steady-state trials. This suggests that psychophysiological orienting occurred towards deviants during pre-exposure of the foreknowledge trial. However, no other significant changes in were observed between the conditions.

As discussed in the interpretation of the previous analyses, the exposure phase of the foreknowledge trials appears to show no OR. To reiterate, whilst an increase in skin conductivity three seconds after deviant presentation until five seconds following presentation (*MD*=-0.361, *SE*=0.169, *p*=0.040; 95% CI [-0.704, -0.018]), no timeslots significantly differed from the steady-state trials, suggesting that the observed increases were not an OR. As a result, and unlike the foreknowledge comparison, it appears at first glance a tempering of the OR towards the deviant is being observed between the pre-exposure (where foreknowledge is presented) and the exposure period (when digit encoding occurs). This falls in line with the hypothesis that disruption from deviant distracters will be tempered by foreknowledge, however, it is complicated by the no foreknowledge condition also showing no orienting response during exposure. In addition, the observation of an orienting response here, whilst no disruption to performance was present behaviourally is of interest, and these observations will be discussed further in the discussion.

*4.4 - Heart Rate - Deviant vs. Steady-state*

A 2(foreknowledge) × 2(distracter type) × 8(time, seconds) mixed ANOVA revealed a main effect of foreknowledge (*F* (1, 38)=4.926, *MSE*=940.019, *p*=0.032, *ηp2*=0.115) and time (*F* (1, 38)=3.078, *MSE*=93.402, *p*=0.004, *ηp2*=0.075). However, no significant main effect of distracter was observed, nor were any significant interactions. Further analysis of the main effect of time revealed that heart rate significantly decreased over time during trials, regardless of foreknowledge provision or distracter type (*MD*=1.949, *SE*=0.855, *p*=0.028; 95% CI [0.217, 3.681]). Decomposition of the main effect of foreknowledge revealed mean heart rate was overall significantly lower in the no foreknowledge block compared to the foreknowledge block (MD=1.714, SE=0.772, p=0.032; 95% CI [0.151, 3.277]). Mean heart rate over time for this ANOVA is displayed in Figure 5, and the means tables are available in Appendix 5.

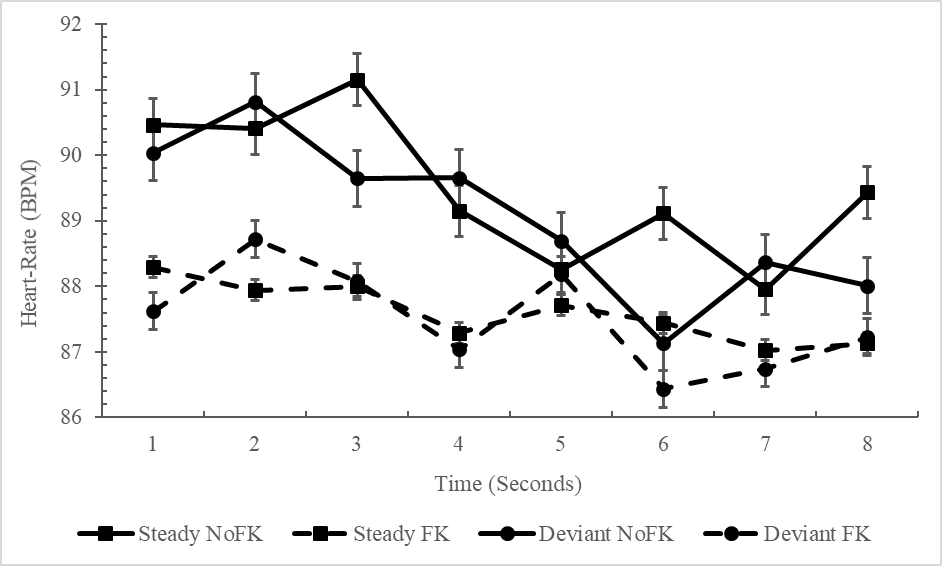


Figure 5 - The changes in heart-rate response over time, comparing between no-foreknowledge and foreknowledge conditions. The no foreknowledge conditions show significantly higher heart rates overall throughout the trial, which decreases over time. Meanwhile the foreknowledge condition shows lower mean heart rates, which does not change significantly over time. These patterns would fall in line with hypotheses, however, this occurred regardless of the distracter type condition.

A second 2(exposure) × 2(distracter type) × 8(time, seconds) mixed ANOVA was employed to compare between the preexposure and the exposure periods for heart rate as well. Significant main effects of exposure (*F* (1, 38) =10.826, *MSE*=4105.420, *p*=0.002, *ηp2*=0.222) and time (*F* (1, 38) =7.460, *MSE*=210.270, *p* < 0.001, *ηp2*=0.164). In addition, there was a significant interaction present between exposure and time was also revealed (*F* (1, 38) =2.670, *MSE*=93.418, *p*=0.011, *ηp2*=0.066). Otherwise, no other significant main effects were observed, and the interactions between distracter type and time, distracter type and exposure, and the 3-way interaction all failed to achieve significance.

Decomposition of the exposure and time interaction with Simple Effects Analysis (LSD) revealed that during every time point during the exposure period (except 3 seconds following the deviant presentation, *MD*=1.943, *SE*=1.234, *p*=0.124; 95% CI [-0.555, 4.442]) heart rate was significantly lower than in the pre-exposure period. This was supported by the main effect of exposure, with exposure having a lower mean heart rate overall (*MD*=3.582, *SE*=1.089, *p*=0.002; 95% CI [1.378, 5.786]). Over time in the pre-exposure period, heart rate was observed to significantly decrease for 4 seconds following the start of the trial (*MD*=4.749, *SE*=1.032, *p*<0.001; 95% CI [2.658, 6.839]). However, all changes in the following 4 seconds were non-significant (*MD*=-0.359, *SE*=1.066, *p*=0.738; 95% CI [-2.516, 1.799]). In the exposure periods, no significant overall changes in mean heart rate were observed throughout the trial (from timeslot-1 to 8: *MD*=0.776, *SE*=0.925, *p*=0.407; 95% CI [-1.096, 2.648]). Whilst a heart rate orienting response would manifest as a decrease in heart rate over time, this decrease in the pre-exposure occurred regardless of the distracter type, complicating the assumption that this response occurring due to attentional orienting towards the distracter. Mean heart rate over time for this ANOVA is displayed in Figure 6, and the means tables are available in Appendix 6.

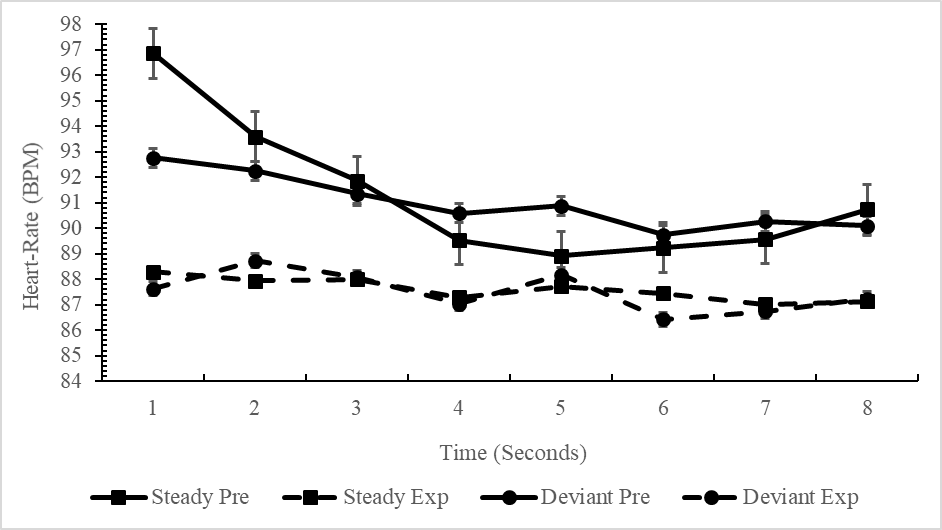


Figure 6 - The changes in heart rate over time, comparing between pre-exposure and exposure periods of the foreknowledge condition. Similar to the foreknowledge comparison, the pre-exposure periods show significantly greater heart rates which decrease significantly over time, a cardiac response curve. The exposure period condition, however, does not change significantly change over time, and mean heart rate remains lower than the pre-exposure period throughout the trial. Despite this, these observations occur regardless of the distracter type.

*4.5 – Skin Conductivity - simple vs. complex changing-state*

Investigating the response in physiological measures between the simple and complex changing-state effect in galvanic skin response employed a 2(foreknowledge) × 2(distracter type) × 15(time, seconds) mixed ANOVA. Unlike with the steady-state and deviant comparison, this ANOVA investigates the changes over the course of the entire 15 second exposure/pre-exposure period, rather than the 8 second distracter/digit presentation.

This mixed ANOVA revealed a significant main effect of time (*F* (1, 38)=1.846, *MSE*=1.127, *p*=0.030, *ηp2*=0.046) as well as a significant interaction between all three variables (*F* (1, 38) =2.572, *MSE*=1.694, *p*=0.001, *ηp2*=0.063). However, the main effects of distracter type and foreknowledge failed to achieve significance; neither did any of the 2-way interactions. Whilst decomposition of the 3-way interaction using Simple Effects Analysis (LSD) revealed significant changes over time and differences between the foreknowledge presentation and distracter types, psychophysiological measures failed to distinguish between the complex and simple-CS effects, undermining the predicted effects. No significant differences in skin conductivity were observed between simple and complex changing-state distracters at any timepoint (MD=-0.174, SE=0.268, p=0.519; 95% CI [-0.716, 0.367]) and whilst a significant increase in skin conductivity was observed towards complex-CS sequences over time in the no foreknowledge block (MD=-0.576, SE=0.237, p=0.020; 95% CI [-1.056, -0.097]), this did not result in a significant difference in skin conductivity when compared to the foreknowledge block (MD=-0.140, SE= 0.299, p=0.643; 95% CI [-0.746, 0.466]). Furthermore, the only significant difference between distracter types were observed in later timeslots for both foreknowledge conditions. However, these differences provide no evidence to support a psychophysiological distinction between the complex and simple-CS effect. The means and statistics for the significant changes observed are shown in Appendix 7.

*4.6 - Heart rate - simple vs. complex changing-state*

Much like skin conductivity, a 2(foreknowledge) × 2(distracter type) × 15(time, seconds) mixed ANOVA was employed to compare between the simple and complex changing-state effect, revealing a significant main effect present in both foreknowledge (*F* (1, 38)=5.836, *MSE*=1079.992, *p*=0.021, *ηp2*=0.133) and time (*F* (1, 38)=1.990, *MSE*=73.270, *p*=0.017, *ηp2*=0.050). However, the main effect of distracter type failed to achieve significance, as did all the interactions between the variables. The main effect of foreknowledge revealed that no foreknowledge trials showed a higher heart rate overall compared to no foreknowledge trials (*MD*=1.342, *SE*=0.555, *p*=0.021; 95% CI [0.217, 2.466]). However, as this difference obtained regardless of distracter type it provides no theoretically relevant evidence for supporting or undermining predictions. Equally, the main effect of time, whilst significant, only describes the overall changes in heart rate throughout all CS trials, regardless of foreknowledge provision. As a result, further discussion of the observations within this main effect will not be discussed further. The means and statistics for the significant changes observed are shown in Appendix 8.

*3.7 - Pupillary response*

Pupillary measures in the present study employed the usage of phasic and tonic measures of pupil size to differentiate between pupillary response between distracter types, as well as the impact manipulations of top-down cognitive control have on said pupillary response. Phasic PDR reflects transient changes in pupil diameter compared to the baseline pupil diameter in the task, being tied more closely momentary changes in pupillary response (Beatty, 1982; Marois et al., 2019). As a result, Tonic however, reflects more sustained changes in absolute pupil diameter (Beatty, 1982; Marois et al., 2019).

Figure 7a and 7b display the variation in pupil diameter over time during distracter pre-exposure and exposure (respectively) for all four distracter types and both foreknowledge condition. Initial observations are consistent those seen in previous pupillometry research (e.g. Marois & Vachon, 2018; Marois et al., 2019), with pupil diameter increasing over time throughout the trial. Furthermore, sequential increases and decreases in pupil size corresponding with the presentation of each digit are also seen, likely representing the light response following lighter and darker visual stimulation (e.g. see Marois & Vachon, 2018; Trygon, 1975).

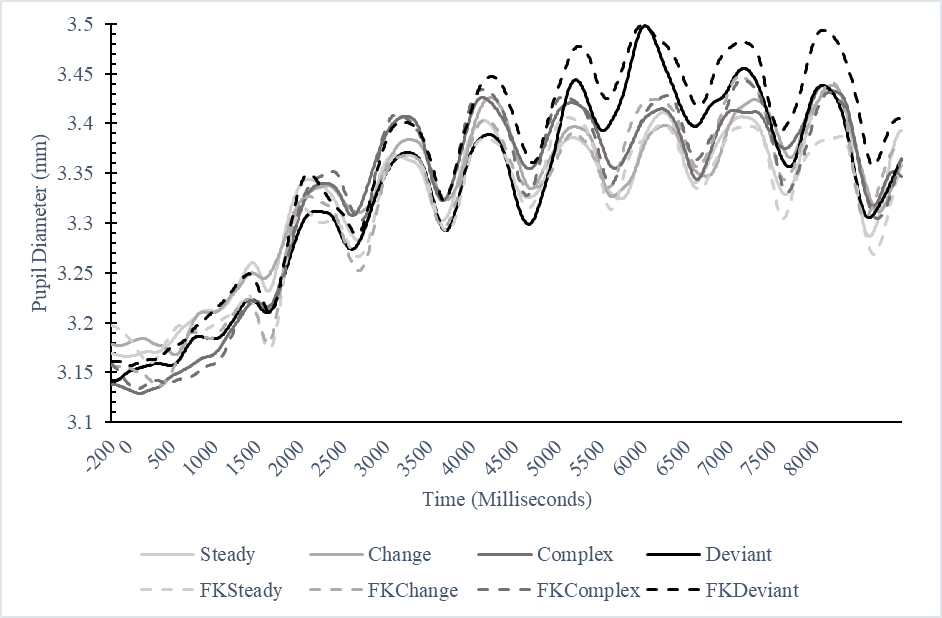


Figure 7b: Variation in pupil diameter over time within the exposure period. This figure includes the mean changes observed for each distracter type in the foreknowledge (FK) and no foreknowledge blocks.

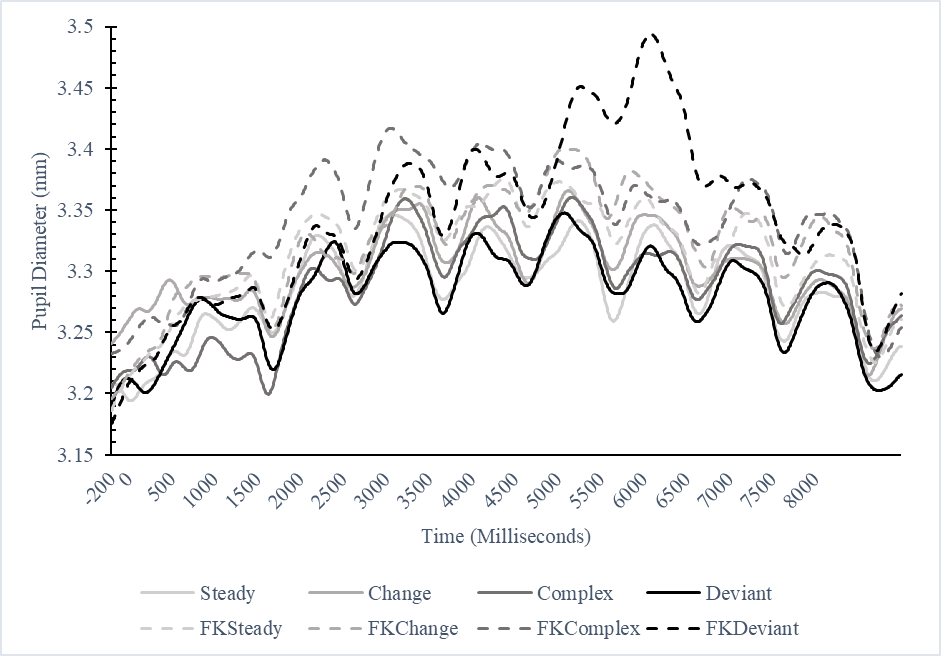


Figure 7a: Variation in pupil diameter over time within the pre-exposure period. This figure includes the mean changes observed for each distracter type in the foreknowledge (FK) and no foreknowledge blocks.

*4.8 - Phasic pupil response*

As phasic pupillary response requires a baseline, the present study utilized steady-state was used as the baseline pupil diameter in the task, generating a difference in waveform between this baseline and the deviant, simple-CS and complex-CS distracters. To observe the changes in phasic pupillary response, the present study employed a 2(foreknowledge) × 2(exposure period) × 3(distracter type) mixed ANOVA, with the distracter type variable incorporating the difference waveforms of simple and complex changing-state distracters, as well as deviant distracters when compared to the steady-state baseline.

This ANOVA demonstrated a significant main effect of distracter type on phasic PDR (*F* (1, 28)=8,197, *MSE*=0.079, *p*=0.001, *ηp2*=0.226), as well as a significant interaction between distracter type and exposure (*F* (1, 28) =3.464, *MSE*=0.014, *p*=0.038, *ηp2*=0.110). The main effects of exposure and foreknowledge failed to achieve significance, as did the interactions between foreknowledge & distracter type, foreknowledge & exposure and the 3-way interaction between all three variables. Figures and display the differences in phasic pupillary response in the pre-exposure and exposure periods respectively. Simple effects analysis (LSD) of the significant interaction between distracter type and exposure revealed the following pattern of effects:

First, deviant distracters were shown to elicit significantly greater phasic pupillary responses when compared to the complex changing-state distracters during the pre-exposure period (*MD*=-0.045, *SE*=0.017, *p*=0.013; 95% CI [-0.079, -0.010]). However, when compared with the simple changing-state counterparts, the difference was non-significant (*MD*=-0.018, *SE*=0.018, *p*=0.311; 95% CI [-0.055, 0.018]). However, in the exposure period deviants showed significantly greater phasic pupillary response compared to the both the complex changing-state (*MD*=-0.053, *SE*=0.015, *p*=0.001; 95% CI [-0.083, -0.023]) and simple changing-state (*MD*=-0.060, *SE*=0.014, *p* < 0.001; 95% CI [-0.088, -0.031]) distracters. The phasic pupillary response when comparing between simple and complex changing-state distracters did not significantly differ, regardless of whether the measure was taken during the preexposure (*MD*=0.026, *SE*=0.017, *p*=0.144; 95% CI [-0.009, 0.062]), or exposure period (*MD*=-0.006, *SE*=0.009, *p*=0.478; 95% CI [-0.024, 0.012]).

However, comparing between the two exposure periods overall, none of the distracter types showed a significant difference in phasic pupillary response. This therefore suggests that deviant distracters showed no significant change in the phasic pupillary response seen, regardless of foreknowledge presentation or exposure condition (*MD*=0.002, *SE*=0.023, *p*=0.917; 95% CI [-0.045, 0.049]). Furthermore, it also shows that the lack of a significant phasic pupil response shown in simple changing-state (*MD*=0.043, *SE*=0.023, *p*=0.075; 95% CI [-0.005, 0.092]) and complex changing-state (*MD*=0.011, *SE*=0.026, *p*=0.671; 95% CI [-0.042, 0.064]) trials remained non-significant regardless of the condition. Figure 8a and 8b display the differences in phasic pupil response between each of the distracter types, and statistics associated with this ANOVA are available in Appendix 9.



Figure 8a: Baseline (Steady-state PDR) corrected phasic pupil difference in the pre-exposure period. The differences between the 3 distracter types during the foreknowledge and no foreknowledge block are displayed.

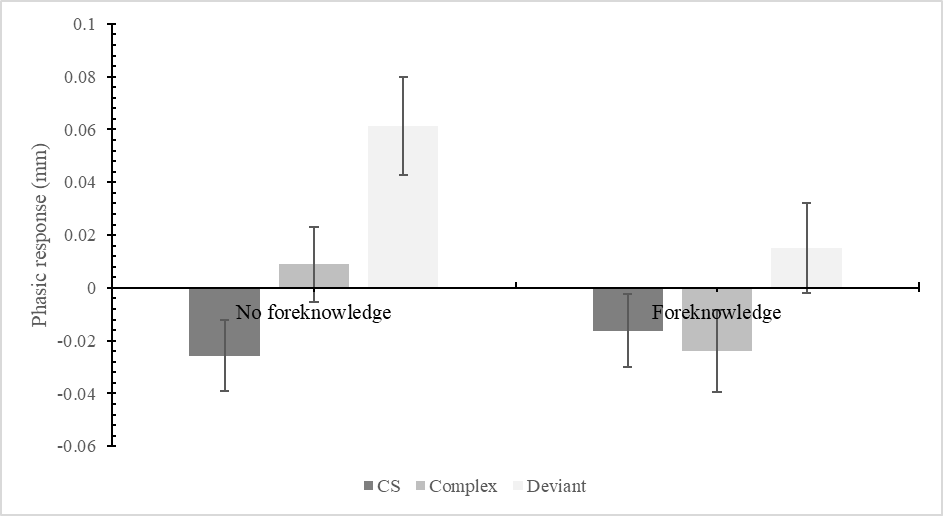


Figure 8b: Baseline (Steady-state PDR) corrected phasic pupil difference in the exposure period. The differences between the 3 distracter types during the foreknowledge and no foreknowledge block are displayed.

*4.9 - Tonic pupil response*

Investigating tonic pupillary response employed a 2(foreknowledge) × 2(exposure period) × 4(distracter type) mixed ANOVA. Unlike phasic pupillary response, tonic response compares sustained change over time, as a result no baseline measure was necessary in this comparison.

This ANOVA revealed no significant main effects to be present: foreknowledge (*F* (1, 28)=1.399, *MSE*=0.084, *p*=0.247, *ηp2*=0.048), exposure (*F* (1, 28)=0.514, *MSE*=0.027, *p*=0.479, *ηp2*=0.018) nor distracter type (*F* (1, 28)=1.182, *MSE*=0.322, *p*=0.322, *ηp2*=0.041) managed to achieve significance. Despite this, significant interactions were still observed between both foreknowledge & exposure (*F* (1, 28) =8.335, *MSE*=0.050, *p*=0.007, *ηp2*=0.230) and foreknowledge & distracter type (*F* (1, 28) =2.996, *MSE*=0.011, *p*=0.035, *ηp2*=0.097). The other interactions between distracter type and exposure, as well as the 3-way interaction also failed to achieve significance.

Whilst a significant interaction was present between foreknowledge and exposure, follow-up Simple Effects Analysis (LSD) showed no theoretically applicable effects within the interaction (sound presentation elicits greater PDR than silence). However, pairwise analyses of the foreknowledge and distracter type interaction did reveal, that deviant distracters showed a significantly greater tonic PDR in the foreknowledge block than the no foreknowledge block (*MD*=-0.054, *SE*=0.025, *p*=0.042; 95% CI [0.002, 0.106]). Otherwise, the other 3 distracter types showed no significant differences in tonic pupillary response between foreknowledge conditions. Furthermore, the only notable difference observed between the distracter was that deviant trials showed significantly greater tonic pupil response than (MD=-0.039, SE=0.013, p=0.005; 95% CI [-0.065, -0.013]), with no other significant differences being present. Figure 9a and 9b display the differences in tonic pupil response for each of the distracter types, and statistics associated with this ANOVA are available in Appendix 10.

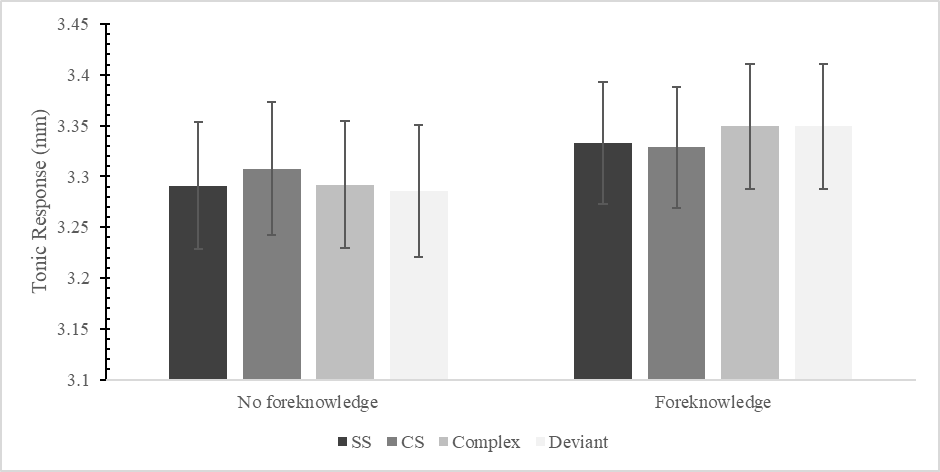


Figure 9a: Tonic pupil response within the pre-exposure period for all distracter types with and without foreknowledge presentation



Figure 9b: Tonic pupil response within the exposure period for all distracter types with and without foreknowledge presentation

*4.10 - Working memory capacity and physiological response*

Notably, incorporating working memory capacity into the above discussed analyses consistently resulted in non-significant interactions which did not include working memory capacity. This was true regardless of the distracter types being compared, or the physiological measure employed (true for heart rate, galvanic skin response and both tonic and phasic pupil response). As a result, the statistics for the ANOVAs incorporating working memory capacity will not be reported in detail here and are available in Appendix . Despite this, the lack of a significant working memory capacity influence is of theoretical note and will be explored further in the discussion.

**5 - Discussion**

To summarise, the present study aimed to further explore the relationship between manipulations of top-down cognitive control (via foreknowledge provision and trait capacity for cognitive control as measured by working memory capacity), using physiological recording (pupil response; heart rate and skin conductivity), and behavioural performance in visual-serial recall tasks. This combination of factors was intended to help address whether two distinct forms of auditory distraction (as in the duplex account; Hughes, 2014) or a single form (proposed by the unitary account; Bell et al.,2017; Cowan, 1995, 1999) exist. Furthermore, the work also intended to determine the nature of the complex-CS effect and the mechanism(s) behind the disruption that complex (e.g., sentential) CS sounds produce. Finally, it was hoped that the research could uncover any relationships between physiological and behavioural responses and that this, in turn, may contribute to the debate between the duplex and unitary accounts.

Behaviourally, the present study failed to reveal an auditory deviant effect since performance in the deviant condition did not differ significantly from that of the steady-state condition. However, both the changing-state [CS] effect (greater disruption with changing as compared with steady-state distracters) and the so-called “complex changing-state effect” (greater disruption from complex as compared with simple-CS sequences) were observed. Furthermore, the disruption produced by complex-CS distracters was diminished to the level of simple-CS distracters in the presence of foreknowledge, while the disruption produced by simple-CS distracters, although always greater than that of steady-state distracters, was not tempered by foreknowledge (In line with observations by Hughes & Marsh, 2019).

At the physiological level, Pupil measures revealed deviant distracters elicited significant phasic PDRs compared to all other distracter types (whom did not differ significantly). Additionally, no significant differences in Tonic PDR between any distracters were observed. Heart rate demonstrated a significant cardiac response curve (CRC) to be present in the pre-exposure of the foreknowledge block and exposure of the no-foreknowledge block, with this CRC being diminished in the foreknowledge block exposure period. However, these responses were seen regardless of distracter type, undermining the view that this constitutes an OR. Galvanic skin response observed a significant OR towards deviant distracters compared to steady-state trials during foreknowledge pre-exposure period. However, there was no evidence for an OR response present exposure regardless of foreknowledge, suggesting that increased memory load attenuated deviant distractibility, in turn eliminating the OR towards the deviant. All psychophysiological measures also failed to evidence a distinction between simple and complex-CS distracters.

Finally, working memory capacity (WMC) consistently displayed non-significant interactions with the other variables, initially suggesting WMC does not attenuate behavioural or physiological responses to auditory distracters. These findings are discussed in relation to previous research and theories of auditory distraction.

*5.1 - Disruption of different distracters on task performance*

The present results in task performance are mixed in relation to supporting either the duplex (Hughes, 2014) or unitary (Bell et al.,2017; Cowan 1995, 1999) accounts of auditory distraction. Ordinarily, the presentation of a deviant stimulus within a to-be-ignored sequence produces substantial disruption to performance on visual-verbal short-term memory tasks. However, unexpectedly in the current study, no significant disruption to performance occurred for trials in which the to-be-ignored sequence contained a deviant relative to control, steady-state trials, in which one was not presented, regardless of foreknowledge presentation. Under normal circumstances, adaptive gain theory (Aston-Jones & Cohen, 2005) proposes that the presentation of an unexpected auditory stimulus would violate expectations of an individual’s neuronal model of the auditory environment, leading to the marked physiological and behavioural responses normally observed (e.g. see Marois et al. 2019; Röer et al., 2015). Repeated presentation of unexpected auditory stimuli to the auditory environment would allow incorporation of the new information into this neuronal model, leading to a habituation of the OR as it becomes predictable (Miller & Cohen, 2001; Sara & Bouret, 2012). Given this, it was initially considered that habituation of the auditory deviation effect may have occurred over the course of the experiment. Indeed, previous research has demonstrated that habituation can occur within an experimental session (Röer et al., 2013, 2014; but see Hellbrück, Kuwano, & Namba, 1996, and Jones et al., 1997). However, an ensuing supplementary comparison (available upon request) between first and last deviant trials using corresponding steady-state trials as the baseline, failed to produce convincing evidence that the auditory deviation effect had habituated over the course of the experiment However, comparing performance from single trials is inevitably noisy.

Another possibility as to why a deviant effect failed to emerge is that the deviant and steady-state sequences deployed were identical with the exception that the deviant trials contained a burst of pink noise. Given that the same number of deviant trials as steady-state trials were included in the study, participants may have come to expect a burst of pink noise following the onset of a steady-state sequence. If so, then the neural model deployed for the steady-state trials could be violated precisely because no deviant occurred, thereby resulting in poor performance thereby failing to distinguish performance between steady-state and deviant trials.

Despite the apparent lack of a deviation effect in task performance, observations between the complex and simple-CS trials provide clear evidence favouring the duplex account (Hughes, 2014). Disruption to performance in simple-CS trials was significantly greater than the steady-state trials; yet, foreknowledge provision did not attenuate the disruption produced. This pattern confirms the interference-by-process account of the simple-CS effect: preattentive processing of the serial order of sounds within the simple-CS sequences inevitably competes, and interferes, with the serial recall processing within the task. Similarly, performance in trials presenting a complex-CS sequence was substantially worse than both steady-state and simple-CS trials. This replicates the finding that complex-CS distracters elicit greater disruption than simple-CS distracters (Bell et al., 2017, Hughes & Marsh, 2019; Röer et al., 2015). A very specific effect of foreknowledge provision on complex-CS sequences was also observed. foreknowledge provision markedly reduced the disruption elicited by the complex-CS effect however; it did not eliminate the disruption caused by that distracter in its entirety. Rather, foreknowledge provision brought serial recall performance approximately on par with that of the simple-CS trials.

Similarly, Bell et al. (2017) also showed an improvement of task performance by foreknowledge for complex, whilst simple-CS distracters remained unaffected. Bell and colleagues postulate that reasoning for this was that participants were particularly successful in converting meaningful, syntactically coherent speech into a stable representation of the upcoming distracter when attending to specific foreknowledge. In turn, this would allow production of a predictive model of the sequence, reducing its disruptive effect. Equally, they argued that simple-CS sequences did not benefit in the same regard due to randomly assembled lists of words or letters being more difficult to assemble into a stable representation, and in turn, a predictive model. Given this assumption they concluded that this selective improvement could be explained under the unitary account (Cowan 1995, 1999).

However, Bell and colleagues dismiss the alternate explanation that coherent speech produces additional disruption on top of the simple-CS effect, a “semantic disruption” that captures attention (Pg. 13, Bell et al., 2017). However, the highly selective impact of foreknowledge on the complex-CS effect observed here supports this claim. If complex changing-state distracters did indeed follow the predictions made by Bell et al. (2017; by extension the unitary account), we would expect that the disruption caused should be eliminated, however, this was not the case. Instead, disruption comparable to the changing-state effect remained following foreknowledge presentation. As a result, the present observations support the notion complex-CS distracters, such as comprehensible spoken sentences, produce two distinct forms of disruption; a simple-CS effect overlaid with an attentional diversion effect (Hughes & Marsh, 2019), with only the latter being abolished with foreknowledge presentation.

*45.2 - Physiological responses towards auditory distraction*

At a physiological level, responses to the distracter types presented in the study were also mixed in supporting the duplex (Hughes, 2014) or unitary (Bell et al.,2017; Cowan 1995, 1999) accounts. Different responses were observed to distracters between physiological measures, suggesting that some may be more reliable or sensitive than others.

First, deviants elicited a significant phasic PDR when compared to any other distracter type. This finding is twofold as it both falls in line with previous results of pupillary response reliably indexing the OR (Marois et al., 2018, 2019), and evidences a distinction between deviant and simple-CS sequences. The attentional capture based unitary account would assume that each change within a simple-CS sequence would elicit attentional capture, which should in turn result in orienting to change (along with the physiological responses associated with the OR). However, the present data shows this not to be the case, with simple-CS sequences showing no changes in phasic or tonic PDR. This, therefore, provides further support for the duplex mechanism account (Hughes, 2014) over the unitary account (Bell et al., 2017).

The results observed in galvanic skin response also followed the predictions of the duplex account (Hughes, 2014): presentation of a deviant elicited a significant OR during the pre-exposure of the foreknowledge block, however no significant OR was observed in any condition when simple-CS sequences were presented. However, deviant distracters failed to elicit an OR during the exposure periods of the trial, when memorisation of to-be-remembered digits occurred. As this was noted regardless of foreknowledge presentation, it suggests that the pre-exposure to the deviant stimulus was not the reason for this observed attenuation. Rather, an explanation for why this was the case could lie in the central load present during the exposure period (Halin et al., 2015). As discussed in the introduction, Öhman (1979) takes the stance that if central processing load is high, habituation of the OR would not occur as processing capacity that could be used to develop a neuronal model of the deviant is instead usurped by task-engagement. The present results are inconsistent with this stance, as central load is expected to be greater when participants are actively engaging in memorisation of the to-be-remembered digits, compared to the passive listening present in the pre-exposure period. However other recent work has indicated that increased central processing can result in attenuation of the deviant effect. Halin et al (2015; also see Hughes et al., 2013) demonstrate that manipulating central load by increasing task difficulty constrains the ability for individuals to process peripheral information, as shown by their reduced incidental memory of the presented distracter. As a result, it appears that what Halin et al (2015) observed is reflected in the present work, peripheral processing of the deviant stimuli is reduced when participants are under increased central load whilst engaging in memorisation of to-be-remembered digits.

Unlike the prior measures, changes in heart rate over time did not appear to distinguish between the steady-state and deviant effect. Presentation of both forms of distracter appeared to elicit a CRC during the time period analysed with this response being eliminated with foreknowledge presentation. Previous work (e.g. by Potter et al., 2018) has suggested that heart rate should be a reliable index of the orienting towards distracters, however steady-state distracters do not elicit attentional capture, as a result no physiological orienting should occur towards them. However, the reason for a CRC being observed towards both steady-state and deviants may be explained due to anticipation of a deviant being presented, similarly as discussed prior at the behavioural level. As the deviant trials were identical to steady-state trials, asides the embedded deviant, participants could have come to expect a burst of pink noise in the steady-state sequence. As a result, the lack of a deviant sound in steady-state trials could have violated the neuronal model (as no deviant sound occurred) resulting in the decrease in heart rate observed. In turn, this could explain why similar responses towards deviant and steady-state sounds were observed. Given that heart rate appeared to be the only measure impacted, it may suggest that heart rate is not as reliable of an index of the OR as the other measures employed in the present study.

Finally, in their pupillometry study, Marois et al., (2019) discusses the potential for complex and simple-CS sequences being distinct in response, determining that the content of CS sequences plays a minor role in the performance disruption they elicit (citing work by Jones and Macken, 1993). However, the “complex-CS sequences” employed by Jones and Macken (1993) did not consist of sentences possessing syntactical and sentential meaning, as employed in the present study, rather, they used sequences of spoken syllables. In turn, it was expected the present physiological response would provide distinction between the complex and simple-CS effects, but, no significant differences in physiological response between simple and complex-CS sequences were observed.

An explanation could lie in a distinction between the attentional capture elicited by deviant and complex-CS sequences. Rather than manifesting from the result of an auditory oddball (as in the deviant effect), the duplex account (Hughes, 2014) proposes attentional capture from complex-CS sequences results from the specific content of the distracter, referred to as stimulus-aspecific and stimulus-specific attentional diversion respectively (Hughes & Marsh 2019). A notable distinction is that in stimulus-specific attentional capture, no distinct feature of the auditory distracter can be pinpointed to elicit an OR. Rather the content has a relevance or interest for the organism which diverts attention. Therefore, it is supposable that stimulus-specific attentional capture may lead to differing physiological responses to the orienting response shown towards deviant distracters. This may not necessarily manifest as an orienting response but could instead be tied more closely to sentence processing instead. Zekveld, Koelewjin and Kramer (2018)’s review of pupillary response to sound supports this claim suggesting both positive (increases) and negative (decreases) PDRs can be elicited in response to the content of distracters as well as the structural and linguistic complexity (for examples, see Mathôt et al., 2017; Wendt et al., 2016). Therefore, usage of the complex-CS effect to tease apart evidence for the duplex (Hughes et al., 2014) and unitary accounts (Bell et al., 2017) may want to consider the potential differences in physiological response that stimulus specific and aspecific attentional capture elicit.

Overall, the present findings would suggest that further work with psychophysiological measures would be key component in providing evidence in the debate between the unitary (Bell et al., 2019) and duplex accounts (Hughes 2014). Pupillometry and skin conductivity were evidenced as reliable indexes of the orienting response, successfully providing a distinction between the CS and deviant effects, whilst, heart rate appeared to be a less reliable or sensitive measure. However, the employed physiological methods failed to differentiate between the complex and simple-CS effects, unlike the behavioural measures. This in turn suggests that the additional disruption complex-CS sequences elicit above the simple-CS effect is more distinct than that produced by the deviant effect, and further work into the physiological response to stimulus-specific/aspecific attentional capture may be necessary.

*5.3 - Distinction between behavioural and psychophysiological response*

The present work demonstrates an incongruity between the behavioural and physiological responses. Whilst deviants did not produce task disruption, an orienting towards the distracters was present in the pupillary dilation response, and to a lesser degree, skin conductivity. Previous research has shown that dissociations can arise between the physiological and task performance measures. For example, Marois and Vachon (2018) observed a significant PDR response towards deviant distracters, however, no behavioural/task performance disruption was observed (and equally habituation could not reasonably explain this lack of disruption). Marois and Vachon postulated that this dissociation could evidence that deviant elicited PDR does not capture attention per-say but, the detection of the deviant event. The use of event-related potentials (ERPs; minute changes is electrical potentials on an electroencephalogram/EEG which occur in response to sensory stimuli, see Näätänen, 1990) refer to this “call for attention” as mismatch negativity (MMN). Furthermore, a follow-up component, P3 or P3a has also been observed in the EEG record and this is thought to occur once the “call” for attention (indexed by the MMN) is answered and therefore represents the attentional orienting towards the distracter (Marois & Vachon 2018).

Although it is unclear whether the PDR maps on to the MNN or occurs analogously to the P3 or P3a, if the PDR maps onto the call for attention (e.g., MNN) rather than an actual orienting resulting from attentional capture (e.g., P3 or P3a) then there are several theoretical implications for the early *vs*. late selection debate (Hughes et al., 2013; Lavie & Tsal, 1994). The dissociation between the CS effect and the deviation effect by manipulations of top-down cognitive control such as task encoding load (Hughes et al., 2013) and perceptual load (Marsh et al., 2019) have led to the development of and ensuing support for a late-blocking view (Hughes et al., 2013; Marsh et al., 2018) over an early-filtering view (Lavie, 1995, 2000). The late-blocking view assumes that, in the presence of manipulations that shield performance from disruption from an auditory deviant (e.g., encoding load), the deviant within the irrelevant sound sequence is equally as detectable as it is in standard conditions. However, the stronger task-engagement engendered by the top-down manipulations help circumvent the switch of attention to the deviant or cuts short its evaluation if switching of attention does occur. On this view a dissociation between behavioural and physiological measures is possible if one supposes that the deviant event is detected, but attention is not switched to the deviant (or is rapidly switched back to the focal task). If the PDR observed in the current study is related to the MNN (the detection of the deviant and the call to attention) but not the P3 or P3a (the actual switch of attention to the deviant) then it follows that the PDR can occur in the absence of any behavioural disruption. If the PDR was, instead, related to the P3 or P3a (the switch of attention) then one would expect the manifestation of both the PDR and behavioural disruption.

However, a complicating factor in this interpretation is that previous research suggests that the P3 and PDR have a common source of influence within the locus coeruleus. The results, however, are at odds with an early-filtering view (Lavie, 1995, 2000) on which one might argue that the failure to observe behavioural disruption is related to the capacity to filter task-irrelevant to the extent that it is no longer detected. The fact that the PDR to deviant distracters occurred in the absence of behavioural disruption, suggest that the deviant auditory input was still registered by the cognitive system. Moreover, the mere finding that CS effects are immune to variables that influence top-down cognitive control (encoding-load, foreknowledge, working memory capacity), while deviant effects are modulated, further undermine the notion that irrelevant sound is passively filtered out before reaching higher levels of analysis within the cognitive system (e.g., early selection; see Hughes et al., 2013; Marsh et al., 2019).

*5.4 - Does working memory capacity temper the response to distracters?*

Previous work demonstrated that trait capacity for cognitive control—as measured by WMC—tempers the deviation effect but not the CS effect (Hughes et al., 2013; Sörqvist et al., 2013) and it was expected that the same pattern of results would obtain in the current study. However, here it was observed that neither the CS nor the deviant effect were disassociated by WMC. Indeed, both effects appeared equally unrelated to WMC (see. Körner et al., 2017). Both the unitary and duplex account would suppose that individuals with high WMC should possess an increased ability to maintain task-oriented representations and volitional control over their attention. The attentional capture component of the unitary account (Bell et al.,2017) would suppose that the relationship between WMC and the deviant effect, and between the simple-CS effect would not differ. This is generally predicted to constitute to both being attenuated, due to WMC being associated with greater capacity to resist attentional capture (e.g. Elliott, 2002; Hughes et al., 2013; Sörqvist, 2010), however the idea has been entertained that WMC could increase the influence of distraction (see. Elliott & Cowan, 2005). Conversely, the duplex account (Hughes, 2014) would argue that deviant effect should be reduced amongst individuals with high working memory compared to lower WMC. Yet, the simple-CS effect, with its disruption rooted in direct interference from the processing of sound and the processing of serial recall, would remain unaffected by WMC. Furthermore, the complex-CS effect, if underpinned by the same mechanism as deviant distracters (attentional capture, as previous research and the data reported here suggests), then one would also expect disruption from complex-CS distracters to be tempered by WMC to a similar extent as foreknowledge tempers the disruption they confer to serial recall.

However, WMC was not related to behavioural disruption from deviant or complex-CS distracters. Further, no significant interactions occurred between skin conductivity (during pre-exposure of foreknowledge) and the phasic PDR towards deviant distracters when WMC was included in the analyses. The results, although showing the predicted non-association between the steady-state effect and simple-CS effect, are inconsistent with the duplex account of auditory distraction. Moreover, if WMC should be related to the simple-CS effect, complex-CS effect and deviant effect, the results also contradict the unitary account. The one interaction that involved working memory was with foreknowledge presentation and showed that high WMC participants benefit from foreknowledge regardless of the distracter type. This is at odds with previous findings that report that low WMC benefit to a greater extent from foreknowledge than high WMC do (although this was seen only for the disruption produced by auditory deviants; Hughes et al., 2013; also see Halin et al., 2014). An intriguing suggestion here is that high against low WMC may be able to incorporate into the neural model simple and more precise information concerning an auditory sequence that facilitates performance when exposed to those sequences while remembering digits. However, this assumption does not cohere well with the notion that the CS effect is indomitable (Hughes et al., 2013). It should be mentioned here that two limitations occlude interpretation of these results. First, only one block of each of the two complex span tasks was given to participants. Thus, might limit the reliability of the WM measure and thus its association with different auditory distraction effects at behavioural and psychophysiological levels. Second, the absence of a deviation effect in the no foreknowledge block meant that no modulation of the effect through foreknowledge or WM (or an interaction of both) could be observed.

*5.5 - Applied implications of the present study*

As the present work sheds further light into the disruption unattended complex speech can have on performance in serial recall memory, the present study has potential implications in two areas: The prevention of distraction, and the exploitation of attentional capture. In the latter area, preventing distraction in a work or education-based setting is of great importance in maintaining performance in work and learning tasks. Beaman (2005) notes that two sets of cognitive tasks are likely to be employed it such environments, those involving numerical processing and those involving verbal processing. Modern work often involves electronic aids, cognitive tasks in these often are simplified to more minor tasks: entering data (such as in databases), counting/simple arithmetic, and transcription. In turn the retention or manipulation of information in these tasks follow similar patterns to the mechanisms involved in serial recall (e.g. see Banbury & Berry, 1998, Buchner et al., 1998; Logie & Baddeley, 1987). As the consequences for errors in tasks such as these could be severe (e.g. an error in the transcription of values into a database could prove financially costly), the present observation evidencing complex changing-state sequences being both highly disruptive to performance, but also being modulated by foreknowledge, can assist in the production of a more work-friendly auditory environment for such tasks. Changes to the sound design within the workplace (using sound absorbent surfaces and modifying office structure, Oseland & Hodsman, 2017) or equally masking potentially disruptive sound with more beneficial sound (commonly music, evidenced to have significant value in mediating mood in the workplace. For a comprehensive review; see Landay & Harms, 2019). Reduction of complex changing-state sounds, primarily audible and comprehensible background speech, in this way to a level below the hearing threshold (40Db; Jones & Macken, 1998) would be expected to provide a marked reduction in errors made in the task.

On the contrary, the present findings can also be further applied into taking advantage of the attention capture effect seen in complex changing-state distracters (as well as deviants ordinarily). Most notably is the application within the auditory design of radio jingles and effects (Potter et al, 2018; Potter & Choi, 2006). Advertisements and jingles already commonly include both speech and novel structural features (Rodero, Potter & Prieto, 2017), which mirrors the complex changing-state distracters and deviants often used in research such as the present study. As complex comprehensible speech elicits a stimulus specific form of attentional capture, speech incorporated into radios features may require additional consideration into the content incorporated, to maximise its ability to maximise attentional capture. Further work could therefore investigate manipulations of speech within a radio advert or jingle context and provide further focused insight into the nature of complex changing-state distracters within an applied setting.

Equally, the present conclusion that steady-state and deviant trials appeared conflated due to the lack of a deviant violated the neuronal model in steady-state trials could also provide further insight into the sound design. As Potter, Lynch and Kraus (2015) describe, habituation towards the structural features within in a radio segment, advertisement or jingle can diminish orienting towards said auditory structural features. Their interpretation for this reasoning was “by the time listeners heard the third jingle and the third production effect it became more irritating than novel and they began to actively disengage from processing the audio.” (Potter et al., 2015; Page 375). Whilst further research would be necessary, it may be possible for sound designers to use expectation of a structural feature to their advantage: varying or removing key structural features between advertisements or jingles. In turn, the uncertainty of whether a feature will arise or not could elicit a similar effect observed at present, maintaining a structural feature’s novelty beyond the point of “irritating” or when it would habituate.

*5.6 - Limitations of the present study*

However, the present study isn’t without its limitations. Firstly, a median split within the working memory capacity data was employed in the present study. As mentioned, prior, the rationale for a median split was for maximising comparability within working memory literature (e.g., Kane & Engle, 2000; Rosen & Engle, 1997). However, no working memory interactions were observed in the present work, resulting in the conclusion that working memory capacity does not modulate the disruption from auditory distraction. However, McClelland, Lynch, Irwin, Spillerd, and Fitzsimons (2015) regard the primary issue with employing a median split in data is that they add error, reducing the power of the analyses performed. Splitting the data in this way increases the chance of both Type I and II errors. Therefore, the observed non-significance of working memory capacity interactions could have equally been the result of a Type II error due to the usage of a median split, rather than no interactions being present. A recommendation for further work or replication would therefore be to employ a regression or covariate over a median split, which would reduce the chance of any potential Type II errors within the work. If this was the case, the present data (which a median split did not reveal any interaction from), provide insight working memory interaction with the behavioural and physiological measures that was not previously detected.

A further limitation of the present study is the lack of a formal priori power analysis. Much like a median split, the lack of a priori power analysis could potentially impact the power of the analyses in the present study, which in turn could increase the possibility of errors. Within the present study, it was rationalised that previous similar work employed a similar sample size, allowing for a more accurate comparison with prior work, however, a replication of the present design using a formal priori power analysis is a further recommendation (Nayak, 2010).

*5.7 - Conclusion*

Overall, the present study demonstrates the usefulness of using multiple methods (behavioural and psychophysiological) to address the mechanistic underpinnings of auditory distraction. The present study provided further support for the distinction between the unitary and duplex mechanism accounts of distraction in relation to the complex-CS effect. The disruption produced by complex-CS speech was tempered by foreknowledge (whilst simple-CS distracters were not) and reduced to the level of disruption exerted by simple-CS distracter. This strongly suggests that the disruption produced by complex-CS distracters are produced via two mechanisms—attentional capture and interference-by-process—the first of which can be attenuated by top-down cognitive control (foreknowledge) leaving the second (interference-by-process as revealed by the simple-CS effect) that is impervious to manipulation of cognitive control. In other areas, however, the current study failed to differentiate compellingly between unitary and duplex accounts of distraction numerous observations were made that could help finetune subsequent studies. First galvanic skin response and pupillary responses seem a more reliable measure of the OR than does heart rate. Second, presenting too many deviant trials may prevent the deviant effect from materialising in baseline conditions (no foreknowledge in the current study) within behavioural, but not psychophysiological measures. Clearly, a replication of the design of this study wherein fewer deviant to steady-state (baseline) trials are presented may facilitate proper inspection of the relationship between top-down cognitive control (foreknowledge, WMC) and behavioural and physiological responses to deviant distracters. Third, given the difference between behavioural and physiological response, further inspection of the underpinnings of the PDR is warranted. Potential lies in examining the relation between the PDR and ERPs within the EEG record to discern whether pupillary response is tied more closely to the MMN component (suggesting a change detection-based mechanism) or an attentional capture proper (e.g. the P3a component).

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**7 - Appendices**

**Appendix 1 – Transcripts of complex changing-state distracters:**

1. A cold start for many, then most places dry with sunny spells, cloudier in the southeast with rain.
2. A widespread frost at first, perhaps the odd mist or fog patch, and then bright with sunny spells.
3. Mainly dry with the best of the cloud breaks around the North Sea coast, clouds thickening at times.
4. Humanity is an ocean; if a few drops of the ocean are dirty, the ocean doesn’t become dirty.
5. I object to violence because when it appears to do good, the good is temporary; evil is permanent.
6. Put over a medium heat and warm, whilst stirring constantly, until it is very thick and just bubbling.
7. Whisk in the mashed date mixture, then fold into the egg white mixture until it is well combined.
8. Heat the custard in the microwave according to instructions, then tip in chopped chocolate and stir until smooth.
9. The decrease of crosslinker dosage or increase of chain length thereof could enhance swelling capacities of the hydrogels
10. No obvious distinction was found for the lower critical solution temperature and swelling response to a temperature jump
11. Christmas is coming. The goose is getting very fat, please put a penny in the old man’s hat.
12. That I scarce was sure I heard you"- here I opened wide the door; Darkness there, nothing more.
13. What though that light, thro' storm and night, so trembled from afar- could there be more purely bright.
14. Old taps may seize in the closed position and thus prevent the water from reaching into the machine.
15. Ensure that before disposing of the plug itself, you make the pins unusable so it cannot be inserted.
16. Fit the hinge supports to the appliance front panel, positioning the hole that is marked with an arrow.
17. Travel conditions are dangerous, and you should avoid the specified roads, if you travel, you may experience disruption.
18. Wearing a helmet aims to reduce head injuries if an accident occurs, absorbing impact and distributing the load.
19. The optimist proclaims we live in the best of possible worlds; and the pessimist fears this is true
20. Millions long for immortality but do not know what to do with themselves on a rainy Sunday afternoon

**Appendix 2 - Means tables for 2(working memory group) × 2(foreknowledge) × 4(distracter type) mixed ANOVA - task performance**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Within-Subjects Effects** | | | | | | | | | |
|  | | | | | | | | | |
| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Powera |
| DistracterType | Sphericity Assumed | .439 | 3 | .146 | 15.542 | .000 | .290 | 46.626 | 1.000 |
| Greenhouse-Geisser | .439 | 2.411 | .182 | 15.542 | .000 | .290 | 37.478 | 1.000 |
| Huynh-Feldt | .439 | 2.654 | .165 | 15.542 | .000 | .290 | 41.250 | 1.000 |
| Lower-bound | .439 | 1.000 | .439 | 15.542 | .000 | .290 | 15.542 | .970 |
| DistracterType \* WMCGroup | Sphericity Assumed | .063 | 3 | .021 | 2.240 | .087 | .056 | 6.719 | .554 |
| Greenhouse-Geisser | .063 | 2.411 | .026 | 2.240 | .102 | .056 | 5.400 | .491 |
| Huynh-Feldt | .063 | 2.654 | .024 | 2.240 | .096 | .056 | 5.944 | .518 |
| Lower-bound | .063 | 1.000 | .063 | 2.240 | .143 | .056 | 2.240 | .308 |
| Error (DistracterType) | Sphericity Assumed | 1.072 | 114 | .009 |  |  |  |  |  |
| Greenhouse-Geisser | 1.072 | 91.634 | .012 |  |  |  |  |  |
| Huynh-Feldt | 1.072 | 100.856 | .011 |  |  |  |  |  |
| Lower-bound | 1.072 | 38.000 | .028 |  |  |  |  |  |
| Foreknowledge | Sphericity Assumed | .047 | 1 | .047 | 2.934 | .095 | .072 | 2.934 | .386 |
| Greenhouse-Geisser | .047 | 1.000 | .047 | 2.934 | .095 | .072 | 2.934 | .386 |
| Huynh-Feldt | .047 | 1.000 | .047 | 2.934 | .095 | .072 | 2.934 | .386 |
| Lower-bound | .047 | 1.000 | .047 | 2.934 | .095 | .072 | 2.934 | .386 |
| Foreknowledge \* WMCGroup | Sphericity Assumed | .127 | 1 | .127 | 7.942 | .008 | .173 | 7.942 | .784 |
| Greenhouse-Geisser | .127 | 1.000 | .127 | 7.942 | .008 | .173 | 7.942 | .784 |
| Huynh-Feldt | .127 | 1.000 | .127 | 7.942 | .008 | .173 | 7.942 | .784 |
| Lower-bound | .127 | 1.000 | .127 | 7.942 | .008 | .173 | 7.942 | .784 |
| Error (Foreknowledge) | Sphericity Assumed | .608 | 38 | .016 |  |  |  |  |  |
| Greenhouse-Geisser | .608 | 38.000 | .016 |  |  |  |  |  |
| Huynh-Feldt | .608 | 38.000 | .016 |  |  |  |  |  |
| Lower-bound | .608 | 38.000 | .016 |  |  |  |  |  |
| DistracterType \* Foreknowledge | Sphericity Assumed | .051 | 3 | .017 | 2.932 | .037 | .072 | 8.797 | .684 |
| Greenhouse-Geisser | .051 | 2.661 | .019 | 2.932 | .043 | .072 | 7.803 | .645 |
| Huynh-Feldt | .051 | 2.955 | .017 | 2.932 | .037 | .072 | 8.666 | .679 |
| Lower-bound | .051 | 1.000 | .051 | 2.932 | .095 | .072 | 2.932 | .386 |
| DistracterType \* Foreknowledge \* WMCGroup | Sphericity Assumed | .012 | 3 | .004 | .674 | .570 | .017 | 2.022 | .189 |
| Greenhouse-Geisser | .012 | 2.661 | .004 | .674 | .553 | .017 | 1.793 | .179 |
| Huynh-Feldt | .012 | 2.955 | .004 | .674 | .568 | .017 | 1.992 | .187 |
| Lower-bound | .012 | 1.000 | .012 | .674 | .417 | .017 | .674 | .126 |
| Error (DistracterType \* Foreknowledge) | Sphericity Assumed | .664 | 114 | .006 |  |  |  |  |  |
| Greenhouse-Geisser | .664 | 101.117 | .007 |  |  |  |  |  |
| Huynh-Feldt | .664 | 112.303 | .006 |  |  |  |  |  |
| Lower-bound | .664 | 38.000 | .017 |  |  |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Pairwise Comparisons - Foreknowledge x WMCGroup** | | | | | | | |
|  | | | | | | | |
| WMCGroup | (I) Foreknowledge | (J) Foreknowledge | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| high | No Foreknowledge | Foreknowledge | -.064\* | .020 | .003 | -.105 | -.024 |
| Foreknowledge | No Foreknowledge | .064\* | .020 | .003 | .024 | .105 |
| low | No Foreknowledge | Foreknowledge | .016 | .020 | .439 | -.025 | .056 |
| Foreknowledge | No Foreknowledge | -.016 | .020 | .439 | -.056 | .025 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | |
| Foreknowledge | (I) WMCGroup | (J) WMCGroup | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| No Foreknowledge | high | low | .046 | .062 | .457 | -.079 | .171 |
| low | high | -.046 | .062 | .457 | -.171 | .079 |
| Foreknowledge | high | low | .126\* | .060 | .043 | .004 | .248 |
| low | high | -.126\* | .060 | .043 | -.248 | -.004 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Pairwise Comparisons - Foreknowledge x Distracter Type** | | | | | | | |
|  | | | | | | | |
| Foreknowledge | (I) DistracterType | (J) DistracterType | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| No Foreknowledge | Steady State | Deviant | .062\* | .020 | .003 | .022 | .102 |
| Simple | .109\* | .021 | .000 | .067 | .152 |
| Complex | -.011 | .019 | .586 | -.050 | .028 |
| Deviant | Steady State | -.062\* | .020 | .003 | -.102 | -.022 |
| Simple | .047\* | .018 | .012 | .011 | .084 |
| Complex | -.073\* | .018 | .000 | -.109 | -.037 |
| Simple | Steady State | -.109\* | .021 | .000 | -.152 | -.067 |
| Deviant | -.047\* | .018 | .012 | -.084 | -.011 |
| Complex | -.120\* | .021 | .000 | -.163 | -.077 |
| Complex | Steady State | .011 | .019 | .586 | -.028 | .050 |
| Deviant | .073\* | .018 | .000 | .037 | .109 |
| Simple | .120\* | .021 | .000 | .077 | .163 |
| Foreknowledge | Simple | Deviant | .053\* | .022 | .021 | .009 | .098 |
| Simple | .063\* | .019 | .002 | .024 | .102 |
| Complex | .013 | .015 | .398 | -.018 | .044 |
| Deviant | Steady State | -.053\* | .022 | .021 | -.098 | -.009 |
| Simple | .010 | .020 | .633 | -.031 | .050 |
| Complex | -.040 | .022 | .080 | -.085 | .005 |
| Simple | Steady State | -.063\* | .019 | .002 | -.102 | -.024 |
| Deviant | -.010 | .020 | .633 | -.050 | .031 |
| Complex | -.050\* | .017 | .006 | -.085 | -.015 |
| Complex | Steady State | -.013 | .015 | .398 | -.044 | .018 |
| Deviant | .040 | .022 | .080 | -.005 | .085 |
| Simple | .050\* | .017 | .006 | .015 | .085 |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | |
|  | | | | | | | |
| DistracterType | (I) Foreknowledge | (J) Foreknowledge | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Steady State | No Foreknowledge | Foreknowledge | -.016 | .016 | .316 | -.049 | .016 |
| Foreknowledge | No Foreknowledge | .016 | .016 | .316 | -.016 | .049 |
| Deviant | No Foreknowledge | Foreknowledge | -.025 | .021 | .240 | -.068 | .018 |
| Foreknowledge | No Foreknowledge | .025 | .021 | .240 | -.018 | .068 |
| Simple | No Foreknowledge | Foreknowledge | -.063\* | .020 | .003 | -.103 | -.023 |
| Foreknowledge | No Foreknowledge | .063\* | .020 | .003 | .023 | .103 |
| Complex | No Foreknowledge | Foreknowledge | .008 | .024 | .757 | -.041 | .056 |
| Foreknowledge | No Foreknowledge | -.008 | .024 | .757 | -.056 | .041 |

**Appendix 3 – Means tables for 2(working memory group) × 2(Foreknowledge) × 2(distracter type) × 8(time, seconds) mixed ANOVA - Galvanic Skin Response**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Within-Subjects Effects** | | | | | | | | | |
|  | | | | | | | | | |
| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Powera |
| DistracterType | Sphericity Assumed | 3.990 | 1 | 3.990 | .071 | .791 | .002 | .071 | .058 |
| Greenhouse-Geisser | 3.990 | 1.000 | 3.990 | .071 | .791 | .002 | .071 | .058 |
| Huynh-Feldt | 3.990 | 1.000 | 3.990 | .071 | .791 | .002 | .071 | .058 |
| Lower-bound | 3.990 | 1.000 | 3.990 | .071 | .791 | .002 | .071 | .058 |
| DistracterType \* WMCGroup | Sphericity Assumed | 34.448 | 1 | 34.448 | .615 | .438 | .016 | .615 | .119 |
| Greenhouse-Geisser | 34.448 | 1.000 | 34.448 | .615 | .438 | .016 | .615 | .119 |
| Huynh-Feldt | 34.448 | 1.000 | 34.448 | .615 | .438 | .016 | .615 | .119 |
| Lower-bound | 34.448 | 1.000 | 34.448 | .615 | .438 | .016 | .615 | .119 |
| Error(DistracterType) | Sphericity Assumed | 2072.651 | 37 | 56.018 |  |  |  |  |  |
| Greenhouse-Geisser | 2072.651 | 37.000 | 56.018 |  |  |  |  |  |
| Huynh-Feldt | 2072.651 | 37.000 | 56.018 |  |  |  |  |  |
| Lower-bound | 2072.651 | 37.000 | 56.018 |  |  |  |  |  |
| Foreknowledge | Sphericity Assumed | 3.520 | 1 | 3.520 | 2.190 | .147 | .056 | 2.190 | .302 |
| Greenhouse-Geisser | 3.520 | 1.000 | 3.520 | 2.190 | .147 | .056 | 2.190 | .302 |
| Huynh-Feldt | 3.520 | 1.000 | 3.520 | 2.190 | .147 | .056 | 2.190 | .302 |
| Lower-bound | 3.520 | 1.000 | 3.520 | 2.190 | .147 | .056 | 2.190 | .302 |
| Foreknowledge \* WMCGroup | Sphericity Assumed | .507 | 1 | .507 | .315 | .578 | .008 | .315 | .085 |
| Greenhouse-Geisser | .507 | 1.000 | .507 | .315 | .578 | .008 | .315 | .085 |
| Huynh-Feldt | .507 | 1.000 | .507 | .315 | .578 | .008 | .315 | .085 |
| Lower-bound | .507 | 1.000 | .507 | .315 | .578 | .008 | .315 | .085 |
| Error(Foreknowledge) | Sphericity Assumed | 59.479 | 37 | 1.608 |  |  |  |  |  |
| Greenhouse-Geisser | 59.479 | 37.000 | 1.608 |  |  |  |  |  |
| Huynh-Feldt | 59.479 | 37.000 | 1.608 |  |  |  |  |  |
| Lower-bound | 59.479 | 37.000 | 1.608 |  |  |  |  |  |
| Time | Sphericity Assumed | 11.541 | 7 | 1.649 | 3.731 | .001 | .092 | 26.119 | .976 |
| Greenhouse-Geisser | 11.541 | 3.004 | 3.841 | 3.731 | .013 | .092 | 11.210 | .797 |
| Huynh-Feldt | 11.541 | 3.388 | 3.407 | 3.731 | .010 | .092 | 12.641 | .833 |
| Lower-bound | 11.541 | 1.000 | 11.541 | 3.731 | .061 | .092 | 3.731 | .469 |
| Time \* WMCGroup | Sphericity Assumed | 1.243 | 7 | .178 | .402 | .901 | .011 | 2.813 | .178 |
| Greenhouse-Geisser | 1.243 | 3.004 | .414 | .402 | .752 | .011 | 1.207 | .128 |
| Huynh-Feldt | 1.243 | 3.388 | .367 | .402 | .776 | .011 | 1.361 | .133 |
| Lower-bound | 1.243 | 1.000 | 1.243 | .402 | .530 | .011 | .402 | .095 |
| Error(Time) | Sphericity Assumed | 114.445 | 259 | .442 |  |  |  |  |  |
| Greenhouse-Geisser | 114.445 | 111.165 | 1.030 |  |  |  |  |  |
| Huynh-Feldt | 114.445 | 125.353 | .913 |  |  |  |  |  |
| Lower-bound | 114.445 | 37.000 | 3.093 |  |  |  |  |  |
| DistracterType \* Foreknowledge | Sphericity Assumed | 3.808 | 1 | 3.808 | 6.378 | .016 | .147 | 6.378 | .691 |
| Greenhouse-Geisser | 3.808 | 1.000 | 3.808 | 6.378 | .016 | .147 | 6.378 | .691 |
| Huynh-Feldt | 3.808 | 1.000 | 3.808 | 6.378 | .016 | .147 | 6.378 | .691 |
| Lower-bound | 3.808 | 1.000 | 3.808 | 6.378 | .016 | .147 | 6.378 | .691 |
| DistracterType \* Foreknowledge \* WMCGroup | Sphericity Assumed | 1.767 | 1 | 1.767 | 2.960 | .094 | .074 | 2.960 | .388 |
| Greenhouse-Geisser | 1.767 | 1.000 | 1.767 | 2.960 | .094 | .074 | 2.960 | .388 |
| Huynh-Feldt | 1.767 | 1.000 | 1.767 | 2.960 | .094 | .074 | 2.960 | .388 |
| Lower-bound | 1.767 | 1.000 | 1.767 | 2.960 | .094 | .074 | 2.960 | .388 |
| Error(DistracterType\*Foreknowledge) | Sphericity Assumed | 22.091 | 37 | .597 |  |  |  |  |  |
| Greenhouse-Geisser | 22.091 | 37.000 | .597 |  |  |  |  |  |
| Huynh-Feldt | 22.091 | 37.000 | .597 |  |  |  |  |  |
| Lower-bound | 22.091 | 37.000 | .597 |  |  |  |  |  |
| DistracterType \* Time | Sphericity Assumed | 7.370 | 7 | 1.053 | .603 | .754 | .016 | 4.218 | .259 |
| Greenhouse-Geisser | 7.370 | 1.643 | 4.485 | .603 | .519 | .016 | .990 | .137 |
| Huynh-Feldt | 7.370 | 1.756 | 4.197 | .603 | .530 | .016 | 1.058 | .140 |
| Lower-bound | 7.370 | 1.000 | 7.370 | .603 | .443 | .016 | .603 | .118 |
| DistracterType \* Time \* WMCGroup | Sphericity Assumed | .381 | 7 | .054 | .031 | 1.000 | .001 | .218 | .058 |
| Greenhouse-Geisser | .381 | 1.643 | .232 | .031 | .948 | .001 | .051 | .054 |
| Huynh-Feldt | .381 | 1.756 | .217 | .031 | .956 | .001 | .055 | .054 |
| Lower-bound | .381 | 1.000 | .381 | .031 | .861 | .001 | .031 | .053 |
| Error(DistracterType\*Time) | Sphericity Assumed | 452.506 | 259 | 1.747 |  |  |  |  |  |
| Greenhouse-Geisser | 452.506 | 60.797 | 7.443 |  |  |  |  |  |
| Huynh-Feldt | 452.506 | 64.968 | 6.965 |  |  |  |  |  |
| Lower-bound | 452.506 | 37.000 | 12.230 |  |  |  |  |  |
| Foreknowledge \* Time | Sphericity Assumed | 6.096 | 7 | .871 | 1.263 | .269 | .033 | 8.843 | .537 |
| Greenhouse-Geisser | 6.096 | 3.379 | 1.804 | 1.263 | .290 | .033 | 4.269 | .353 |
| Huynh-Feldt | 6.096 | 3.860 | 1.579 | 1.263 | .288 | .033 | 4.876 | .380 |
| Lower-bound | 6.096 | 1.000 | 6.096 | 1.263 | .268 | .033 | 1.263 | .195 |
| Foreknowledge \* Time \* WMCGroup | Sphericity Assumed | 2.520 | 7 | .360 | .522 | .817 | .014 | 3.656 | .225 |
| Greenhouse-Geisser | 2.520 | 3.379 | .746 | .522 | .689 | .014 | 1.765 | .161 |
| Huynh-Feldt | 2.520 | 3.860 | .653 | .522 | .713 | .014 | 2.016 | .171 |
| Lower-bound | 2.520 | 1.000 | 2.520 | .522 | .474 | .014 | .522 | .108 |
| Error(Foreknowledge\*Time) | Sphericity Assumed | 178.539 | 259 | .689 |  |  |  |  |  |
| Greenhouse-Geisser | 178.539 | 125.027 | 1.428 |  |  |  |  |  |
| Huynh-Feldt | 178.539 | 142.829 | 1.250 |  |  |  |  |  |
| Lower-bound | 178.539 | 37.000 | 4.825 |  |  |  |  |  |
| DistracterType \* Foreknowledge \* Time | Sphericity Assumed | 16.503 | 7 | 2.358 | 4.922 | .000 | .117 | 34.454 | .996 |
| Greenhouse-Geisser | 16.503 | 5.226 | 3.158 | 4.922 | .000 | .117 | 25.725 | .984 |
| Huynh-Feldt | 16.503 | 6.352 | 2.598 | 4.922 | .000 | .117 | 31.265 | .994 |
| Lower-bound | 16.503 | 1.000 | 16.503 | 4.922 | .033 | .117 | 4.922 | .580 |
| DistracterType \* Foreknowledge \* Time \* WMCGroup | Sphericity Assumed | 3.970 | 7 | .567 | 1.184 | .312 | .031 | 8.288 | .506 |
| Greenhouse-Geisser | 3.970 | 5.226 | .760 | 1.184 | .318 | .031 | 6.188 | .426 |
| Huynh-Feldt | 3.970 | 6.352 | .625 | 1.184 | .315 | .031 | 7.521 | .478 |
| Lower-bound | 3.970 | 1.000 | 3.970 | 1.184 | .284 | .031 | 1.184 | .185 |
| Error(DistracterType\*Foreknowledge\*Time) | Sphericity Assumed | 124.053 | 259 | .479 |  |  |  |  |  |
| Greenhouse-Geisser | 124.053 | 193.376 | .642 |  |  |  |  |  |
| Huynh-Feldt | 124.053 | 235.028 | .528 |  |  |  |  |  |
| Lower-bound | 124.053 | 37.000 | 3.353 |  |  |  |  |  |
| a. Computed using alpha = .05 | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pairwise Comparisons – Foreknowledge x Time x Distracter Type** | | | | | | | | |
|  | | | | | | | | |
| Foreknowledge | Time | (I) DistracterType | (J) DistracterType | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| No Foreknowledge | 1 | Steady | Deviant | -.043 | .268 | .872 | -.586 | .499 |
| Deviant | Steady | .043 | .268 | .872 | -.499 | .586 |
| 2 | Steady | Deviant | .017 | .329 | .960 | -.650 | .684 |
| Deviant | Steady | -.017 | .329 | .960 | -.684 | .650 |
| 3 | Steady | Deviant | .148 | .333 | .659 | -.526 | .822 |
| Deviant | Steady | -.148 | .333 | .659 | -.822 | .526 |
| 4 | Steady | Deviant | .296 | .516 | .569 | -.749 | 1.341 |
| Deviant | Steady | -.296 | .516 | .569 | -1.341 | .749 |
| 5 | Steady | Deviant | -.277 | .561 | .624 | -1.414 | .859 |
| Deviant | Steady | .277 | .561 | .624 | -.859 | 1.414 |
| 6 | Steady | Deviant | .140 | .582 | .811 | -1.040 | 1.319 |
| Deviant | Steady | -.140 | .582 | .811 | -1.319 | 1.040 |
| 7 | Steady | Deviant | -.236 | .642 | .715 | -1.536 | 1.064 |
| Deviant | Steady | .236 | .642 | .715 | -1.064 | 1.536 |
| 8 | Steady | Deviant | -.065 | .567 | .909 | -1.213 | 1.083 |
| Deviant | Steady | .065 | .567 | .909 | -1.083 | 1.213 |
| Foreknowledge | 1 | Steady | Deviant | -.842\* | .232 | .001 | -1.312 | -.372 |
| Deviant | Steady | .842\* | .232 | .001 | .372 | 1.312 |
| 2 | Steady | Deviant | -.522 | .295 | .085 | -1.119 | .075 |
| Deviant | Steady | .522 | .295 | .085 | -.075 | 1.119 |
| 3 | Steady | Deviant | -.445 | .398 | .270 | -1.251 | .360 |
| Deviant | Steady | .445 | .398 | .270 | -.360 | 1.251 |
| 4 | Steady | Deviant | -.223 | .445 | .619 | -1.124 | .678 |
| Deviant | Steady | .223 | .445 | .619 | -.678 | 1.124 |
| 5 | Steady | Deviant | .262 | .489 | .595 | -.728 | 1.252 |
| Deviant | Steady | -.262 | .489 | .595 | -1.252 | .728 |
| 6 | Steady | Deviant | -.204 | .597 | .735 | -1.413 | 1.006 |
| Deviant | Steady | .204 | .597 | .735 | -1.006 | 1.413 |
| 7 | Steady | Deviant | .073 | .627 | .908 | -1.198 | 1.344 |
| Deviant | Steady | -.073 | .627 | .908 | -1.344 | 1.198 |
| 8 | Steady | Deviant | .111 | .526 | .834 | -.954 | 1.177 |
| Deviant | Steady | -.111 | .526 | .834 | -1.177 | .954 |
| Based on estimated marginal means | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | |
| DistracterType | Time | (I) Foreknowledge | (J) Foreknowledge | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Steady | 1 | No Foreknowledge | Foreknowledge | .252 | .214 | .245 | -.181 | .686 |
| Foreknowledge | No Foreknowledge | -.252 | .214 | .245 | -.686 | .181 |
| 2 | No Foreknowledge | Foreknowledge | .266 | .176 | .139 | -.090 | .622 |
| Foreknowledge | No Foreknowledge | -.266 | .176 | .139 | -.622 | .090 |
| 3 | No Foreknowledge | Foreknowledge | .250 | .205 | .231 | -.166 | .666 |
| Foreknowledge | No Foreknowledge | -.250 | .205 | .231 | -.666 | .166 |
| 4 | No Foreknowledge | Foreknowledge | .397\* | .184 | .037 | .025 | .769 |
| Foreknowledge | No Foreknowledge | -.397\* | .184 | .037 | -.769 | -.025 |
| 5 | No Foreknowledge | Foreknowledge | -.526\* | .168 | .003 | -.867 | -.185 |
| Foreknowledge | No Foreknowledge | .526\* | .168 | .003 | .185 | .867 |
| 6 | No Foreknowledge | Foreknowledge | -.104 | .135 | .447 | -.377 | .170 |
| Foreknowledge | No Foreknowledge | .104 | .135 | .447 | -.170 | .377 |
| 7 | No Foreknowledge | Foreknowledge | -.164 | .137 | .239 | -.440 | .113 |
| Foreknowledge | No Foreknowledge | .164 | .137 | .239 | -.113 | .440 |
| 8 | No Foreknowledge | Foreknowledge | -.338 | .172 | .057 | -.687 | .011 |
| Foreknowledge | No Foreknowledge | .338 | .172 | .057 | -.011 | .687 |
| Deviant | 1 | No Foreknowledge | Foreknowledge | -.546\* | .195 | .008 | -.942 | -.150 |
| Foreknowledge | No Foreknowledge | .546\* | .195 | .008 | .150 | .942 |
| 2 | No Foreknowledge | Foreknowledge | -.273 | .157 | .091 | -.592 | .046 |
| Foreknowledge | No Foreknowledge | .273 | .157 | .091 | -.046 | .592 |
| 3 | No Foreknowledge | Foreknowledge | -.343\* | .164 | .044 | -.676 | -.010 |
| Foreknowledge | No Foreknowledge | .343\* | .164 | .044 | .010 | .676 |
| 4 | No Foreknowledge | Foreknowledge | -.122 | .242 | .616 | -.612 | .368 |
| Foreknowledge | No Foreknowledge | .122 | .242 | .616 | -.368 | .612 |
| 5 | No Foreknowledge | Foreknowledge | .013 | .144 | .927 | -.278 | .305 |
| Foreknowledge | No Foreknowledge | -.013 | .144 | .927 | -.305 | .278 |
| 6 | No Foreknowledge | Foreknowledge | -.447\* | .179 | .017 | -.809 | -.085 |
| Foreknowledge | No Foreknowledge | .447\* | .179 | .017 | .085 | .809 |
| 7 | No Foreknowledge | Foreknowledge | .146 | .196 | .462 | -.252 | .543 |
| Foreknowledge | No Foreknowledge | -.146 | .196 | .462 | -.543 | .252 |
| 8 | No Foreknowledge | Foreknowledge | -.162 | .214 | .454 | -.596 | .272 |
| Foreknowledge | No Foreknowledge | .162 | .214 | .454 | -.272 | .596 |
| Based on estimated marginal means | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DistracterType | Foreknowledge | (I) Time | (J) Time | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Steady | No Foreknowledge | 1 | 2 | -.256 | .167 | .134 | -.596 | .083 |
| 3 | -.225 | .151 | .144 | -.530 | .080 |
| 4 | -.372 | .251 | .146 | -.881 | .136 |
| 5 | .022 | .296 | .940 | -.578 | .623 |
| 6 | -.295 | .253 | .251 | -.808 | .218 |
| 7 | -.236 | .325 | .473 | -.893 | .422 |
| 8 | -.197 | .323 | .546 | -.850 | .457 |
| 2 | 1 | .256 | .167 | .134 | -.083 | .596 |
| 3 | .032 | .142 | .825 | -.256 | .319 |
| 4 | -.116 | .173 | .505 | -.466 | .234 |
| 5 | .279 | .213 | .199 | -.153 | .711 |
| 6 | -.039 | .200 | .847 | -.445 | .367 |
| 7 | .021 | .267 | .939 | -.521 | .562 |
| 8 | .060 | .264 | .822 | -.475 | .594 |
| 3 | 1 | .225 | .151 | .144 | -.080 | .530 |
| 2 | -.032 | .142 | .825 | -.319 | .256 |
| 4 | -.148 | .195 | .454 | -.544 | .248 |
| 5 | .247 | .236 | .301 | -.231 | .725 |
| 6 | -.070 | .204 | .732 | -.484 | .343 |
| 7 | -.011 | .276 | .969 | -.570 | .548 |
| 8 | .028 | .274 | .919 | -.526 | .582 |
| 4 | 1 | .372 | .251 | .146 | -.136 | .881 |
| 2 | .116 | .173 | .505 | -.234 | .466 |
| 3 | .148 | .195 | .454 | -.248 | .544 |
| 5 | .395\* | .181 | .036 | .027 | .762 |
| 6 | .077 | .165 | .642 | -.257 | .411 |
| 7 | .137 | .226 | .548 | -.321 | .594 |
| 8 | .176 | .229 | .447 | -.288 | .640 |
| 5 | 1 | -.022 | .296 | .940 | -.623 | .578 |
| 2 | -.279 | .213 | .199 | -.711 | .153 |
| 3 | -.247 | .236 | .301 | -.725 | .231 |
| 4 | -.395\* | .181 | .036 | -.762 | -.027 |
| 6 | -.318\* | .114 | .008 | -.548 | -.087 |
| 7 | -.258 | .160 | .115 | -.582 | .066 |
| 8 | -.219 | .167 | .197 | -.557 | .119 |
| 6 | 1 | .295 | .253 | .251 | -.218 | .808 |
| 2 | .039 | .200 | .847 | -.367 | .445 |
| 3 | .070 | .204 | .732 | -.343 | .484 |
| 4 | -.077 | .165 | .642 | -.411 | .257 |
| 5 | .318\* | .114 | .008 | .087 | .548 |
| 7 | .060 | .135 | .662 | -.214 | .333 |
| 8 | .099 | .156 | .533 | -.218 | .416 |
| 7 | 1 | .236 | .325 | .473 | -.422 | .893 |
| 2 | -.021 | .267 | .939 | -.562 | .521 |
| 3 | .011 | .276 | .969 | -.548 | .570 |
| 4 | -.137 | .226 | .548 | -.594 | .321 |
| 5 | .258 | .160 | .115 | -.066 | .582 |
| 6 | -.060 | .135 | .662 | -.333 | .214 |
| 8 | .039 | .114 | .735 | -.193 | .271 |
| 8 | 1 | .197 | .323 | .546 | -.457 | .850 |
| 2 | -.060 | .264 | .822 | -.594 | .475 |
| 3 | -.028 | .274 | .919 | -.582 | .526 |
| 4 | -.176 | .229 | .447 | -.640 | .288 |
| 5 | .219 | .167 | .197 | -.119 | .557 |
| 6 | -.099 | .156 | .533 | -.416 | .218 |
| 7 | -.039 | .114 | .735 | -.271 | .193 |
| Foreknowledge | 1 | 2 | -.243 | .122 | .054 | -.490 | .004 |
| 3 | -.227 | .184 | .226 | -.600 | .146 |
| 4 | -.228 | .159 | .160 | -.550 | .094 |
| 5 | -.756\* | .220 | .001 | -1.202 | -.310 |
| 6 | -.651\* | .178 | .001 | -1.012 | -.290 |
| 7 | -.652\* | .226 | .007 | -1.110 | -.194 |
| 8 | -.787\* | .200 | .000 | -1.192 | -.383 |
| 2 | 1 | .243 | .122 | .054 | -.004 | .490 |
| 3 | .016 | .175 | .927 | -.339 | .371 |
| 4 | .015 | .168 | .930 | -.325 | .355 |
| 5 | -.513\* | .209 | .019 | -.936 | -.090 |
| 6 | -.408\* | .189 | .037 | -.791 | -.026 |
| 7 | -.409 | .215 | .065 | -.845 | .027 |
| 8 | -.544\* | .194 | .008 | -.938 | -.151 |
| 3 | 1 | .227 | .184 | .226 | -.146 | .600 |
| 2 | -.016 | .175 | .927 | -.371 | .339 |
| 4 | -.001 | .145 | .993 | -.295 | .292 |
| 5 | -.529\* | .161 | .002 | -.856 | -.202 |
| 6 | -.425\* | .177 | .022 | -.784 | -.065 |
| 7 | -.425 | .228 | .070 | -.887 | .037 |
| 8 | -.561\* | .181 | .004 | -.927 | -.194 |
| 4 | 1 | .228 | .159 | .160 | -.094 | .550 |
| 2 | -.015 | .168 | .930 | -.355 | .325 |
| 3 | .001 | .145 | .993 | -.292 | .295 |
| 5 | -.528\* | .186 | .007 | -.904 | -.152 |
| 6 | -.423\* | .128 | .002 | -.683 | -.163 |
| 7 | -.424\* | .147 | .006 | -.721 | -.126 |
| 8 | -.559\* | .139 | .000 | -.841 | -.277 |
| 5 | 1 | .756\* | .220 | .001 | .310 | 1.202 |
| 2 | .513\* | .209 | .019 | .090 | .936 |
| 3 | .529\* | .161 | .002 | .202 | .856 |
| 4 | .528\* | .186 | .007 | .152 | .904 |
| 6 | .105 | .169 | .539 | -.237 | .446 |
| 7 | .104 | .212 | .626 | -.326 | .534 |
| 8 | -.031 | .179 | .862 | -.394 | .331 |
| 6 | 1 | .651\* | .178 | .001 | .290 | 1.012 |
| 2 | .408\* | .189 | .037 | .026 | .791 |
| 3 | .425\* | .177 | .022 | .065 | .784 |
| 4 | .423\* | .128 | .002 | .163 | .683 |
| 5 | -.105 | .169 | .539 | -.446 | .237 |
| 7 | .000 | .138 | .998 | -.279 | .278 |
| 8 | -.136 | .168 | .423 | -.476 | .204 |
| 7 | 1 | .652\* | .226 | .007 | .194 | 1.110 |
| 2 | .409 | .215 | .065 | -.027 | .845 |
| 3 | .425 | .228 | .070 | -.037 | .887 |
| 4 | .424\* | .147 | .006 | .126 | .721 |
| 5 | -.104 | .212 | .626 | -.534 | .326 |
| 6 | .000 | .138 | .998 | -.278 | .279 |
| 8 | -.136 | .168 | .424 | -.475 | .204 |
| 8 | 1 | .787\* | .200 | .000 | .383 | 1.192 |
| 2 | .544\* | .194 | .008 | .151 | .938 |
| 3 | .561\* | .181 | .004 | .194 | .927 |
| 4 | .559\* | .139 | .000 | .277 | .841 |
| 5 | .031 | .179 | .862 | -.331 | .394 |
| 6 | .136 | .168 | .423 | -.204 | .476 |
| 7 | .136 | .168 | .424 | -.204 | .475 |
| Deviant | No Foreknowledge | 1 | 2 | -.196 | .101 | .060 | -.401 | .008 |
| 3 | -.033 | .158 | .833 | -.353 | .286 |
| 4 | -.033 | .237 | .891 | -.512 | .447 |
| 5 | -.211 | .198 | .292 | -.612 | .189 |
| 6 | -.112 | .274 | .686 | -.668 | .444 |
| 7 | -.428 | .286 | .142 | -1.007 | .150 |
| 8 | -.218 | .206 | .296 | -.635 | .198 |
| 2 | 1 | .196 | .101 | .060 | -.008 | .401 |
| 3 | .163 | .138 | .246 | -.117 | .442 |
| 4 | .164 | .209 | .440 | -.261 | .588 |
| 5 | -.015 | .178 | .933 | -.376 | .346 |
| 6 | .084 | .256 | .744 | -.435 | .603 |
| 7 | -.232 | .270 | .395 | -.779 | .314 |
| 8 | -.022 | .203 | .914 | -.434 | .390 |
| 3 | 1 | .033 | .158 | .833 | -.286 | .353 |
| 2 | -.163 | .138 | .246 | -.442 | .117 |
| 4 | .001 | .138 | .995 | -.278 | .280 |
| 5 | -.178 | .124 | .161 | -.430 | .074 |
| 6 | -.078 | .178 | .661 | -.438 | .282 |
| 7 | -.395 | .220 | .081 | -.841 | .051 |
| 8 | -.185 | .180 | .311 | -.549 | .180 |
| 4 | 1 | .033 | .237 | .891 | -.447 | .512 |
| 2 | -.164 | .209 | .440 | -.588 | .261 |
| 3 | -.001 | .138 | .995 | -.280 | .278 |
| 5 | -.179 | .130 | .179 | -.443 | .086 |
| 6 | -.079 | .138 | .569 | -.359 | .200 |
| 7 | -.396\* | .183 | .037 | -.766 | -.025 |
| 8 | -.186 | .199 | .357 | -.589 | .218 |
| 5 | 1 | .211 | .198 | .292 | -.189 | .612 |
| 2 | .015 | .178 | .933 | -.346 | .376 |
| 3 | .178 | .124 | .161 | -.074 | .430 |
| 4 | .179 | .130 | .179 | -.086 | .443 |
| 6 | .099 | .131 | .453 | -.166 | .365 |
| 7 | -.217 | .164 | .195 | -.550 | .116 |
| 8 | -.007 | .155 | .965 | -.320 | .306 |
| 6 | 1 | .112 | .274 | .686 | -.444 | .668 |
| 2 | -.084 | .256 | .744 | -.603 | .435 |
| 3 | .078 | .178 | .661 | -.282 | .438 |
| 4 | .079 | .138 | .569 | -.200 | .359 |
| 5 | -.099 | .131 | .453 | -.365 | .166 |
| 7 | -.317\* | .111 | .007 | -.542 | -.091 |
| 8 | -.106 | .195 | .589 | -.501 | .289 |
| 7 | 1 | .428 | .286 | .142 | -.150 | 1.007 |
| 2 | .232 | .270 | .395 | -.314 | .779 |
| 3 | .395 | .220 | .081 | -.051 | .841 |
| 4 | .396\* | .183 | .037 | .025 | .766 |
| 5 | .217 | .164 | .195 | -.116 | .550 |
| 6 | .317\* | .111 | .007 | .091 | .542 |
| 8 | .210 | .165 | .212 | -.125 | .545 |
| 8 | 1 | .218 | .206 | .296 | -.198 | .635 |
| 2 | .022 | .203 | .914 | -.390 | .434 |
| 3 | .185 | .180 | .311 | -.180 | .549 |
| 4 | .186 | .199 | .357 | -.218 | .589 |
| 5 | .007 | .155 | .965 | -.306 | .320 |
| 6 | .106 | .195 | .589 | -.289 | .501 |
| 7 | -.210 | .165 | .212 | -.545 | .125 |
| Foreknowledge | 1 | 2 | .077 | .113 | .498 | -.151 | .305 |
| 3 | .170 | .162 | .302 | -.158 | .498 |
| 4 | .391 | .226 | .092 | -.067 | .849 |
| 5 | .348 | .269 | .204 | -.197 | .893 |
| 6 | -.013 | .346 | .970 | -.713 | .688 |
| 7 | .263 | .344 | .449 | -.434 | .960 |
| 8 | .166 | .356 | .644 | -.556 | .888 |
| 2 | 1 | -.077 | .113 | .498 | -.305 | .151 |
| 3 | .093 | .111 | .409 | -.132 | .318 |
| 4 | .314 | .181 | .091 | -.052 | .680 |
| 5 | .271 | .227 | .240 | -.189 | .731 |
| 6 | -.090 | .293 | .760 | -.683 | .503 |
| 7 | .186 | .285 | .518 | -.392 | .765 |
| 8 | .089 | .308 | .774 | -.535 | .712 |
| 3 | 1 | -.170 | .162 | .302 | -.498 | .158 |
| 2 | -.093 | .111 | .409 | -.318 | .132 |
| 4 | .221 | .132 | .103 | -.047 | .490 |
| 5 | .178 | .205 | .391 | -.238 | .594 |
| 6 | -.183 | .271 | .504 | -.731 | .366 |
| 7 | .094 | .253 | .713 | -.419 | .606 |
| 8 | -.004 | .276 | .989 | -.562 | .555 |
| 4 | 1 | -.391 | .226 | .092 | -.849 | .067 |
| 2 | -.314 | .181 | .091 | -.680 | .052 |
| 3 | -.221 | .132 | .103 | -.490 | .047 |
| 5 | -.043 | .162 | .792 | -.372 | .285 |
| 6 | -.404 | .274 | .148 | -.959 | .151 |
| 7 | -.128 | .260 | .626 | -.655 | .399 |
| 8 | -.225 | .276 | .420 | -.785 | .334 |
| 5 | 1 | -.348 | .269 | .204 | -.893 | .197 |
| 2 | -.271 | .227 | .240 | -.731 | .189 |
| 3 | -.178 | .205 | .391 | -.594 | .238 |
| 4 | .043 | .162 | .792 | -.285 | .372 |
| 6 | -.361\* | .169 | .040 | -.704 | -.018 |
| 7 | -.085 | .222 | .705 | -.535 | .366 |
| 8 | -.182 | .230 | .433 | -.648 | .284 |
| 6 | 1 | .013 | .346 | .970 | -.688 | .713 |
| 2 | .090 | .293 | .760 | -.503 | .683 |
| 3 | .183 | .271 | .504 | -.366 | .731 |
| 4 | .404 | .274 | .148 | -.151 | .959 |
| 5 | .361\* | .169 | .040 | .018 | .704 |
| 7 | .276 | .151 | .076 | -.030 | .582 |
| 8 | .179 | .155 | .256 | -.135 | .493 |
| 7 | 1 | -.263 | .344 | .449 | -.960 | .434 |
| 2 | -.186 | .285 | .518 | -.765 | .392 |
| 3 | -.094 | .253 | .713 | -.606 | .419 |
| 4 | .128 | .260 | .626 | -.399 | .655 |
| 5 | .085 | .222 | .705 | -.366 | .535 |
| 6 | -.276 | .151 | .076 | -.582 | .030 |
| 8 | -.097 | .107 | .370 | -.315 | .120 |
| 8 | 1 | -.166 | .356 | .644 | -.888 | .556 |
| 2 | -.089 | .308 | .774 | -.712 | .535 |
| 3 | .004 | .276 | .989 | -.555 | .562 |
| 4 | .225 | .276 | .420 | -.334 | .785 |
| 5 | .182 | .230 | .433 | -.284 | .648 |
| 6 | -.179 | .155 | .256 | -.493 | .135 |
| 7 | .097 | .107 | .370 | -.120 | .315 |
| Based on estimated marginal means | | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | | | |

**Appendix 4 – Means tables for 2(working memory group) × 2(Exposure) × 2(distracter type) × 8(time, seconds) mixed ANOVA - Galvanic Skin Response**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Within-Subjects Effects** | | | | | | | | | |
|  | | | | | | | | | |
| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Powera |
| DistracterType | Sphericity Assumed | 11.363 | 1 | 11.363 | 9.467 | .004 | .204 | 9.467 | .850 |
| Greenhouse-Geisser | 11.363 | 1.000 | 11.363 | 9.467 | .004 | .204 | 9.467 | .850 |
| Huynh-Feldt | 11.363 | 1.000 | 11.363 | 9.467 | .004 | .204 | 9.467 | .850 |
| Lower-bound | 11.363 | 1.000 | 11.363 | 9.467 | .004 | .204 | 9.467 | .850 |
| DistracterType \* WMCGroup | Sphericity Assumed | .120 | 1 | .120 | .100 | .754 | .003 | .100 | .061 |
| Greenhouse-Geisser | .120 | 1.000 | .120 | .100 | .754 | .003 | .100 | .061 |
| Huynh-Feldt | .120 | 1.000 | .120 | .100 | .754 | .003 | .100 | .061 |
| Lower-bound | .120 | 1.000 | .120 | .100 | .754 | .003 | .100 | .061 |
| Error(DistracterType) | Sphericity Assumed | 44.411 | 37 | 1.200 |  |  |  |  |  |
| Greenhouse-Geisser | 44.411 | 37.000 | 1.200 |  |  |  |  |  |
| Huynh-Feldt | 44.411 | 37.000 | 1.200 |  |  |  |  |  |
| Lower-bound | 44.411 | 37.000 | 1.200 |  |  |  |  |  |
| Exposure | Sphericity Assumed | .272 | 1 | .272 | .008 | .929 | .000 | .008 | .051 |
| Greenhouse-Geisser | .272 | 1.000 | .272 | .008 | .929 | .000 | .008 | .051 |
| Huynh-Feldt | .272 | 1.000 | .272 | .008 | .929 | .000 | .008 | .051 |
| Lower-bound | .272 | 1.000 | .272 | .008 | .929 | .000 | .008 | .051 |
| Exposure \* WMCGroup | Sphericity Assumed | 5.349 | 1 | 5.349 | .159 | .692 | .004 | .159 | .067 |
| Greenhouse-Geisser | 5.349 | 1.000 | 5.349 | .159 | .692 | .004 | .159 | .067 |
| Huynh-Feldt | 5.349 | 1.000 | 5.349 | .159 | .692 | .004 | .159 | .067 |
| Lower-bound | 5.349 | 1.000 | 5.349 | .159 | .692 | .004 | .159 | .067 |
| Error(Exposure) | Sphericity Assumed | 1245.399 | 37 | 33.659 |  |  |  |  |  |
| Greenhouse-Geisser | 1245.399 | 37.000 | 33.659 |  |  |  |  |  |
| Huynh-Feldt | 1245.399 | 37.000 | 33.659 |  |  |  |  |  |
| Lower-bound | 1245.399 | 37.000 | 33.659 |  |  |  |  |  |
| Time | Sphericity Assumed | 12.351 | 7 | 1.764 | 2.993 | .005 | .075 | 20.949 | .933 |
| Greenhouse-Geisser | 12.351 | 3.020 | 4.090 | 2.993 | .034 | .075 | 9.037 | .695 |
| Huynh-Feldt | 12.351 | 3.407 | 3.625 | 2.993 | .028 | .075 | 10.195 | .735 |
| Lower-bound | 12.351 | 1.000 | 12.351 | 2.993 | .092 | .075 | 2.993 | .392 |
| Time \* WMCGroup | Sphericity Assumed | 6.798 | 7 | .971 | 1.647 | .122 | .043 | 11.531 | .675 |
| Greenhouse-Geisser | 6.798 | 3.020 | 2.251 | 1.647 | .182 | .043 | 4.974 | .424 |
| Huynh-Feldt | 6.798 | 3.407 | 1.996 | 1.647 | .175 | .043 | 5.612 | .454 |
| Lower-bound | 6.798 | 1.000 | 6.798 | 1.647 | .207 | .043 | 1.647 | .240 |
| Error(Time) | Sphericity Assumed | 152.698 | 259 | .590 |  |  |  |  |  |
| Greenhouse-Geisser | 152.698 | 111.723 | 1.367 |  |  |  |  |  |
| Huynh-Feldt | 152.698 | 126.049 | 1.211 |  |  |  |  |  |
| Lower-bound | 152.698 | 37.000 | 4.127 |  |  |  |  |  |
| DistracterType \* Exposure | Sphericity Assumed | .209 | 1 | .209 | .070 | .792 | .002 | .070 | .058 |
| Greenhouse-Geisser | .209 | 1.000 | .209 | .070 | .792 | .002 | .070 | .058 |
| Huynh-Feldt | .209 | 1.000 | .209 | .070 | .792 | .002 | .070 | .058 |
| Lower-bound | .209 | 1.000 | .209 | .070 | .792 | .002 | .070 | .058 |
| DistracterType \* Exposure \* WMCGroup | Sphericity Assumed | 2.873 | 1 | 2.873 | .967 | .332 | .025 | .967 | .160 |
| Greenhouse-Geisser | 2.873 | 1.000 | 2.873 | .967 | .332 | .025 | .967 | .160 |
| Huynh-Feldt | 2.873 | 1.000 | 2.873 | .967 | .332 | .025 | .967 | .160 |
| Lower-bound | 2.873 | 1.000 | 2.873 | .967 | .332 | .025 | .967 | .160 |
| Error(DistracterType\*Exposure) | Sphericity Assumed | 109.928 | 37 | 2.971 |  |  |  |  |  |
| Greenhouse-Geisser | 109.928 | 37.000 | 2.971 |  |  |  |  |  |
| Huynh-Feldt | 109.928 | 37.000 | 2.971 |  |  |  |  |  |
| Lower-bound | 109.928 | 37.000 | 2.971 |  |  |  |  |  |
| DistracterType \* Time | Sphericity Assumed | 8.290 | 7 | 1.184 | 2.738 | .009 | .069 | 19.169 | .907 |
| Greenhouse-Geisser | 8.290 | 4.758 | 1.742 | 2.738 | .023 | .069 | 13.030 | .801 |
| Huynh-Feldt | 8.290 | 5.694 | 1.456 | 2.738 | .016 | .069 | 15.592 | .854 |
| Lower-bound | 8.290 | 1.000 | 8.290 | 2.738 | .106 | .069 | 2.738 | .364 |
| DistracterType \* Time \* WMCGroup | Sphericity Assumed | 4.210 | 7 | .601 | 1.391 | .209 | .036 | 9.736 | .586 |
| Greenhouse-Geisser | 4.210 | 4.758 | .885 | 1.391 | .232 | .036 | 6.618 | .470 |
| Huynh-Feldt | 4.210 | 5.694 | .739 | 1.391 | .222 | .036 | 7.919 | .522 |
| Lower-bound | 4.210 | 1.000 | 4.210 | 1.391 | .246 | .036 | 1.391 | .210 |
| Error(DistracterType\*Time) | Sphericity Assumed | 112.010 | 259 | .432 |  |  |  |  |  |
| Greenhouse-Geisser | 112.010 | 176.062 | .636 |  |  |  |  |  |
| Huynh-Feldt | 112.010 | 210.672 | .532 |  |  |  |  |  |
| Lower-bound | 112.010 | 37.000 | 3.027 |  |  |  |  |  |
| Exposure \* Time | Sphericity Assumed | 11.564 | 7 | 1.652 | .661 | .705 | .018 | 4.628 | .283 |
| Greenhouse-Geisser | 11.564 | 1.331 | 8.685 | .661 | .462 | .018 | .880 | .136 |
| Huynh-Feldt | 11.564 | 1.400 | 8.261 | .661 | .469 | .018 | .925 | .138 |
| Lower-bound | 11.564 | 1.000 | 11.564 | .661 | .421 | .018 | .661 | .124 |
| Exposure \* Time \* WMCGroup | Sphericity Assumed | 3.847 | 7 | .550 | .220 | .981 | .006 | 1.540 | .113 |
| Greenhouse-Geisser | 3.847 | 1.331 | 2.889 | .220 | .711 | .006 | .293 | .078 |
| Huynh-Feldt | 3.847 | 1.400 | 2.748 | .220 | .722 | .006 | .308 | .078 |
| Lower-bound | 3.847 | 1.000 | 3.847 | .220 | .642 | .006 | .220 | .074 |
| Error(Exposure\*Time) | Sphericity Assumed | 647.199 | 259 | 2.499 |  |  |  |  |  |
| Greenhouse-Geisser | 647.199 | 49.265 | 13.137 |  |  |  |  |  |
| Huynh-Feldt | 647.199 | 51.792 | 12.496 |  |  |  |  |  |
| Lower-bound | 647.199 | 37.000 | 17.492 |  |  |  |  |  |
| DistracterType \* Exposure \* Time | Sphericity Assumed | 17.777 | 7 | 2.540 | 3.893 | .000 | .095 | 27.253 | .982 |
| Greenhouse-Geisser | 17.777 | 3.483 | 5.103 | 3.893 | .007 | .095 | 13.562 | .857 |
| Huynh-Feldt | 17.777 | 3.994 | 4.451 | 3.893 | .005 | .095 | 15.549 | .893 |
| Lower-bound | 17.777 | 1.000 | 17.777 | 3.893 | .056 | .095 | 3.893 | .485 |
| DistracterType \* Exposure \* Time \* WMCGroup | Sphericity Assumed | .767 | 7 | .110 | .168 | .991 | .005 | 1.176 | .096 |
| Greenhouse-Geisser | .767 | 3.483 | .220 | .168 | .938 | .005 | .585 | .082 |
| Huynh-Feldt | .767 | 3.994 | .192 | .168 | .954 | .005 | .671 | .085 |
| Lower-bound | .767 | 1.000 | .767 | .168 | .684 | .005 | .168 | .068 |
| Error(DistracterType\*Exposure\*Time) | Sphericity Assumed | 168.946 | 259 | .652 |  |  |  |  |  |
| Greenhouse-Geisser | 168.946 | 128.888 | 1.311 |  |  |  |  |  |
| Huynh-Feldt | 168.946 | 147.767 | 1.143 |  |  |  |  |  |
| Lower-bound | 168.946 | 37.000 | 4.566 |  |  |  |  |  |
| a. Computed using alpha = .05 | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pairwise Comparisons - Exposure x Time x Distracter Type** | | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | | |
| Exposure | Time | (I) DistracterType | (J) DistracterType | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Pre-exposure | 1 | Steady | Deviant | .110 | .145 | .451 | -.183 | .404 |
| Deviant | Steady | -.110 | .145 | .451 | -.404 | .183 |
| 2 | Steady | Deviant | -.246 | .247 | .327 | -.747 | .255 |
| Deviant | Steady | .246 | .247 | .327 | -.255 | .747 |
| 3 | Steady | Deviant | -.244 | .217 | .269 | -.684 | .196 |
| Deviant | Steady | .244 | .217 | .269 | -.196 | .684 |
| 4 | Steady | Deviant | -.541\* | .229 | .024 | -1.005 | -.077 |
| Deviant | Steady | .541\* | .229 | .024 | .077 | 1.005 |
| 5 | Steady | Deviant | -.578\* | .230 | .016 | -1.043 | -.113 |
| Deviant | Steady | .578\* | .230 | .016 | .113 | 1.043 |
| 6 | Steady | Deviant | -.069 | .172 | .691 | -.417 | .279 |
| Deviant | Steady | .069 | .172 | .691 | -.279 | .417 |
| 7 | Steady | Deviant | -.315 | .189 | .105 | -.699 | .069 |
| Deviant | Steady | .315 | .189 | .105 | -.069 | .699 |
| 8 | Steady | Deviant | .562\* | .136 | .000 | .287 | .837 |
| Deviant | Steady | -.562\* | .136 | .000 | -.837 | -.287 |
| Exposure | 1 | Steady | Deviant | -.546\* | .195 | .008 | -.942 | -.150 |
| Deviant | Steady | .546\* | .195 | .008 | .150 | .942 |
| 2 | Steady | Deviant | -.273 | .157 | .091 | -.592 | .046 |
| Deviant | Steady | .273 | .157 | .091 | -.046 | .592 |
| 3 | Steady | Deviant | -.343\* | .164 | .044 | -.676 | -.010 |
| Deviant | Steady | .343\* | .164 | .044 | .010 | .676 |
| 4 | Steady | Deviant | -.122 | .242 | .616 | -.612 | .368 |
| Deviant | Steady | .122 | .242 | .616 | -.368 | .612 |
| 5 | Steady | Deviant | .013 | .144 | .927 | -.278 | .305 |
| Deviant | Steady | -.013 | .144 | .927 | -.305 | .278 |
| 6 | Steady | Deviant | -.447\* | .179 | .017 | -.809 | -.085 |
| Deviant | Steady | .447\* | .179 | .017 | .085 | .809 |
| 7 | Steady | Deviant | .146 | .196 | .462 | -.252 | .543 |
| Deviant | Steady | -.146 | .196 | .462 | -.543 | .252 |
| 8 | Steady | Deviant | -.162 | .214 | .454 | -.596 | .272 |
| Deviant | Steady | .162 | .214 | .454 | -.272 | .596 |
| Based on estimated marginal means | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DistracterType | Exposure | (I) Time | (J) Time | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Steady | Pre-Exposure | 1 | 2 | -.032 | .161 | .846 | -.359 | .296 |
| 3 | -.039 | .184 | .832 | -.411 | .333 |
| 4 | .047 | .264 | .858 | -.487 | .581 |
| 5 | -.251 | .229 | .279 | -.715 | .212 |
| 6 | -.448 | .295 | .137 | -1.046 | .150 |
| 7 | -.145 | .368 | .695 | -.890 | .600 |
| 8 | -.537 | .352 | .136 | -1.251 | .177 |
| 2 | 1 | .032 | .161 | .846 | -.296 | .359 |
| 3 | -.008 | .156 | .961 | -.323 | .308 |
| 4 | .079 | .213 | .713 | -.352 | .510 |
| 5 | -.220 | .172 | .209 | -.568 | .129 |
| 6 | -.416 | .240 | .091 | -.903 | .070 |
| 7 | -.114 | .309 | .715 | -.741 | .513 |
| 8 | -.506 | .306 | .107 | -1.126 | .114 |
| 3 | 1 | .039 | .184 | .832 | -.333 | .411 |
| 2 | .008 | .156 | .961 | -.308 | .323 |
| 4 | .087 | .136 | .530 | -.190 | .363 |
| 5 | -.212 | .180 | .247 | -.577 | .153 |
| 6 | -.409\* | .194 | .042 | -.803 | -.015 |
| 7 | -.106 | .259 | .685 | -.631 | .419 |
| 8 | -.498 | .271 | .074 | -1.047 | .051 |
| 4 | 1 | -.047 | .264 | .858 | -.581 | .487 |
| 2 | -.079 | .213 | .713 | -.510 | .352 |
| 3 | -.087 | .136 | .530 | -.363 | .190 |
| 5 | -.298 | .174 | .094 | -.651 | .054 |
| 6 | -.495\* | .123 | .000 | -.744 | -.247 |
| 7 | -.193 | .188 | .312 | -.574 | .188 |
| 8 | -.585\* | .204 | .007 | -.999 | -.171 |
| 5 | 1 | .251 | .229 | .279 | -.212 | .715 |
| 2 | .220 | .172 | .209 | -.129 | .568 |
| 3 | .212 | .180 | .247 | -.153 | .577 |
| 4 | .298 | .174 | .094 | -.054 | .651 |
| 6 | -.197 | .150 | .198 | -.501 | .108 |
| 7 | .106 | .195 | .590 | -.288 | .500 |
| 8 | -.286 | .202 | .164 | -.695 | .122 |
| 6 | 1 | .448 | .295 | .137 | -.150 | 1.046 |
| 2 | .416 | .240 | .091 | -.070 | .903 |
| 3 | .409\* | .194 | .042 | .015 | .803 |
| 4 | .495\* | .123 | .000 | .247 | .744 |
| 5 | .197 | .150 | .198 | -.108 | .501 |
| 7 | .303\* | .139 | .036 | .022 | .584 |
| 8 | -.089 | .139 | .523 | -.370 | .192 |
| 7 | 1 | .145 | .368 | .695 | -.600 | .890 |
| 2 | .114 | .309 | .715 | -.513 | .741 |
| 3 | .106 | .259 | .685 | -.419 | .631 |
| 4 | .193 | .188 | .312 | -.188 | .574 |
| 5 | -.106 | .195 | .590 | -.500 | .288 |
| 6 | -.303\* | .139 | .036 | -.584 | -.022 |
| 8 | -.392\* | .136 | .006 | -.667 | -.117 |
| 8 | 1 | .537 | .352 | .136 | -.177 | 1.251 |
| 2 | .506 | .306 | .107 | -.114 | 1.126 |
| 3 | .498 | .271 | .074 | -.051 | 1.047 |
| 4 | .585\* | .204 | .007 | .171 | .999 |
| 5 | .286 | .202 | .164 | -.122 | .695 |
| 6 | .089 | .139 | .523 | -.192 | .370 |
| 7 | .392\* | .136 | .006 | .117 | .667 |
| Exposure | 1 | 2 | -.196 | .101 | .060 | -.401 | .008 |
| 3 | -.033 | .158 | .833 | -.353 | .286 |
| 4 | -.033 | .237 | .891 | -.512 | .447 |
| 5 | -.211 | .198 | .292 | -.612 | .189 |
| 6 | -.112 | .274 | .686 | -.668 | .444 |
| 7 | -.428 | .286 | .142 | -1.007 | .150 |
| 8 | -.218 | .206 | .296 | -.635 | .198 |
| 2 | 1 | .196 | .101 | .060 | -.008 | .401 |
| 3 | .163 | .138 | .246 | -.117 | .442 |
| 4 | .164 | .209 | .440 | -.261 | .588 |
| 5 | -.015 | .178 | .933 | -.376 | .346 |
| 6 | .084 | .256 | .744 | -.435 | .603 |
| 7 | -.232 | .270 | .395 | -.779 | .314 |
| 8 | -.022 | .203 | .914 | -.434 | .390 |
| 3 | 1 | .033 | .158 | .833 | -.286 | .353 |
| 2 | -.163 | .138 | .246 | -.442 | .117 |
| 4 | .001 | .138 | .995 | -.278 | .280 |
| 5 | -.178 | .124 | .161 | -.430 | .074 |
| 6 | -.078 | .178 | .661 | -.438 | .282 |
| 7 | -.395 | .220 | .081 | -.841 | .051 |
| 8 | -.185 | .180 | .311 | -.549 | .180 |
| 4 | 1 | .033 | .237 | .891 | -.447 | .512 |
| 2 | -.164 | .209 | .440 | -.588 | .261 |
| 3 | -.001 | .138 | .995 | -.280 | .278 |
| 5 | -.179 | .130 | .179 | -.443 | .086 |
| 6 | -.079 | .138 | .569 | -.359 | .200 |
| 7 | -.396\* | .183 | .037 | -.766 | -.025 |
| 8 | -.186 | .199 | .357 | -.589 | .218 |
| 5 | 1 | .211 | .198 | .292 | -.189 | .612 |
| 2 | .015 | .178 | .933 | -.346 | .376 |
| 3 | .178 | .124 | .161 | -.074 | .430 |
| 4 | .179 | .130 | .179 | -.086 | .443 |
| 6 | .099 | .131 | .453 | -.166 | .365 |
| 7 | -.217 | .164 | .195 | -.550 | .116 |
| 8 | -.007 | .155 | .965 | -.320 | .306 |
| 6 | 1 | .112 | .274 | .686 | -.444 | .668 |
| 2 | -.084 | .256 | .744 | -.603 | .435 |
| 3 | .078 | .178 | .661 | -.282 | .438 |
| 4 | .079 | .138 | .569 | -.200 | .359 |
| 5 | -.099 | .131 | .453 | -.365 | .166 |
| 7 | -.317\* | .111 | .007 | -.542 | -.091 |
| 8 | -.106 | .195 | .589 | -.501 | .289 |
| 7 | 1 | .428 | .286 | .142 | -.150 | 1.007 |
| 2 | .232 | .270 | .395 | -.314 | .779 |
| 3 | .395 | .220 | .081 | -.051 | .841 |
| 4 | .396\* | .183 | .037 | .025 | .766 |
| 5 | .217 | .164 | .195 | -.116 | .550 |
| 6 | .317\* | .111 | .007 | .091 | .542 |
| 8 | .210 | .165 | .212 | -.125 | .545 |
| 8 | 1 | .218 | .206 | .296 | -.198 | .635 |
| 2 | .022 | .203 | .914 | -.390 | .434 |
| 3 | .185 | .180 | .311 | -.180 | .549 |
| 4 | .186 | .199 | .357 | -.218 | .589 |
| 5 | .007 | .155 | .965 | -.306 | .320 |
| 6 | .106 | .195 | .589 | -.289 | .501 |
| 7 | -.210 | .165 | .212 | -.545 | .125 |
| Deviant | Pre-Exposure | 1 | 2 | -.388\* | .164 | .024 | -.720 | -.055 |
| 3 | -.394\* | .163 | .021 | -.724 | -.063 |
| 4 | -.604\* | .198 | .004 | -1.005 | -.203 |
| 5 | -.939\* | .228 | .000 | -1.400 | -.478 |
| 6 | -.627\* | .261 | .021 | -1.155 | -.099 |
| 7 | -.571 | .364 | .125 | -1.308 | .166 |
| 8 | -.086 | .464 | .854 | -1.025 | .854 |
| 2 | 1 | .388\* | .164 | .024 | .055 | .720 |
| 3 | -.006 | .097 | .951 | -.203 | .191 |
| 4 | -.217 | .225 | .342 | -.672 | .239 |
| 5 | -.552\* | .229 | .021 | -1.015 | -.089 |
| 6 | -.240 | .264 | .369 | -.774 | .295 |
| 7 | -.183 | .357 | .611 | -.907 | .541 |
| 8 | .302 | .488 | .540 | -.686 | 1.290 |
| 3 | 1 | .394\* | .163 | .021 | .063 | .724 |
| 2 | .006 | .097 | .951 | -.191 | .203 |
| 4 | -.211 | .156 | .186 | -.528 | .106 |
| 5 | -.546\* | .166 | .002 | -.881 | -.210 |
| 6 | -.234 | .193 | .235 | -.626 | .158 |
| 7 | -.177 | .276 | .525 | -.737 | .383 |
| 8 | .308 | .412 | .460 | -.527 | 1.143 |
| 4 | 1 | .604\* | .198 | .004 | .203 | 1.005 |
| 2 | .217 | .225 | .342 | -.239 | .672 |
| 3 | .211 | .156 | .186 | -.106 | .528 |
| 5 | -.335 | .175 | .063 | -.689 | .019 |
| 6 | -.023 | .142 | .872 | -.310 | .264 |
| 7 | .034 | .211 | .875 | -.395 | .462 |
| 8 | .519 | .321 | .114 | -.131 | 1.168 |
| 5 | 1 | .939\* | .228 | .000 | .478 | 1.400 |
| 2 | .552\* | .229 | .021 | .089 | 1.015 |
| 3 | .546\* | .166 | .002 | .210 | .881 |
| 4 | .335 | .175 | .063 | -.019 | .689 |
| 6 | .312 | .169 | .073 | -.031 | .655 |
| 7 | .369 | .250 | .149 | -.138 | .875 |
| 8 | .854\* | .376 | .029 | .092 | 1.616 |
| 6 | 1 | .627\* | .261 | .021 | .099 | 1.155 |
| 2 | .240 | .264 | .369 | -.295 | .774 |
| 3 | .234 | .193 | .235 | -.158 | .626 |
| 4 | .023 | .142 | .872 | -.264 | .310 |
| 5 | -.312 | .169 | .073 | -.655 | .031 |
| 7 | .056 | .159 | .725 | -.266 | .379 |
| 8 | .542 | .273 | .055 | -.012 | 1.095 |
| 7 | 1 | .571 | .364 | .125 | -.166 | 1.308 |
| 2 | .183 | .357 | .611 | -.541 | .907 |
| 3 | .177 | .276 | .525 | -.383 | .737 |
| 4 | -.034 | .211 | .875 | -.462 | .395 |
| 5 | -.369 | .250 | .149 | -.875 | .138 |
| 6 | -.056 | .159 | .725 | -.379 | .266 |
| 8 | .485\* | .204 | .023 | .072 | .898 |
| 8 | 1 | .086 | .464 | .854 | -.854 | 1.025 |
| 2 | -.302 | .488 | .540 | -1.290 | .686 |
| 3 | -.308 | .412 | .460 | -1.143 | .527 |
| 4 | -.519 | .321 | .114 | -1.168 | .131 |
| 5 | -.854\* | .376 | .029 | -1.616 | -.092 |
| 6 | -.542 | .273 | .055 | -1.095 | .012 |
| 7 | -.485\* | .204 | .023 | -.898 | -.072 |
| Exposure | 1 | 2 | .077 | .113 | .498 | -.151 | .305 |
| 3 | .170 | .162 | .302 | -.158 | .498 |
| 4 | .391 | .226 | .092 | -.067 | .849 |
| 5 | .348 | .269 | .204 | -.197 | .893 |
| 6 | -.013 | .346 | .970 | -.713 | .688 |
| 7 | .263 | .344 | .449 | -.434 | .960 |
| 8 | .166 | .356 | .644 | -.556 | .888 |
| 2 | 1 | -.077 | .113 | .498 | -.305 | .151 |
| 3 | .093 | .111 | .409 | -.132 | .318 |
| 4 | .314 | .181 | .091 | -.052 | .680 |
| 5 | .271 | .227 | .240 | -.189 | .731 |
| 6 | -.090 | .293 | .760 | -.683 | .503 |
| 7 | .186 | .285 | .518 | -.392 | .765 |
| 8 | .089 | .308 | .774 | -.535 | .712 |
| 3 | 1 | -.170 | .162 | .302 | -.498 | .158 |
| 2 | -.093 | .111 | .409 | -.318 | .132 |
| 4 | .221 | .132 | .103 | -.047 | .490 |
| 5 | .178 | .205 | .391 | -.238 | .594 |
| 6 | -.183 | .271 | .504 | -.731 | .366 |
| 7 | .094 | .253 | .713 | -.419 | .606 |
| 8 | -.004 | .276 | .989 | -.562 | .555 |
| 4 | 1 | -.391 | .226 | .092 | -.849 | .067 |
| 2 | -.314 | .181 | .091 | -.680 | .052 |
| 3 | -.221 | .132 | .103 | -.490 | .047 |
| 5 | -.043 | .162 | .792 | -.372 | .285 |
| 6 | -.404 | .274 | .148 | -.959 | .151 |
| 7 | -.128 | .260 | .626 | -.655 | .399 |
| 8 | -.225 | .276 | .420 | -.785 | .334 |
| 5 | 1 | -.348 | .269 | .204 | -.893 | .197 |
| 2 | -.271 | .227 | .240 | -.731 | .189 |
| 3 | -.178 | .205 | .391 | -.594 | .238 |
| 4 | .043 | .162 | .792 | -.285 | .372 |
| 6 | -.361\* | .169 | .040 | -.704 | -.018 |
| 7 | -.085 | .222 | .705 | -.535 | .366 |
| 8 | -.182 | .230 | .433 | -.648 | .284 |
| 6 | 1 | .013 | .346 | .970 | -.688 | .713 |
| 2 | .090 | .293 | .760 | -.503 | .683 |
| 3 | .183 | .271 | .504 | -.366 | .731 |
| 4 | .404 | .274 | .148 | -.151 | .959 |
| 5 | .361\* | .169 | .040 | .018 | .704 |
| 7 | .276 | .151 | .076 | -.030 | .582 |
| 8 | .179 | .155 | .256 | -.135 | .493 |
| 7 | 1 | -.263 | .344 | .449 | -.960 | .434 |
| 2 | -.186 | .285 | .518 | -.765 | .392 |
| 3 | -.094 | .253 | .713 | -.606 | .419 |
| 4 | .128 | .260 | .626 | -.399 | .655 |
| 5 | .085 | .222 | .705 | -.366 | .535 |
| 6 | -.276 | .151 | .076 | -.582 | .030 |
| 8 | -.097 | .107 | .370 | -.315 | .120 |
| 8 | 1 | -.166 | .356 | .644 | -.888 | .556 |
| 2 | -.089 | .308 | .774 | -.712 | .535 |
| 3 | .004 | .276 | .989 | -.555 | .562 |
| 4 | .225 | .276 | .420 | -.334 | .785 |
| 5 | .182 | .230 | .433 | -.284 | .648 |
| 6 | -.179 | .155 | .256 | -.493 | .135 |
| 7 | .097 | .107 | .370 | -.120 | .315 |
| Based on estimated marginal means | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | |
| DistracterType | Time | (I) Exposure | (J) Exposure | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Steady | 1 | Pre-Exposure | Exposure | -.025 | .253 | .921 | -.538 | .488 |
| Exposure | Pre-Exposure | .025 | .253 | .921 | -.488 | .538 |
| 2 | Pre-Exposure | Exposure | -.190 | .316 | .552 | -.830 | .451 |
| Exposure | Pre-Exposure | .190 | .316 | .552 | -.451 | .830 |
| 3 | Pre-Exposure | Exposure | -.019 | .388 | .960 | -.806 | .767 |
| Exposure | Pre-Exposure | .019 | .388 | .960 | -.767 | .806 |
| 4 | Pre-Exposure | Exposure | -.105 | .516 | .839 | -1.150 | .940 |
| Exposure | Pre-Exposure | .105 | .516 | .839 | -.940 | 1.150 |
| 5 | Pre-Exposure | Exposure | .014 | .448 | .974 | -.893 | .922 |
| Exposure | Pre-Exposure | -.014 | .448 | .974 | -.922 | .893 |
| 6 | Pre-Exposure | Exposure | .311 | .570 | .589 | -.845 | 1.467 |
| Exposure | Pre-Exposure | -.311 | .570 | .589 | -1.467 | .845 |
| 7 | Pre-Exposure | Exposure | -.308 | .617 | .620 | -1.559 | .942 |
| Exposure | Pre-Exposure | .308 | .617 | .620 | -.942 | 1.559 |
| 8 | Pre-Exposure | Exposure | .294 | .536 | .587 | -.792 | 1.380 |
| Exposure | Pre-Exposure | -.294 | .536 | .587 | -1.380 | .792 |
| Deviant | 1 | Pre-Exposure | Exposure | -.682\* | .279 | .019 | -1.247 | -.116 |
| Exposure | Pre-Exposure | .682\* | .279 | .019 | .116 | 1.247 |
| 2 | Pre-Exposure | Exposure | -.217 | .269 | .425 | -.763 | .329 |
| Exposure | Pre-Exposure | .217 | .269 | .425 | -.329 | .763 |
| 3 | Pre-Exposure | Exposure | -.118 | .247 | .634 | -.618 | .381 |
| Exposure | Pre-Exposure | .118 | .247 | .634 | -.381 | .618 |
| 4 | Pre-Exposure | Exposure | .314 | .292 | .290 | -.279 | .906 |
| Exposure | Pre-Exposure | -.314 | .292 | .290 | -.906 | .279 |
| 5 | Pre-Exposure | Exposure | .606 | .322 | .068 | -.046 | 1.257 |
| Exposure | Pre-Exposure | -.606 | .322 | .068 | -1.257 | .046 |
| 6 | Pre-Exposure | Exposure | -.067 | .418 | .873 | -.914 | .779 |
| Exposure | Pre-Exposure | .067 | .418 | .873 | -.779 | .914 |
| 7 | Pre-Exposure | Exposure | .152 | .524 | .773 | -.909 | 1.213 |
| Exposure | Pre-Exposure | -.152 | .524 | .773 | -1.213 | .909 |
| 8 | Pre-Exposure | Exposure | -.430 | .623 | .494 | -1.692 | .831 |
| Exposure | Pre-Exposure | .430 | .623 | .494 | -.831 | 1.692 |
| Based on estimated marginal means | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | | |

**Appendix 5 –Means tables for 2(working memory group) × 2(Foreknowledge) × 2(distracter type) × 8(time, seconds) mixed ANOVA - Heart Rate**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Within-Subjects Effects** | | | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | | | |
| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Powera |
| DistracterType | Sphericity Assumed | 24.062 | 1 | 24.062 | .643 | .428 | .017 | .643 | .122 |
| Greenhouse-Geisser | 24.062 | 1.000 | 24.062 | .643 | .428 | .017 | .643 | .122 |
| Huynh-Feldt | 24.062 | 1.000 | 24.062 | .643 | .428 | .017 | .643 | .122 |
| Lower-bound | 24.062 | 1.000 | 24.062 | .643 | .428 | .017 | .643 | .122 |
| DistracterType \* WMCGroup | Sphericity Assumed | .225 | 1 | .225 | .006 | .939 | .000 | .006 | .051 |
| Greenhouse-Geisser | .225 | 1.000 | .225 | .006 | .939 | .000 | .006 | .051 |
| Huynh-Feldt | .225 | 1.000 | .225 | .006 | .939 | .000 | .006 | .051 |
| Lower-bound | .225 | 1.000 | .225 | .006 | .939 | .000 | .006 | .051 |
| Error(DistracterType) | Sphericity Assumed | 1421.528 | 38 | 37.409 |  |  |  |  |  |
| Greenhouse-Geisser | 1421.528 | 38.000 | 37.409 |  |  |  |  |  |
| Huynh-Feldt | 1421.528 | 38.000 | 37.409 |  |  |  |  |  |
| Lower-bound | 1421.528 | 38.000 | 37.409 |  |  |  |  |  |
| Foreknowledge | Sphericity Assumed | 940.019 | 1 | 940.019 | 4.926 | .032 | .115 | 4.926 | .581 |
| Greenhouse-Geisser | 940.019 | 1.000 | 940.019 | 4.926 | .032 | .115 | 4.926 | .581 |
| Huynh-Feldt | 940.019 | 1.000 | 940.019 | 4.926 | .032 | .115 | 4.926 | .581 |
| Lower-bound | 940.019 | 1.000 | 940.019 | 4.926 | .032 | .115 | 4.926 | .581 |
| Foreknowledge \* WMCGroup | Sphericity Assumed | .041 | 1 | .041 | .000 | .988 | .000 | .000 | .050 |
| Greenhouse-Geisser | .041 | 1.000 | .041 | .000 | .988 | .000 | .000 | .050 |
| Huynh-Feldt | .041 | 1.000 | .041 | .000 | .988 | .000 | .000 | .050 |
| Lower-bound | .041 | 1.000 | .041 | .000 | .988 | .000 | .000 | .050 |
| Error(Foreknowledge) | Sphericity Assumed | 7251.419 | 38 | 190.827 |  |  |  |  |  |
| Greenhouse-Geisser | 7251.419 | 38.000 | 190.827 |  |  |  |  |  |
| Huynh-Feldt | 7251.419 | 38.000 | 190.827 |  |  |  |  |  |
| Lower-bound | 7251.419 | 38.000 | 190.827 |  |  |  |  |  |
| Time | Sphericity Assumed | 653.814 | 7 | 93.402 | 3.078 | .004 | .075 | 21.546 | .941 |
| Greenhouse-Geisser | 653.814 | 2.733 | 239.266 | 3.078 | .035 | .075 | 8.411 | .676 |
| Huynh-Feldt | 653.814 | 3.043 | 214.890 | 3.078 | .030 | .075 | 9.365 | .712 |
| Lower-bound | 653.814 | 1.000 | 653.814 | 3.078 | .087 | .075 | 3.078 | .401 |
| Time \* WMCGroup | Sphericity Assumed | 56.905 | 7 | 8.129 | .268 | .966 | .007 | 1.875 | .129 |
| Greenhouse-Geisser | 56.905 | 2.733 | 20.825 | .268 | .830 | .007 | .732 | .098 |
| Huynh-Feldt | 56.905 | 3.043 | 18.703 | .268 | .851 | .007 | .815 | .100 |
| Lower-bound | 56.905 | 1.000 | 56.905 | .268 | .608 | .007 | .268 | .080 |
| Error(Time) | Sphericity Assumed | 8071.798 | 266 | 30.345 |  |  |  |  |  |
| Greenhouse-Geisser | 8071.798 | 103.838 | 77.734 |  |  |  |  |  |
| Huynh-Feldt | 8071.798 | 115.617 | 69.815 |  |  |  |  |  |
| Lower-bound | 8071.798 | 38.000 | 212.416 |  |  |  |  |  |
| DistracterType \* Foreknowledge | Sphericity Assumed | 9.725 | 1 | 9.725 | .302 | .586 | .008 | .302 | .083 |
| Greenhouse-Geisser | 9.725 | 1.000 | 9.725 | .302 | .586 | .008 | .302 | .083 |
| Huynh-Feldt | 9.725 | 1.000 | 9.725 | .302 | .586 | .008 | .302 | .083 |
| Lower-bound | 9.725 | 1.000 | 9.725 | .302 | .586 | .008 | .302 | .083 |
| DistracterType \* Foreknowledge \* WMCGroup | Sphericity Assumed | 127.801 | 1 | 127.801 | 3.968 | .054 | .095 | 3.968 | .493 |
| Greenhouse-Geisser | 127.801 | 1.000 | 127.801 | 3.968 | .054 | .095 | 3.968 | .493 |
| Huynh-Feldt | 127.801 | 1.000 | 127.801 | 3.968 | .054 | .095 | 3.968 | .493 |
| Lower-bound | 127.801 | 1.000 | 127.801 | 3.968 | .054 | .095 | 3.968 | .493 |
| Error(DistracterType\*Foreknowledge) | Sphericity Assumed | 1223.899 | 38 | 32.208 |  |  |  |  |  |
| Greenhouse-Geisser | 1223.899 | 38.000 | 32.208 |  |  |  |  |  |
| Huynh-Feldt | 1223.899 | 38.000 | 32.208 |  |  |  |  |  |
| Lower-bound | 1223.899 | 38.000 | 32.208 |  |  |  |  |  |
| DistracterType \* Time | Sphericity Assumed | 138.228 | 7 | 19.747 | .965 | .458 | .025 | 6.752 | .414 |
| Greenhouse-Geisser | 138.228 | 5.083 | 27.194 | .965 | .442 | .025 | 4.903 | .344 |
| Huynh-Feldt | 138.228 | 6.116 | 22.600 | .965 | .451 | .025 | 5.900 | .383 |
| Lower-bound | 138.228 | 1.000 | 138.228 | .965 | .332 | .025 | .965 | .160 |
| DistracterType \* Time \* WMCGroup | Sphericity Assumed | 79.829 | 7 | 11.404 | .557 | .790 | .014 | 3.899 | .240 |
| Greenhouse-Geisser | 79.829 | 5.083 | 15.705 | .557 | .736 | .014 | 2.832 | .204 |
| Huynh-Feldt | 79.829 | 6.116 | 13.052 | .557 | .767 | .014 | 3.407 | .224 |
| Lower-bound | 79.829 | 1.000 | 79.829 | .557 | .460 | .014 | .557 | .113 |
| Error(DistracterType\*Time) | Sphericity Assumed | 5445.572 | 266 | 20.472 |  |  |  |  |  |
| Greenhouse-Geisser | 5445.572 | 193.159 | 28.192 |  |  |  |  |  |
| Huynh-Feldt | 5445.572 | 232.415 | 23.430 |  |  |  |  |  |
| Lower-bound | 5445.572 | 38.000 | 143.305 |  |  |  |  |  |
| Foreknowledge \* Time | Sphericity Assumed | 130.101 | 7 | 18.586 | .739 | .639 | .019 | 5.170 | .317 |
| Greenhouse-Geisser | 130.101 | 3.073 | 42.330 | .739 | .534 | .019 | 2.270 | .206 |
| Huynh-Feldt | 130.101 | 3.463 | 37.572 | .739 | .549 | .019 | 2.558 | .218 |
| Lower-bound | 130.101 | 1.000 | 130.101 | .739 | .395 | .019 | .739 | .133 |
| Foreknowledge \* Time \* WMCGroup | Sphericity Assumed | 121.300 | 7 | 17.329 | .689 | .682 | .018 | 4.821 | .295 |
| Greenhouse-Geisser | 121.300 | 3.073 | 39.466 | .689 | .564 | .018 | 2.117 | .194 |
| Huynh-Feldt | 121.300 | 3.463 | 35.031 | .689 | .581 | .018 | 2.385 | .205 |
| Lower-bound | 121.300 | 1.000 | 121.300 | .689 | .412 | .018 | .689 | .128 |
| Error(Foreknowledge\*Time) | Sphericity Assumed | 6693.361 | 266 | 25.163 |  |  |  |  |  |
| Greenhouse-Geisser | 6693.361 | 116.793 | 57.310 |  |  |  |  |  |
| Huynh-Feldt | 6693.361 | 131.582 | 50.868 |  |  |  |  |  |
| Lower-bound | 6693.361 | 38.000 | 176.141 |  |  |  |  |  |
| DistracterType \* Foreknowledge \* Time | Sphericity Assumed | 60.060 | 7 | 8.580 | .230 | .978 | .006 | 1.610 | .116 |
| Greenhouse-Geisser | 60.060 | 2.973 | 20.205 | .230 | .874 | .006 | .684 | .092 |
| Huynh-Feldt | 60.060 | 3.337 | 17.996 | .230 | .894 | .006 | .768 | .095 |
| Lower-bound | 60.060 | 1.000 | 60.060 | .230 | .634 | .006 | .230 | .075 |
| DistracterType \* Foreknowledge \* Time \* WMCGroup | Sphericity Assumed | 121.851 | 7 | 17.407 | .467 | .858 | .012 | 3.267 | .203 |
| Greenhouse-Geisser | 121.851 | 2.973 | 40.993 | .467 | .704 | .012 | 1.387 | .141 |
| Huynh-Feldt | 121.851 | 3.337 | 36.511 | .467 | .726 | .012 | 1.558 | .147 |
| Lower-bound | 121.851 | 1.000 | 121.851 | .467 | .499 | .012 | .467 | .102 |
| Error(DistracterType\*Foreknowledge\*Time) | Sphericity Assumed | 9920.726 | 266 | 37.296 |  |  |  |  |  |
| Greenhouse-Geisser | 9920.726 | 112.955 | 87.829 |  |  |  |  |  |
| Huynh-Feldt | 9920.726 | 126.820 | 78.227 |  |  |  |  |  |
| Lower-bound | 9920.726 | 38.000 | 261.072 |  |  |  |  |  |
| a. Computed using alpha = .05 | | | | | | | | | |

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| **Main effect of Time** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| Measure: MEASURE\_1 | | | | |
| Time | Mean | Std. Error | 95% Confidence Interval | |
| Lower Bound | Upper Bound |
| 1 | 89.103 | 2.051 | 84.951 | 93.256 |
| 2 | 89.472 | 2.140 | 85.139 | 93.805 |
| 3 | 89.219 | 2.073 | 85.022 | 93.416 |
| 4 | 88.284 | 1.997 | 84.242 | 92.326 |
| 5 | 88.213 | 1.914 | 84.338 | 92.087 |
| 6 | 87.532 | 1.930 | 83.624 | 91.440 |
| 7 | 87.523 | 1.822 | 83.834 | 91.212 |
| 8 | 87.950 | 1.914 | 84.075 | 91.826 |

**Pairwise Comparisons**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | |
| Measure: MEASURE\_1 | | | | | | |
| (I) Time | (J) Time | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| 1 | 2 | -.369 | .414 | .379 | -1.207 | .470 |
| 3 | -.116 | .595 | .847 | -1.320 | 1.089 |
| 4 | .819 | .582 | .167 | -.358 | 1.996 |
| 5 | .890 | .672 | .193 | -.470 | 2.250 |
| 6 | 1.571\* | .772 | .049 | .008 | 3.135 |
| 7 | 1.580 | .884 | .082 | -.209 | 3.370 |
| 8 | 1.153 | .844 | .180 | -.556 | 2.862 |
| 2 | 1 | .369 | .414 | .379 | -.470 | 1.207 |
| 3 | .253 | .506 | .620 | -.771 | 1.277 |
| 4 | 1.188\* | .567 | .043 | .039 | 2.336 |
| 5 | 1.259 | .672 | .069 | -.102 | 2.620 |
| 6 | 1.940\* | .764 | .015 | .394 | 3.486 |
| 7 | 1.949\* | .855 | .028 | .217 | 3.681 |
| 8 | 1.521 | .835 | .076 | -.169 | 3.212 |
| 3 | 1 | .116 | .595 | .847 | -1.089 | 1.320 |
| 2 | -.253 | .506 | .620 | -1.277 | .771 |
| 4 | .935\* | .370 | .016 | .186 | 1.683 |
| 5 | 1.006 | .601 | .103 | -.212 | 2.224 |
| 6 | 1.687\* | .617 | .009 | .437 | 2.937 |
| 7 | 1.696\* | .722 | .024 | .234 | 3.158 |
| 8 | 1.269 | .684 | .072 | -.117 | 2.654 |
| 4 | 1 | -.819 | .582 | .167 | -1.996 | .358 |
| 2 | -1.188\* | .567 | .043 | -2.336 | -.039 |
| 3 | -.935\* | .370 | .016 | -1.683 | -.186 |
| 5 | .071 | .483 | .883 | -.907 | 1.050 |
| 6 | .753 | .497 | .138 | -.254 | 1.759 |
| 7 | .761 | .573 | .192 | -.399 | 1.922 |
| 8 | .334 | .594 | .578 | -.870 | 1.537 |
| 5 | 1 | -.890 | .672 | .193 | -2.250 | .470 |
| 2 | -1.259 | .672 | .069 | -2.620 | .102 |
| 3 | -1.006 | .601 | .103 | -2.224 | .212 |
| 4 | -.071 | .483 | .883 | -1.050 | .907 |
| 6 | .681 | .367 | .071 | -.061 | 1.423 |
| 7 | .690 | .455 | .137 | -.230 | 1.610 |
| 8 | .262 | .520 | .617 | -.790 | 1.315 |
| 6 | 1 | -1.571\* | .772 | .049 | -3.135 | -.008 |
| 2 | -1.940\* | .764 | .015 | -3.486 | -.394 |
| 3 | -1.687\* | .617 | .009 | -2.937 | -.437 |
| 4 | -.753 | .497 | .138 | -1.759 | .254 |
| 5 | -.681 | .367 | .071 | -1.423 | .061 |
| 7 | .009 | .394 | .983 | -.790 | .807 |
| 8 | -.419 | .486 | .394 | -1.403 | .565 |
| 7 | 1 | -1.580 | .884 | .082 | -3.370 | .209 |
| 2 | -1.949\* | .855 | .028 | -3.681 | -.217 |
| 3 | -1.696\* | .722 | .024 | -3.158 | -.234 |
| 4 | -.761 | .573 | .192 | -1.922 | .399 |
| 5 | -.690 | .455 | .137 | -1.610 | .230 |
| 6 | -.009 | .394 | .983 | -.807 | .790 |
| 8 | -.427 | .370 | .255 | -1.177 | .322 |
| 8 | 1 | -1.153 | .844 | .180 | -2.862 | .556 |
| 2 | -1.521 | .835 | .076 | -3.212 | .169 |
| 3 | -1.269 | .684 | .072 | -2.654 | .117 |
| 4 | -.334 | .594 | .578 | -1.537 | .870 |
| 5 | -.262 | .520 | .617 | -1.315 | .790 |
| 6 | .419 | .486 | .394 | -.565 | 1.403 |
| 7 | .427 | .370 | .255 | -.322 | 1.177 |
| Based on estimated marginal means | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | |

**Main effect of Foreknowledge**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| Measure: MEASURE\_1 | | | | |
| Foreknowledge | Mean | Std. Error | 95% Confidence Interval | |
| Lower Bound | Upper Bound |
| No Foreknowledge | 89.269 | 1.960 | 85.301 | 93.237 |
| Foreknowledge | 87.555 | 1.997 | 83.513 | 91.597 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Pairwise Comparisons** | | | | | | |
| Measure: MEASURE\_1 | | | | | | |
| (I) Foreknowledge | (J) Foreknowledge | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| No Foreknowledge | Foreknowledge | 1.714\* | .772 | .032 | .151 | 3.277 |
| Foreknowledge | No Foreknowledge | -1.714\* | .772 | .032 | -3.277 | -.151 |
| Based on estimated marginal means | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | |

**Appendix 6 –Means tables for 2(working memory group) × 2(Exposure) × 2(distracter type) × 8(time, seconds) mixed ANOVA - Heart Rate**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Within-Subjects Effects** | | | | | | | | | |
|  | | | | | | | | | |
| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Powera |
| DistracterType | Sphericity Assumed | 12.732 | 1 | 12.732 | .220 | .642 | .006 | .220 | .074 |
| Greenhouse-Geisser | 12.732 | 1.000 | 12.732 | .220 | .642 | .006 | .220 | .074 |
| Huynh-Feldt | 12.732 | 1.000 | 12.732 | .220 | .642 | .006 | .220 | .074 |
| Lower-bound | 12.732 | 1.000 | 12.732 | .220 | .642 | .006 | .220 | .074 |
| DistracterType \* WMCGroup | Sphericity Assumed | 53.482 | 1 | 53.482 | .923 | .343 | .024 | .923 | .155 |
| Greenhouse-Geisser | 53.482 | 1.000 | 53.482 | .923 | .343 | .024 | .923 | .155 |
| Huynh-Feldt | 53.482 | 1.000 | 53.482 | .923 | .343 | .024 | .923 | .155 |
| Lower-bound | 53.482 | 1.000 | 53.482 | .923 | .343 | .024 | .923 | .155 |
| Error(DistracterType) | Sphericity Assumed | 2201.263 | 38 | 57.928 |  |  |  |  |  |
| Greenhouse-Geisser | 2201.263 | 38.000 | 57.928 |  |  |  |  |  |
| Huynh-Feldt | 2201.263 | 38.000 | 57.928 |  |  |  |  |  |
| Lower-bound | 2201.263 | 38.000 | 57.928 |  |  |  |  |  |
| Exposure | Sphericity Assumed | 4105.420 | 1 | 4105.420 | 10.826 | .002 | .222 | 10.826 | .894 |
| Greenhouse-Geisser | 4105.420 | 1.000 | 4105.420 | 10.826 | .002 | .222 | 10.826 | .894 |
| Huynh-Feldt | 4105.420 | 1.000 | 4105.420 | 10.826 | .002 | .222 | 10.826 | .894 |
| Lower-bound | 4105.420 | 1.000 | 4105.420 | 10.826 | .002 | .222 | 10.826 | .894 |
| Exposure \* WMCGroup | Sphericity Assumed | 116.434 | 1 | 116.434 | .307 | .583 | .008 | .307 | .084 |
| Greenhouse-Geisser | 116.434 | 1.000 | 116.434 | .307 | .583 | .008 | .307 | .084 |
| Huynh-Feldt | 116.434 | 1.000 | 116.434 | .307 | .583 | .008 | .307 | .084 |
| Lower-bound | 116.434 | 1.000 | 116.434 | .307 | .583 | .008 | .307 | .084 |
| Error(Exposure) | Sphericity Assumed | 14410.608 | 38 | 379.227 |  |  |  |  |  |
| Greenhouse-Geisser | 14410.608 | 38.000 | 379.227 |  |  |  |  |  |
| Huynh-Feldt | 14410.608 | 38.000 | 379.227 |  |  |  |  |  |
| Lower-bound | 14410.608 | 38.000 | 379.227 |  |  |  |  |  |
| Time | Sphericity Assumed | 1471.888 | 7 | 210.270 | 7.460 | .000 | .164 | 52.220 | 1.000 |
| Greenhouse-Geisser | 1471.888 | 4.514 | 326.058 | 7.460 | .000 | .164 | 33.676 | .998 |
| Huynh-Feldt | 1471.888 | 5.333 | 276.015 | 7.460 | .000 | .164 | 39.781 | .999 |
| Lower-bound | 1471.888 | 1.000 | 1471.888 | 7.460 | .010 | .164 | 7.460 | .759 |
| Time \* WMCGroup | Sphericity Assumed | 193.389 | 7 | 27.627 | .980 | .446 | .025 | 6.861 | .421 |
| Greenhouse-Geisser | 193.389 | 4.514 | 42.840 | .980 | .426 | .025 | 4.425 | .326 |
| Huynh-Feldt | 193.389 | 5.333 | 36.265 | .980 | .434 | .025 | 5.227 | .359 |
| Lower-bound | 193.389 | 1.000 | 193.389 | .980 | .328 | .025 | .980 | .162 |
| Error(Time) | Sphericity Assumed | 7497.574 | 266 | 28.186 |  |  |  |  |  |
| Greenhouse-Geisser | 7497.574 | 171.539 | 43.708 |  |  |  |  |  |
| Huynh-Feldt | 7497.574 | 202.640 | 36.999 |  |  |  |  |  |
| Lower-bound | 7497.574 | 38.000 | 197.305 |  |  |  |  |  |
| DistracterType \* Exposure | Sphericity Assumed | 3.173 | 1 | 3.173 | .102 | .751 | .003 | .102 | .061 |
| Greenhouse-Geisser | 3.173 | 1.000 | 3.173 | .102 | .751 | .003 | .102 | .061 |
| Huynh-Feldt | 3.173 | 1.000 | 3.173 | .102 | .751 | .003 | .102 | .061 |
| Lower-bound | 3.173 | 1.000 | 3.173 | .102 | .751 | .003 | .102 | .061 |
| DistracterType \* Exposure \* WMCGroup | Sphericity Assumed | 19.949 | 1 | 19.949 | .642 | .428 | .017 | .642 | .122 |
| Greenhouse-Geisser | 19.949 | 1.000 | 19.949 | .642 | .428 | .017 | .642 | .122 |
| Huynh-Feldt | 19.949 | 1.000 | 19.949 | .642 | .428 | .017 | .642 | .122 |
| Lower-bound | 19.949 | 1.000 | 19.949 | .642 | .428 | .017 | .642 | .122 |
| Error(DistracterType\*Exposure) | Sphericity Assumed | 1181.377 | 38 | 31.089 |  |  |  |  |  |
| Greenhouse-Geisser | 1181.377 | 38.000 | 31.089 |  |  |  |  |  |
| Huynh-Feldt | 1181.377 | 38.000 | 31.089 |  |  |  |  |  |
| Lower-bound | 1181.377 | 38.000 | 31.089 |  |  |  |  |  |
| DistracterType \* Time | Sphericity Assumed | 291.629 | 7 | 41.661 | 1.425 | .195 | .036 | 9.976 | .599 |
| Greenhouse-Geisser | 291.629 | 5.103 | 57.152 | 1.425 | .216 | .036 | 7.272 | .501 |
| Huynh-Feldt | 291.629 | 6.144 | 47.469 | 1.425 | .204 | .036 | 8.755 | .557 |
| Lower-bound | 291.629 | 1.000 | 291.629 | 1.425 | .240 | .036 | 1.425 | .214 |
| DistracterType \* Time \* WMCGroup | Sphericity Assumed | 167.624 | 7 | 23.946 | .819 | .572 | .021 | 5.734 | .352 |
| Greenhouse-Geisser | 167.624 | 5.103 | 32.850 | .819 | .539 | .021 | 4.180 | .294 |
| Huynh-Feldt | 167.624 | 6.144 | 27.285 | .819 | .558 | .021 | 5.032 | .326 |
| Lower-bound | 167.624 | 1.000 | 167.624 | .819 | .371 | .021 | .819 | .143 |
| Error(DistracterType\*Time) | Sphericity Assumed | 7776.046 | 266 | 29.233 |  |  |  |  |  |
| Greenhouse-Geisser | 7776.046 | 193.901 | 40.103 |  |  |  |  |  |
| Huynh-Feldt | 7776.046 | 233.454 | 33.309 |  |  |  |  |  |
| Lower-bound | 7776.046 | 38.000 | 204.633 |  |  |  |  |  |
| Exposure \* Time | Sphericity Assumed | 653.929 | 7 | 93.418 | 2.670 | .011 | .066 | 18.693 | .899 |
| Greenhouse-Geisser | 653.929 | 3.199 | 204.419 | 2.670 | .047 | .066 | 8.543 | .659 |
| Huynh-Feldt | 653.929 | 3.619 | 180.674 | 2.670 | .040 | .066 | 9.665 | .700 |
| Lower-bound | 653.929 | 1.000 | 653.929 | 2.670 | .110 | .066 | 2.670 | .357 |
| Exposure \* Time \* WMCGroup | Sphericity Assumed | 94.320 | 7 | 13.474 | .385 | .911 | .010 | 2.696 | .171 |
| Greenhouse-Geisser | 94.320 | 3.199 | 29.484 | .385 | .776 | .010 | 1.232 | .127 |
| Huynh-Feldt | 94.320 | 3.619 | 26.060 | .385 | .800 | .010 | 1.394 | .132 |
| Lower-bound | 94.320 | 1.000 | 94.320 | .385 | .539 | .010 | .385 | .093 |
| Error(Exposure\*Time) | Sphericity Assumed | 9305.267 | 266 | 34.982 |  |  |  |  |  |
| Greenhouse-Geisser | 9305.267 | 121.561 | 76.548 |  |  |  |  |  |
| Huynh-Feldt | 9305.267 | 137.537 | 67.657 |  |  |  |  |  |
| Lower-bound | 9305.267 | 38.000 | 244.875 |  |  |  |  |  |
| DistracterType \* Exposure \* Time | Sphericity Assumed | 239.771 | 7 | 34.253 | 1.044 | .400 | .027 | 7.309 | .448 |
| Greenhouse-Geisser | 239.771 | 4.991 | 48.039 | 1.044 | .393 | .027 | 5.212 | .367 |
| Huynh-Feldt | 239.771 | 5.988 | 40.043 | 1.044 | .397 | .027 | 6.252 | .409 |
| Lower-bound | 239.771 | 1.000 | 239.771 | 1.044 | .313 | .027 | 1.044 | .169 |
| DistracterType \* Exposure \* Time \* WMCGroup | Sphericity Assumed | 296.290 | 7 | 42.327 | 1.290 | .255 | .033 | 9.032 | .548 |
| Greenhouse-Geisser | 296.290 | 4.991 | 59.362 | 1.290 | .270 | .033 | 6.440 | .451 |
| Huynh-Feldt | 296.290 | 5.988 | 49.483 | 1.290 | .263 | .033 | 7.726 | .501 |
| Lower-bound | 296.290 | 1.000 | 296.290 | 1.290 | .263 | .033 | 1.290 | .198 |
| Error(DistracterType\*Exposure\*Time) | Sphericity Assumed | 8725.622 | 266 | 32.803 |  |  |  |  |  |
| Greenhouse-Geisser | 8725.622 | 189.667 | 46.005 |  |  |  |  |  |
| Huynh-Feldt | 8725.622 | 227.536 | 38.348 |  |  |  |  |  |
| Lower-bound | 8725.622 | 38.000 | 229.622 |  |  |  |  |  |
| a. Computed using alpha = .05 | | | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Pairwise Comparisons – Exposure x Time** | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | |
| Time | (I) Exposure | (J) Exposure | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| 1 | Pre-Exposure | Exposure | 6.852\* | 1.730 | .000 | 3.350 | 10.355 |
| Exposure | Pre-Exposure | -6.852\* | 1.730 | .000 | -10.355 | -3.350 |
| 2 | Pre-Exposure | Exposure | 4.585\* | 1.494 | .004 | 1.560 | 7.609 |
| Exposure | Pre-Exposure | -4.585\* | 1.494 | .004 | -7.609 | -1.560 |
| 3 | Pre-Exposure | Exposure | 3.560\* | 1.603 | .032 | .315 | 6.806 |
| Exposure | Pre-Exposure | -3.560\* | 1.603 | .032 | -6.806 | -.315 |
| 4 | Pre-Exposure | Exposure | 2.895\* | 1.421 | .049 | .019 | 5.771 |
| Exposure | Pre-Exposure | -2.895\* | 1.421 | .049 | -5.771 | -.019 |
| 5 | Pre-Exposure | Exposure | 1.943 | 1.234 | .124 | -.555 | 4.442 |
| Exposure | Pre-Exposure | -1.943 | 1.234 | .124 | -4.442 | .555 |
| 6 | Pre-Exposure | Exposure | 2.548\* | 1.219 | .043 | .080 | 5.017 |
| Exposure | Pre-Exposure | -2.548\* | 1.219 | .043 | -5.017 | -.080 |
| 7 | Pre-Exposure | Exposure | 3.032\* | 1.116 | .010 | .773 | 5.291 |
| Exposure | Pre-Exposure | -3.032\* | 1.116 | .010 | -5.291 | -.773 |
| 8 | Pre-Exposure | Exposure | 3.239\* | 1.239 | .013 | .731 | 5.747 |
| Exposure | Pre-Exposure | -3.239\* | 1.239 | .013 | -5.747 | -.731 |
| Based on estimated marginal means | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | |
| Exposure | (I) Time | (J) Time | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Pre-Exposure | 1 | 2 | 1.892\* | .740 | .015 | .394 | 3.390 |
| 3 | 3.210\* | 1.039 | .004 | 1.106 | 5.313 |
| 4 | 4.749\* | 1.032 | .000 | 2.658 | 6.839 |
| 5 | 4.917\* | .915 | .000 | 3.065 | 6.769 |
| 6 | 5.321\* | .928 | .000 | 3.443 | 7.198 |
| 7 | 4.893\* | 1.314 | .001 | 2.232 | 7.553 |
| 8 | 4.390\* | 1.241 | .001 | 1.879 | 6.901 |
| 2 | 1 | -1.892\* | .740 | .015 | -3.390 | -.394 |
| 3 | 1.318 | .766 | .094 | -.234 | 2.869 |
| 4 | 2.857\* | .886 | .003 | 1.064 | 4.649 |
| 5 | 3.025\* | .908 | .002 | 1.188 | 4.863 |
| 6 | 3.429\* | .958 | .001 | 1.490 | 5.367 |
| 7 | 3.001\* | 1.202 | .017 | .567 | 5.434 |
| 8 | 2.498 | 1.275 | .057 | -.083 | 5.079 |
| 3 | 1 | -3.210\* | 1.039 | .004 | -5.313 | -1.106 |
| 2 | -1.318 | .766 | .094 | -2.869 | .234 |
| 4 | 1.539\* | .642 | .022 | .239 | 2.839 |
| 5 | 1.708 | 1.117 | .135 | -.554 | 3.969 |
| 6 | 2.111 | 1.043 | .050 | .000 | 4.222 |
| 7 | 1.683 | 1.331 | .214 | -1.011 | 4.378 |
| 8 | 1.180 | 1.244 | .349 | -1.338 | 3.699 |
| 4 | 1 | -4.749\* | 1.032 | .000 | -6.839 | -2.658 |
| 2 | -2.857\* | .886 | .003 | -4.649 | -1.064 |
| 3 | -1.539\* | .642 | .022 | -2.839 | -.239 |
| 5 | .169 | .967 | .862 | -1.789 | 2.126 |
| 6 | .572 | 1.070 | .596 | -1.594 | 2.738 |
| 7 | .144 | 1.107 | .897 | -2.096 | 2.385 |
| 8 | -.359 | 1.066 | .738 | -2.516 | 1.799 |
| 5 | 1 | -4.917\* | .915 | .000 | -6.769 | -3.065 |
| 2 | -3.025\* | .908 | .002 | -4.863 | -1.188 |
| 3 | -1.708 | 1.117 | .135 | -3.969 | .554 |
| 4 | -.169 | .967 | .862 | -2.126 | 1.789 |
| 6 | .403 | .699 | .567 | -1.011 | 1.818 |
| 7 | -.025 | .916 | .979 | -1.879 | 1.830 |
| 8 | -.527 | .925 | .572 | -2.399 | 1.345 |
| 6 | 1 | -5.321\* | .928 | .000 | -7.198 | -3.443 |
| 2 | -3.429\* | .958 | .001 | -5.367 | -1.490 |
| 3 | -2.111 | 1.043 | .050 | -4.222 | .000 |
| 4 | -.572 | 1.070 | .596 | -2.738 | 1.594 |
| 5 | -.403 | .699 | .567 | -1.818 | 1.011 |
| 7 | -.428 | 1.059 | .688 | -2.572 | 1.716 |
| 8 | -.931 | .896 | .305 | -2.744 | .882 |
| 7 | 1 | -4.893\* | 1.314 | .001 | -7.553 | -2.232 |
| 2 | -3.001\* | 1.202 | .017 | -5.434 | -.567 |
| 3 | -1.683 | 1.331 | .214 | -4.378 | 1.011 |
| 4 | -.144 | 1.107 | .897 | -2.385 | 2.096 |
| 5 | .025 | .916 | .979 | -1.830 | 1.879 |
| 6 | .428 | 1.059 | .688 | -1.716 | 2.572 |
| 8 | -.503 | .829 | .548 | -2.180 | 1.175 |
| 8 | 1 | -4.390\* | 1.241 | .001 | -6.901 | -1.879 |
| 2 | -2.498 | 1.275 | .057 | -5.079 | .083 |
| 3 | -1.180 | 1.244 | .349 | -3.699 | 1.338 |
| 4 | .359 | 1.066 | .738 | -1.799 | 2.516 |
| 5 | .527 | .925 | .572 | -1.345 | 2.399 |
| 6 | .931 | .896 | .305 | -.882 | 2.744 |
| 7 | .503 | .829 | .548 | -1.175 | 2.180 |
| Exposure | 1 | 2 | -.376 | .505 | .461 | -1.398 | .646 |
| 3 | -.083 | .759 | .914 | -1.619 | 1.454 |
| 4 | .791 | .787 | .322 | -.803 | 2.385 |
| 5 | .008 | .795 | .992 | -1.601 | 1.618 |
| 6 | 1.016 | .858 | .243 | -.720 | 2.752 |
| 7 | 1.072 | .923 | .253 | -.797 | 2.942 |
| 8 | .776 | .925 | .407 | -1.096 | 2.648 |
| 2 | 1 | .376 | .505 | .461 | -.646 | 1.398 |
| 3 | .293 | .562 | .605 | -.844 | 1.430 |
| 4 | 1.167 | .742 | .124 | -.336 | 2.669 |
| 5 | .384 | .755 | .614 | -1.144 | 1.912 |
| 6 | 1.392 | .794 | .088 | -.215 | 2.999 |
| 7 | 1.448 | .909 | .119 | -.392 | 3.288 |
| 8 | 1.152 | .862 | .189 | -.593 | 2.897 |
| 3 | 1 | .083 | .759 | .914 | -1.454 | 1.619 |
| 2 | -.293 | .562 | .605 | -1.430 | .844 |
| 4 | .873 | .574 | .136 | -.288 | 2.035 |
| 5 | .091 | .676 | .894 | -1.277 | 1.459 |
| 6 | 1.099 | .645 | .097 | -.208 | 2.405 |
| 7 | 1.155 | .955 | .234 | -.779 | 3.088 |
| 8 | .859 | .903 | .348 | -.970 | 2.688 |
| 4 | 1 | -.791 | .787 | .322 | -2.385 | .803 |
| 2 | -1.167 | .742 | .124 | -2.669 | .336 |
| 3 | -.873 | .574 | .136 | -2.035 | .288 |
| 5 | -.783 | .647 | .234 | -2.093 | .527 |
| 6 | .225 | .476 | .639 | -.739 | 1.189 |
| 7 | .281 | .662 | .673 | -1.059 | 1.622 |
| 8 | -.015 | .800 | .985 | -1.635 | 1.606 |
| 5 | 1 | -.008 | .795 | .992 | -1.618 | 1.601 |
| 2 | -.384 | .755 | .614 | -1.912 | 1.144 |
| 3 | -.091 | .676 | .894 | -1.459 | 1.277 |
| 4 | .783 | .647 | .234 | -.527 | 2.093 |
| 6 | 1.008 | .528 | .064 | -.060 | 2.076 |
| 7 | 1.064 | .690 | .131 | -.332 | 2.460 |
| 8 | .768 | .702 | .281 | -.654 | 2.190 |
| 6 | 1 | -1.016 | .858 | .243 | -2.752 | .720 |
| 2 | -1.392 | .794 | .088 | -2.999 | .215 |
| 3 | -1.099 | .645 | .097 | -2.405 | .208 |
| 4 | -.225 | .476 | .639 | -1.189 | .739 |
| 5 | -1.008 | .528 | .064 | -2.076 | .060 |
| 7 | .056 | .508 | .913 | -.972 | 1.084 |
| 8 | -.240 | .608 | .695 | -1.472 | .992 |
| 7 | 1 | -1.072 | .923 | .253 | -2.942 | .797 |
| 2 | -1.448 | .909 | .119 | -3.288 | .392 |
| 3 | -1.155 | .955 | .234 | -3.088 | .779 |
| 4 | -.281 | .662 | .673 | -1.622 | 1.059 |
| 5 | -1.064 | .690 | .131 | -2.460 | .332 |
| 6 | -.056 | .508 | .913 | -1.084 | .972 |
| 8 | -.296 | .621 | .636 | -1.554 | .962 |
| 8 | 1 | -.776 | .925 | .407 | -2.648 | 1.096 |
| 2 | -1.152 | .862 | .189 | -2.897 | .593 |
| 3 | -.859 | .903 | .348 | -2.688 | .970 |
| 4 | .015 | .800 | .985 | -1.606 | 1.635 |
| 5 | -.768 | .702 | .281 | -2.190 | .654 |
| 6 | .240 | .608 | .695 | -.992 | 1.472 |
| 7 | .296 | .621 | .636 | -.962 | 1.554 |
| Based on estimated marginal means | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | |

**Appendix 7 – Means tables for 2(working memory group) × 2(Exposure) × 2(distracter type) × 15(time, seconds) mixed ANOVA - galvanic skin response**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Within-Subjects Effects** | | | | | | | | | |
|  | | | | | | | | | |
| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Powera |
| Foreknowledge | Sphericity Assumed | 14.416 | 1 | 14.416 | .309 | .582 | .008 | .309 | .084 |
| Greenhouse-Geisser | 14.416 | 1.000 | 14.416 | .309 | .582 | .008 | .309 | .084 |
| Huynh-Feldt | 14.416 | 1.000 | 14.416 | .309 | .582 | .008 | .309 | .084 |
| Lower-bound | 14.416 | 1.000 | 14.416 | .309 | .582 | .008 | .309 | .084 |
| Error(Foreknowledge) | Sphericity Assumed | 1773.223 | 38 | 46.664 |  |  |  |  |  |
| Greenhouse-Geisser | 1773.223 | 38.000 | 46.664 |  |  |  |  |  |
| Huynh-Feldt | 1773.223 | 38.000 | 46.664 |  |  |  |  |  |
| Lower-bound | 1773.223 | 38.000 | 46.664 |  |  |  |  |  |
| Type | Sphericity Assumed | .446 | 1 | .446 | .468 | .498 | .012 | .468 | .102 |
| Greenhouse-Geisser | .446 | 1.000 | .446 | .468 | .498 | .012 | .468 | .102 |
| Huynh-Feldt | .446 | 1.000 | .446 | .468 | .498 | .012 | .468 | .102 |
| Lower-bound | .446 | 1.000 | .446 | .468 | .498 | .012 | .468 | .102 |
| Error(Type) | Sphericity Assumed | 36.179 | 38 | .952 |  |  |  |  |  |
| Greenhouse-Geisser | 36.179 | 38.000 | .952 |  |  |  |  |  |
| Huynh-Feldt | 36.179 | 38.000 | .952 |  |  |  |  |  |
| Lower-bound | 36.179 | 38.000 | .952 |  |  |  |  |  |
| Time | Sphericity Assumed | 15.772 | 14 | 1.127 | 1.846 | .030 | .046 | 25.844 | .931 |
| Greenhouse-Geisser | 15.772 | 3.534 | 4.463 | 1.846 | .132 | .046 | 6.524 | .514 |
| Huynh-Feldt | 15.772 | 3.941 | 4.002 | 1.846 | .124 | .046 | 7.275 | .546 |
| Lower-bound | 15.772 | 1.000 | 15.772 | 1.846 | .182 | .046 | 1.846 | .263 |
| Error(Time) | Sphericity Assumed | 324.664 | 532 | .610 |  |  |  |  |  |
| Greenhouse-Geisser | 324.664 | 134.287 | 2.418 |  |  |  |  |  |
| Huynh-Feldt | 324.664 | 149.747 | 2.168 |  |  |  |  |  |
| Lower-bound | 324.664 | 38.000 | 8.544 |  |  |  |  |  |
| Foreknowledge \* Type | Sphericity Assumed | .173 | 1 | .173 | .349 | .558 | .009 | .349 | .089 |
| Greenhouse-Geisser | .173 | 1.000 | .173 | .349 | .558 | .009 | .349 | .089 |
| Huynh-Feldt | .173 | 1.000 | .173 | .349 | .558 | .009 | .349 | .089 |
| Lower-bound | .173 | 1.000 | .173 | .349 | .558 | .009 | .349 | .089 |
| Error(Foreknowledge\*Type) | Sphericity Assumed | 18.875 | 38 | .497 |  |  |  |  |  |
| Greenhouse-Geisser | 18.875 | 38.000 | .497 |  |  |  |  |  |
| Huynh-Feldt | 18.875 | 38.000 | .497 |  |  |  |  |  |
| Lower-bound | 18.875 | 38.000 | .497 |  |  |  |  |  |
| Foreknowledge \* Time | Sphericity Assumed | 26.948 | 14 | 1.925 | .418 | .969 | .011 | 5.854 | .263 |
| Greenhouse-Geisser | 26.948 | 1.314 | 20.504 | .418 | .576 | .011 | .550 | .103 |
| Huynh-Feldt | 26.948 | 1.343 | 20.070 | .418 | .580 | .011 | .561 | .104 |
| Lower-bound | 26.948 | 1.000 | 26.948 | .418 | .522 | .011 | .418 | .097 |
| Error(Foreknowledge\*Time) | Sphericity Assumed | 2449.187 | 532 | 4.604 |  |  |  |  |  |
| Greenhouse-Geisser | 2449.187 | 49.943 | 49.040 |  |  |  |  |  |
| Huynh-Feldt | 2449.187 | 51.022 | 48.003 |  |  |  |  |  |
| Lower-bound | 2449.187 | 38.000 | 64.452 |  |  |  |  |  |
| Type \* Time | Sphericity Assumed | 31.277 | 14 | 2.234 | 4.185 | .000 | .099 | 58.585 | 1.000 |
| Greenhouse-Geisser | 31.277 | 7.246 | 4.316 | 4.185 | .000 | .099 | 30.323 | .990 |
| Huynh-Feldt | 31.277 | 9.124 | 3.428 | 4.185 | .000 | .099 | 38.181 | .997 |
| Lower-bound | 31.277 | 1.000 | 31.277 | 4.185 | .048 | .099 | 4.185 | .514 |
| Error(Type\*Time) | Sphericity Assumed | 284.019 | 532 | .534 |  |  |  |  |  |
| Greenhouse-Geisser | 284.019 | 275.355 | 1.031 |  |  |  |  |  |
| Huynh-Feldt | 284.019 | 346.717 | .819 |  |  |  |  |  |
| Lower-bound | 284.019 | 38.000 | 7.474 |  |  |  |  |  |
| Foreknowledge \* Type \* Time | Sphericity Assumed | 23.723 | 14 | 1.694 | 2.572 | .001 | .063 | 36.012 | .989 |
| Greenhouse-Geisser | 23.723 | 4.508 | 5.262 | 2.572 | .033 | .063 | 11.597 | .754 |
| Huynh-Feldt | 23.723 | 5.190 | 4.571 | 2.572 | .026 | .063 | 13.351 | .800 |
| Lower-bound | 23.723 | 1.000 | 23.723 | 2.572 | .117 | .063 | 2.572 | .346 |
| Error(Foreknowledge\*Type\*Time) | Sphericity Assumed | 350.451 | 532 | .659 |  |  |  |  |  |
| Greenhouse-Geisser | 350.451 | 171.318 | 2.046 |  |  |  |  |  |
| Huynh-Feldt | 350.451 | 197.226 | 1.777 |  |  |  |  |  |
| Lower-bound | 350.451 | 38.000 | 9.222 |  |  |  |  |  |
| a. Computed using alpha = .05 | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pairwise Comparisons – Foreknowledge x Type x Time** | | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | | |
| Type | Time | (I) Foreknowledge | (J) Foreknowledge | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Simple | 1 | No Foreknowledge | Foreknowledge | -.408 | .559 | .469 | -1.539 | .723 |
| Foreknowledge | No Foreknowledge | .408 | .559 | .469 | -.723 | 1.539 |
| 2 | No Foreknowledge | Foreknowledge | -.250 | .355 | .485 | -.969 | .468 |
| Foreknowledge | No Foreknowledge | .250 | .355 | .485 | -.468 | .969 |
| 3 | No Foreknowledge | Foreknowledge | .236 | .312 | .453 | -.395 | .867 |
| Foreknowledge | No Foreknowledge | -.236 | .312 | .453 | -.867 | .395 |
| 4 | No Foreknowledge | Foreknowledge | -.080 | .271 | .768 | -.628 | .468 |
| Foreknowledge | No Foreknowledge | .080 | .271 | .768 | -.468 | .628 |
| 5 | No Foreknowledge | Foreknowledge | -.049 | .225 | .828 | -.504 | .406 |
| Foreknowledge | No Foreknowledge | .049 | .225 | .828 | -.406 | .504 |
| 6 | No Foreknowledge | Foreknowledge | -.156 | .369 | .674 | -.904 | .592 |
| Foreknowledge | No Foreknowledge | .156 | .369 | .674 | -.592 | .904 |
| 7 | No Foreknowledge | Foreknowledge | -.418 | .439 | .347 | -1.306 | .471 |
| Foreknowledge | No Foreknowledge | .418 | .439 | .347 | -.471 | 1.306 |
| 8 | No Foreknowledge | Foreknowledge | -.220 | .467 | .640 | -1.166 | .725 |
| Foreknowledge | No Foreknowledge | .220 | .467 | .640 | -.725 | 1.166 |
| 9 | No Foreknowledge | Foreknowledge | -.292 | .532 | .586 | -1.369 | .784 |
| Foreknowledge | No Foreknowledge | .292 | .532 | .586 | -.784 | 1.369 |
| 10 | No Foreknowledge | Foreknowledge | -.426 | .651 | .517 | -1.744 | .892 |
| Foreknowledge | No Foreknowledge | .426 | .651 | .517 | -.892 | 1.744 |
| 11 | No Foreknowledge | Foreknowledge | -.295 | .668 | .661 | -1.647 | 1.057 |
| Foreknowledge | No Foreknowledge | .295 | .668 | .661 | -1.057 | 1.647 |
| 12 | No Foreknowledge | Foreknowledge | -.376 | .678 | .582 | -1.749 | .997 |
| Foreknowledge | No Foreknowledge | .376 | .678 | .582 | -.997 | 1.749 |
| 13 | No Foreknowledge | Foreknowledge | -.423 | .539 | .437 | -1.514 | .667 |
| Foreknowledge | No Foreknowledge | .423 | .539 | .437 | -.667 | 1.514 |
| 14 | No Foreknowledge | Foreknowledge | .240 | .459 | .603 | -.688 | 1.169 |
| Foreknowledge | No Foreknowledge | -.240 | .459 | .603 | -1.169 | .688 |
| 15 | No Foreknowledge | Foreknowledge | .306 | .394 | .443 | -.493 | 1.104 |
| Foreknowledge | No Foreknowledge | -.306 | .394 | .443 | -1.104 | .493 |
| Complex | 1 | No Foreknowledge | Foreknowledge | -.446 | .247 | .079 | -.946 | .054 |
| Foreknowledge | No Foreknowledge | .446 | .247 | .079 | -.054 | .946 |
| 2 | No Foreknowledge | Foreknowledge | -.316 | .265 | .241 | -.853 | .221 |
| Foreknowledge | No Foreknowledge | .316 | .265 | .241 | -.221 | .853 |
| 3 | No Foreknowledge | Foreknowledge | -.210 | .198 | .297 | -.611 | .192 |
| Foreknowledge | No Foreknowledge | .210 | .198 | .297 | -.192 | .611 |
| 4 | No Foreknowledge | Foreknowledge | -.537\* | .222 | .020 | -.987 | -.088 |
| Foreknowledge | No Foreknowledge | .537\* | .222 | .020 | .088 | .987 |
| 5 | No Foreknowledge | Foreknowledge | -.521 | .344 | .138 | -1.217 | .176 |
| Foreknowledge | No Foreknowledge | .521 | .344 | .138 | -.176 | 1.217 |
| 6 | No Foreknowledge | Foreknowledge | -.217 | .326 | .510 | -.878 | .443 |
| Foreknowledge | No Foreknowledge | .217 | .326 | .510 | -.443 | .878 |
| 7 | No Foreknowledge | Foreknowledge | -.243 | .462 | .602 | -1.178 | .693 |
| Foreknowledge | No Foreknowledge | .243 | .462 | .602 | -.693 | 1.178 |
| 8 | No Foreknowledge | Foreknowledge | -.463 | .558 | .412 | -1.592 | .667 |
| Foreknowledge | No Foreknowledge | .463 | .558 | .412 | -.667 | 1.592 |
| 9 | No Foreknowledge | Foreknowledge | -.249 | .568 | .663 | -1.400 | .901 |
| Foreknowledge | No Foreknowledge | .249 | .568 | .663 | -.901 | 1.400 |
| 10 | No Foreknowledge | Foreknowledge | -.291 | .581 | .619 | -1.468 | .885 |
| Foreknowledge | No Foreknowledge | .291 | .581 | .619 | -.885 | 1.468 |
| 11 | No Foreknowledge | Foreknowledge | .080 | .629 | .899 | -1.194 | 1.354 |
| Foreknowledge | No Foreknowledge | -.080 | .629 | .899 | -1.354 | 1.194 |
| 12 | No Foreknowledge | Foreknowledge | .266 | .512 | .606 | -.770 | 1.302 |
| Foreknowledge | No Foreknowledge | -.266 | .512 | .606 | -1.302 | .770 |
| 13 | No Foreknowledge | Foreknowledge | .632 | .493 | .208 | -.367 | 1.630 |
| Foreknowledge | No Foreknowledge | -.632 | .493 | .208 | -1.630 | .367 |
| 14 | No Foreknowledge | Foreknowledge | .058 | .361 | .873 | -.672 | .788 |
| Foreknowledge | No Foreknowledge | -.058 | .361 | .873 | -.788 | .672 |
| 15 | No Foreknowledge | Foreknowledge | .361 | .246 | .151 | -.137 | .859 |
| Foreknowledge | No Foreknowledge | -.361 | .246 | .151 | -.859 | .137 |
| Based on estimated marginal means | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measure: MEASURE\_1 | | | | | | | | |
| Foreknowledge | Time | (I) Type | (J) Type | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| No Foreknowledge | 1 | Simple | Complex | .311 | .285 | .282 | -.266 | .887 |
| Complex | Simple | -.311 | .285 | .282 | -.887 | .266 |
| 2 | Simple | Complex | .284 | .177 | .118 | -.075 | .643 |
| Complex | Simple | -.284 | .177 | .118 | -.643 | .075 |
| 3 | Simple | Complex | .320 | .281 | .262 | -.249 | .890 |
| Complex | Simple | -.320 | .281 | .262 | -.890 | .249 |
| 4 | Simple | Complex | .377 | .213 | .085 | -.055 | .809 |
| Complex | Simple | -.377 | .213 | .085 | -.809 | .055 |
| 5 | Simple | Complex | .283 | .260 | .285 | -.245 | .810 |
| Complex | Simple | -.283 | .260 | .285 | -.810 | .245 |
| 6 | Simple | Complex | .002 | .140 | .990 | -.281 | .284 |
| Complex | Simple | -.002 | .140 | .990 | -.284 | .281 |
| 7 | Simple | Complex | -.407\* | .151 | .011 | -.713 | -.101 |
| Complex | Simple | .407\* | .151 | .011 | .101 | .713 |
| 8 | Simple | Complex | .138 | .171 | .425 | -.208 | .484 |
| Complex | Simple | -.138 | .171 | .425 | -.484 | .208 |
| 9 | Simple | Complex | .124 | .155 | .426 | -.189 | .438 |
| Complex | Simple | -.124 | .155 | .426 | -.438 | .189 |
| 10 | Simple | Complex | -.377\* | .132 | .007 | -.645 | -.109 |
| Complex | Simple | .377\* | .132 | .007 | .109 | .645 |
| 11 | Simple | Complex | -.752\* | .164 | .000 | -1.084 | -.421 |
| Complex | Simple | .752\* | .164 | .000 | .421 | 1.084 |
| 12 | Simple | Complex | -.160 | .170 | .351 | -.504 | .183 |
| Complex | Simple | .160 | .170 | .351 | -.183 | .504 |
| 13 | Simple | Complex | -.665\* | .175 | .001 | -1.019 | -.310 |
| Complex | Simple | .665\* | .175 | .001 | .310 | 1.019 |
| 14 | Simple | Complex | -.126 | .162 | .441 | -.454 | .202 |
| Complex | Simple | .126 | .162 | .441 | -.202 | .454 |
| 15 | Simple | Complex | -.023 | .263 | .930 | -.556 | .509 |
| Complex | Simple | .023 | .263 | .930 | -.509 | .556 |
| Foreknowledge | 1 | Simple | Complex | .273 | .205 | .191 | -.142 | .687 |
| Complex | Simple | -.273 | .205 | .191 | -.687 | .142 |
| 2 | Simple | Complex | .218 | .160 | .181 | -.106 | .542 |
| Complex | Simple | -.218 | .160 | .181 | -.542 | .106 |
| 3 | Simple | Complex | -.126 | .130 | .339 | -.388 | .137 |
| Complex | Simple | .126 | .130 | .339 | -.137 | .388 |
| 4 | Simple | Complex | -.080 | .115 | .491 | -.314 | .154 |
| Complex | Simple | .080 | .115 | .491 | -.154 | .314 |
| 5 | Simple | Complex | -.189 | .146 | .203 | -.484 | .106 |
| Complex | Simple | .189 | .146 | .203 | -.106 | .484 |
| 6 | Simple | Complex | -.059 | .150 | .697 | -.364 | .246 |
| Complex | Simple | .059 | .150 | .697 | -.246 | .364 |
| 7 | Simple | Complex | -.232 | .149 | .128 | -.535 | .070 |
| Complex | Simple | .232 | .149 | .128 | -.070 | .535 |
| 8 | Simple | Complex | -.105 | .157 | .510 | -.423 | .214 |
| Complex | Simple | .105 | .157 | .510 | -.214 | .423 |
| 9 | Simple | Complex | .168 | .108 | .128 | -.050 | .385 |
| Complex | Simple | -.168 | .108 | .128 | -.385 | .050 |
| 10 | Simple | Complex | -.242 | .168 | .157 | -.582 | .097 |
| Complex | Simple | .242 | .168 | .157 | -.097 | .582 |
| 11 | Simple | Complex | -.377\* | .153 | .018 | -.686 | -.068 |
| Complex | Simple | .377\* | .153 | .018 | .068 | .686 |
| 12 | Simple | Complex | .482\* | .186 | .013 | .106 | .858 |
| Complex | Simple | -.482\* | .186 | .013 | -.858 | -.106 |
| 13 | Simple | Complex | .390\* | .133 | .006 | .121 | .660 |
| Complex | Simple | -.390\* | .133 | .006 | -.660 | -.121 |
| 14 | Simple | Complex | -.309\* | .118 | .013 | -.547 | -.070 |
| Complex | Simple | .309\* | .118 | .013 | .070 | .547 |
| 15 | Simple | Complex | .032 | .114 | .778 | -.198 | .262 |
| Complex | Simple | -.032 | .114 | .778 | -.262 | .198 |
| Based on estimated marginal means | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | | |
| Foreknowledge | Type | (I) Time | (J) Time | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| No Foreknowledge | Simple | 1 | 2 | -.091 | .166 | .589 | -.427 | .246 |
| 3 | -.133 | .141 | .352 | -.419 | .153 |
| 4 | -.045 | .236 | .851 | -.523 | .433 |
| 5 | -.023 | .299 | .940 | -.627 | .582 |
| 6 | .223 | .424 | .603 | -.636 | 1.081 |
| 7 | .402 | .475 | .402 | -.559 | 1.363 |
| 8 | .039 | .489 | .937 | -.950 | 1.028 |
| 9 | -.133 | .524 | .800 | -1.194 | .927 |
| 10 | .242 | .607 | .692 | -.986 | 1.470 |
| 11 | .340 | .655 | .607 | -.986 | 1.666 |
| 12 | -.050 | .642 | .939 | -1.349 | 1.250 |
| 13 | .156 | .599 | .795 | -1.057 | 1.370 |
| 14 | -.115 | .586 | .846 | -1.301 | 1.071 |
| 15 | -.242 | .557 | .666 | -1.371 | .886 |
| 2 | 1 | .091 | .166 | .589 | -.246 | .427 |
| 3 | -.042 | .116 | .716 | -.277 | .192 |
| 4 | .046 | .141 | .747 | -.240 | .332 |
| 5 | .068 | .204 | .741 | -.345 | .481 |
| 6 | .313 | .319 | .332 | -.332 | .958 |
| 7 | .493 | .377 | .199 | -.270 | 1.256 |
| 8 | .130 | .392 | .742 | -.664 | .923 |
| 9 | -.043 | .419 | .919 | -.891 | .806 |
| 10 | .333 | .500 | .509 | -.679 | 1.344 |
| 11 | .431 | .560 | .446 | -.702 | 1.563 |
| 12 | .041 | .543 | .940 | -1.059 | 1.140 |
| 13 | .247 | .496 | .621 | -.757 | 1.251 |
| 14 | -.024 | .482 | .960 | -1.000 | .952 |
| 15 | -.152 | .461 | .744 | -1.086 | .782 |
| 3 | 1 | .133 | .141 | .352 | -.153 | .419 |
| 2 | .042 | .116 | .716 | -.192 | .277 |
| 4 | .088 | .160 | .585 | -.236 | .413 |
| 5 | .110 | .216 | .613 | -.328 | .549 |
| 6 | .356 | .335 | .296 | -.323 | 1.035 |
| 7 | .535 | .386 | .174 | -.246 | 1.316 |
| 8 | .172 | .404 | .672 | -.646 | .991 |
| 9 | .000 | .441 | .999 | -.893 | .892 |
| 10 | .375 | .517 | .473 | -.672 | 1.423 |
| 11 | .473 | .571 | .413 | -.683 | 1.630 |
| 12 | .083 | .564 | .883 | -1.058 | 1.224 |
| 13 | .290 | .515 | .577 | -.754 | 1.333 |
| 14 | .018 | .499 | .971 | -.992 | 1.029 |
| 15 | -.109 | .470 | .817 | -1.060 | .841 |
| 4 | 1 | .045 | .236 | .851 | -.433 | .523 |
| 2 | -.046 | .141 | .747 | -.332 | .240 |
| 3 | -.088 | .160 | .585 | -.413 | .236 |
| 5 | .022 | .179 | .903 | -.340 | .384 |
| 6 | .267 | .248 | .289 | -.236 | .770 |
| 7 | .447 | .298 | .142 | -.157 | 1.051 |
| 8 | .084 | .314 | .791 | -.552 | .719 |
| 9 | -.089 | .359 | .806 | -.815 | .638 |
| 10 | .287 | .433 | .512 | -.590 | 1.164 |
| 11 | .385 | .497 | .444 | -.622 | 1.392 |
| 12 | -.005 | .476 | .991 | -.969 | .959 |
| 13 | .201 | .441 | .651 | -.691 | 1.093 |
| 14 | -.070 | .436 | .873 | -.952 | .812 |
| 15 | -.198 | .400 | .624 | -1.008 | .613 |
| 5 | 1 | .023 | .299 | .940 | -.582 | .627 |
| 2 | -.068 | .204 | .741 | -.481 | .345 |
| 3 | -.110 | .216 | .613 | -.549 | .328 |
| 4 | -.022 | .179 | .903 | -.384 | .340 |
| 6 | .245 | .191 | .206 | -.141 | .631 |
| 7 | .425 | .221 | .062 | -.023 | .872 |
| 8 | .062 | .254 | .809 | -.452 | .575 |
| 9 | -.111 | .273 | .687 | -.664 | .442 |
| 10 | .265 | .358 | .464 | -.460 | .990 |
| 11 | .363 | .404 | .375 | -.454 | 1.180 |
| 12 | -.027 | .389 | .945 | -.814 | .760 |
| 13 | .179 | .346 | .608 | -.521 | .879 |
| 14 | -.092 | .348 | .793 | -.796 | .612 |
| 15 | -.220 | .316 | .491 | -.860 | .420 |
| 6 | 1 | -.223 | .424 | .603 | -1.081 | .636 |
| 2 | -.313 | .319 | .332 | -.958 | .332 |
| 3 | -.356 | .335 | .296 | -1.035 | .323 |
| 4 | -.267 | .248 | .289 | -.770 | .236 |
| 5 | -.245 | .191 | .206 | -.631 | .141 |
| 7 | .180 | .135 | .192 | -.094 | .454 |
| 8 | -.183 | .153 | .239 | -.494 | .127 |
| 9 | -.356 | .182 | .057 | -.724 | .011 |
| 10 | .020 | .228 | .932 | -.441 | .481 |
| 11 | .117 | .290 | .688 | -.469 | .704 |
| 12 | -.272 | .278 | .333 | -.835 | .290 |
| 13 | -.066 | .252 | .794 | -.576 | .444 |
| 14 | -.337 | .255 | .194 | -.854 | .180 |
| 15 | -.465 | .239 | .059 | -.949 | .019 |
| 7 | 1 | -.402 | .475 | .402 | -1.363 | .559 |
| 2 | -.493 | .377 | .199 | -1.256 | .270 |
| 3 | -.535 | .386 | .174 | -1.316 | .246 |
| 4 | -.447 | .298 | .142 | -1.051 | .157 |
| 5 | -.425 | .221 | .062 | -.872 | .023 |
| 6 | -.180 | .135 | .192 | -.454 | .094 |
| 8 | -.363\* | .120 | .004 | -.605 | -.121 |
| 9 | -.536\* | .162 | .002 | -.864 | -.208 |
| 10 | -.160 | .205 | .439 | -.574 | .254 |
| 11 | -.062 | .245 | .801 | -.558 | .433 |
| 12 | -.452 | .224 | .051 | -.906 | .002 |
| 13 | -.246 | .204 | .237 | -.659 | .168 |
| 14 | -.517\* | .235 | .034 | -.992 | -.042 |
| 15 | -.645\* | .190 | .002 | -1.030 | -.259 |
| 8 | 1 | -.039 | .489 | .937 | -1.028 | .950 |
| 2 | -.130 | .392 | .742 | -.923 | .664 |
| 3 | -.172 | .404 | .672 | -.991 | .646 |
| 4 | -.084 | .314 | .791 | -.719 | .552 |
| 5 | -.062 | .254 | .809 | -.575 | .452 |
| 6 | .183 | .153 | .239 | -.127 | .494 |
| 7 | .363\* | .120 | .004 | .121 | .605 |
| 9 | -.173 | .141 | .229 | -.459 | .113 |
| 10 | .203 | .179 | .264 | -.159 | .566 |
| 11 | .301 | .236 | .210 | -.177 | .778 |
| 12 | -.089 | .206 | .669 | -.507 | .329 |
| 13 | .117 | .188 | .535 | -.262 | .497 |
| 14 | -.154 | .214 | .477 | -.588 | .280 |
| 15 | -.282 | .172 | .111 | -.630 | .067 |
| 9 | 1 | .133 | .524 | .800 | -.927 | 1.194 |
| 2 | .043 | .419 | .919 | -.806 | .891 |
| 3 | .000 | .441 | .999 | -.892 | .893 |
| 4 | .089 | .359 | .806 | -.638 | .815 |
| 5 | .111 | .273 | .687 | -.442 | .664 |
| 6 | .356 | .182 | .057 | -.011 | .724 |
| 7 | .536\* | .162 | .002 | .208 | .864 |
| 8 | .173 | .141 | .229 | -.113 | .459 |
| 10 | .376\* | .173 | .036 | .026 | .725 |
| 11 | .473\* | .213 | .032 | .043 | .904 |
| 12 | .084 | .189 | .660 | -.299 | .466 |
| 13 | .290 | .160 | .079 | -.035 | .615 |
| 14 | .019 | .185 | .920 | -.355 | .393 |
| 15 | -.109 | .181 | .550 | -.475 | .257 |
| 10 | 1 | -.242 | .607 | .692 | -1.470 | .986 |
| 2 | -.333 | .500 | .509 | -1.344 | .679 |
| 3 | -.375 | .517 | .473 | -1.423 | .672 |
| 4 | -.287 | .433 | .512 | -1.164 | .590 |
| 5 | -.265 | .358 | .464 | -.990 | .460 |
| 6 | -.020 | .228 | .932 | -.481 | .441 |
| 7 | .160 | .205 | .439 | -.254 | .574 |
| 8 | -.203 | .179 | .264 | -.566 | .159 |
| 9 | -.376\* | .173 | .036 | -.725 | -.026 |
| 11 | .098 | .131 | .460 | -.167 | .363 |
| 12 | -.292\* | .140 | .044 | -.575 | -.009 |
| 13 | -.086 | .130 | .514 | -.350 | .178 |
| 14 | -.357\* | .137 | .013 | -.635 | -.079 |
| 15 | -.485\* | .164 | .005 | -.817 | -.152 |
| 11 | 1 | -.340 | .655 | .607 | -1.666 | .986 |
| 2 | -.431 | .560 | .446 | -1.563 | .702 |
| 3 | -.473 | .571 | .413 | -1.630 | .683 |
| 4 | -.385 | .497 | .444 | -1.392 | .622 |
| 5 | -.363 | .404 | .375 | -1.180 | .454 |
| 6 | -.117 | .290 | .688 | -.704 | .469 |
| 7 | .062 | .245 | .801 | -.433 | .558 |
| 8 | -.301 | .236 | .210 | -.778 | .177 |
| 9 | -.473\* | .213 | .032 | -.904 | -.043 |
| 10 | -.098 | .131 | .460 | -.363 | .167 |
| 12 | -.390\* | .136 | .007 | -.665 | -.115 |
| 13 | -.183 | .145 | .213 | -.477 | .110 |
| 14 | -.455\* | .166 | .009 | -.790 | -.119 |
| 15 | -.582\* | .195 | .005 | -.976 | -.189 |
| 12 | 1 | .050 | .642 | .939 | -1.250 | 1.349 |
| 2 | -.041 | .543 | .940 | -1.140 | 1.059 |
| 3 | -.083 | .564 | .883 | -1.224 | 1.058 |
| 4 | .005 | .476 | .991 | -.959 | .969 |
| 5 | .027 | .389 | .945 | -.760 | .814 |
| 6 | .272 | .278 | .333 | -.290 | .835 |
| 7 | .452 | .224 | .051 | -.002 | .906 |
| 8 | .089 | .206 | .669 | -.329 | .507 |
| 9 | -.084 | .189 | .660 | -.466 | .299 |
| 10 | .292\* | .140 | .044 | .009 | .575 |
| 11 | .390\* | .136 | .007 | .115 | .665 |
| 13 | .206 | .123 | .102 | -.043 | .455 |
| 14 | -.065 | .159 | .685 | -.387 | .257 |
| 15 | -.193 | .165 | .249 | -.526 | .140 |
| 13 | 1 | -.156 | .599 | .795 | -1.370 | 1.057 |
| 2 | -.247 | .496 | .621 | -1.251 | .757 |
| 3 | -.290 | .515 | .577 | -1.333 | .754 |
| 4 | -.201 | .441 | .651 | -1.093 | .691 |
| 5 | -.179 | .346 | .608 | -.879 | .521 |
| 6 | .066 | .252 | .794 | -.444 | .576 |
| 7 | .246 | .204 | .237 | -.168 | .659 |
| 8 | -.117 | .188 | .535 | -.497 | .262 |
| 9 | -.290 | .160 | .079 | -.615 | .035 |
| 10 | .086 | .130 | .514 | -.178 | .350 |
| 11 | .183 | .145 | .213 | -.110 | .477 |
| 12 | -.206 | .123 | .102 | -.455 | .043 |
| 14 | -.271\* | .131 | .046 | -.537 | -.005 |
| 15 | -.399\* | .121 | .002 | -.644 | -.154 |
| 14 | 1 | .115 | .586 | .846 | -1.071 | 1.301 |
| 2 | .024 | .482 | .960 | -.952 | 1.000 |
| 3 | -.018 | .499 | .971 | -1.029 | .992 |
| 4 | .070 | .436 | .873 | -.812 | .952 |
| 5 | .092 | .348 | .793 | -.612 | .796 |
| 6 | .337 | .255 | .194 | -.180 | .854 |
| 7 | .517\* | .235 | .034 | .042 | .992 |
| 8 | .154 | .214 | .477 | -.280 | .588 |
| 9 | -.019 | .185 | .920 | -.393 | .355 |
| 10 | .357\* | .137 | .013 | .079 | .635 |
| 11 | .455\* | .166 | .009 | .119 | .790 |
| 12 | .065 | .159 | .685 | -.257 | .387 |
| 13 | .271\* | .131 | .046 | .005 | .537 |
| 15 | -.128 | .141 | .369 | -.412 | .157 |
| 15 | 1 | .242 | .557 | .666 | -.886 | 1.371 |
| 2 | .152 | .461 | .744 | -.782 | 1.086 |
| 3 | .109 | .470 | .817 | -.841 | 1.060 |
| 4 | .198 | .400 | .624 | -.613 | 1.008 |
| 5 | .220 | .316 | .491 | -.420 | .860 |
| 6 | .465 | .239 | .059 | -.019 | .949 |
| 7 | .645\* | .190 | .002 | .259 | 1.030 |
| 8 | .282 | .172 | .111 | -.067 | .630 |
| 9 | .109 | .181 | .550 | -.257 | .475 |
| 10 | .485\* | .164 | .005 | .152 | .817 |
| 11 | .582\* | .195 | .005 | .189 | .976 |
| 12 | .193 | .165 | .249 | -.140 | .526 |
| 13 | .399\* | .121 | .002 | .154 | .644 |
| 14 | .128 | .141 | .369 | -.157 | .412 |
| Complex | 1 | 2 | -.117 | .112 | .301 | -.343 | .109 |
| 3 | -.123 | .170 | .472 | -.468 | .221 |
| 4 | .022 | .154 | .890 | -.290 | .333 |
| 5 | -.051 | .262 | .848 | -.581 | .480 |
| 6 | -.086 | .230 | .710 | -.552 | .379 |
| 7 | -.315 | .327 | .341 | -.978 | .347 |
| 8 | -.134 | .349 | .704 | -.840 | .572 |
| 9 | -.320 | .356 | .374 | -1.040 | .400 |
| 10 | -.446 | .394 | .266 | -1.244 | .353 |
| 11 | -.723 | .409 | .085 | -1.550 | .105 |
| 12 | -.520 | .409 | .211 | -1.349 | .308 |
| 13 | -.819\* | .399 | .047 | -1.627 | -.010 |
| 14 | -.551 | .288 | .063 | -1.134 | .031 |
| 15 | -.576\* | .237 | .020 | -1.056 | -.097 |
| 2 | 1 | .117 | .112 | .301 | -.109 | .343 |
| 3 | -.006 | .172 | .971 | -.355 | .343 |
| 4 | .139 | .159 | .388 | -.183 | .460 |
| 5 | .067 | .254 | .795 | -.448 | .581 |
| 6 | .031 | .218 | .888 | -.410 | .472 |
| 7 | -.198 | .327 | .547 | -.859 | .463 |
| 8 | -.016 | .361 | .964 | -.748 | .715 |
| 9 | -.203 | .351 | .567 | -.913 | .508 |
| 10 | -.328 | .385 | .399 | -1.108 | .451 |
| 11 | -.606 | .401 | .139 | -1.417 | .205 |
| 12 | -.403 | .403 | .323 | -1.219 | .413 |
| 13 | -.702 | .400 | .088 | -1.512 | .109 |
| 14 | -.434 | .283 | .134 | -1.008 | .139 |
| 15 | -.459 | .253 | .077 | -.971 | .053 |
| 3 | 1 | .123 | .170 | .472 | -.221 | .468 |
| 2 | .006 | .172 | .971 | -.343 | .355 |
| 4 | .145 | .118 | .227 | -.094 | .384 |
| 5 | .073 | .233 | .756 | -.399 | .545 |
| 6 | .037 | .206 | .857 | -.379 | .453 |
| 7 | -.192 | .258 | .462 | -.715 | .331 |
| 8 | -.010 | .285 | .972 | -.587 | .567 |
| 9 | -.196 | .269 | .470 | -.741 | .348 |
| 10 | -.322 | .320 | .320 | -.969 | .325 |
| 11 | -.600 | .337 | .083 | -1.282 | .083 |
| 12 | -.397 | .343 | .255 | -1.092 | .298 |
| 13 | -.695\* | .331 | .042 | -1.366 | -.025 |
| 14 | -.428 | .261 | .109 | -.957 | .101 |
| 15 | -.453 | .244 | .072 | -.947 | .042 |
| 4 | 1 | -.022 | .154 | .890 | -.333 | .290 |
| 2 | -.139 | .159 | .388 | -.460 | .183 |
| 3 | -.145 | .118 | .227 | -.384 | .094 |
| 5 | -.072 | .170 | .675 | -.417 | .273 |
| 6 | -.108 | .133 | .422 | -.376 | .161 |
| 7 | -.337 | .200 | .101 | -.742 | .068 |
| 8 | -.155 | .230 | .504 | -.620 | .310 |
| 9 | -.341 | .230 | .146 | -.806 | .124 |
| 10 | -.467 | .272 | .094 | -1.017 | .083 |
| 11 | -.745\* | .290 | .014 | -1.331 | -.158 |
| 12 | -.542 | .306 | .084 | -1.161 | .077 |
| 13 | -.840\* | .306 | .009 | -1.460 | -.221 |
| 14 | -.573\* | .208 | .009 | -.995 | -.151 |
| 15 | -.598\* | .224 | .011 | -1.051 | -.145 |
| 5 | 1 | .051 | .262 | .848 | -.480 | .581 |
| 2 | -.067 | .254 | .795 | -.581 | .448 |
| 3 | -.073 | .233 | .756 | -.545 | .399 |
| 4 | .072 | .170 | .675 | -.273 | .417 |
| 6 | -.036 | .140 | .801 | -.320 | .249 |
| 7 | -.265 | .151 | .087 | -.570 | .040 |
| 8 | -.083 | .192 | .668 | -.472 | .306 |
| 9 | -.269 | .194 | .174 | -.663 | .125 |
| 10 | -.395 | .206 | .063 | -.813 | .023 |
| 11 | -.672\* | .221 | .004 | -1.119 | -.226 |
| 12 | -.470 | .235 | .052 | -.945 | .005 |
| 13 | -.768\* | .262 | .006 | -1.298 | -.238 |
| 14 | -.501\* | .207 | .020 | -.920 | -.082 |
| 15 | -.526 | .267 | .056 | -1.065 | .014 |
| 6 | 1 | .086 | .230 | .710 | -.379 | .552 |
| 2 | -.031 | .218 | .888 | -.472 | .410 |
| 3 | -.037 | .206 | .857 | -.453 | .379 |
| 4 | .108 | .133 | .422 | -.161 | .376 |
| 5 | .036 | .140 | .801 | -.249 | .320 |
| 7 | -.229 | .166 | .175 | -.565 | .107 |
| 8 | -.047 | .193 | .807 | -.438 | .343 |
| 9 | -.233 | .200 | .251 | -.638 | .172 |
| 10 | -.359 | .206 | .090 | -.777 | .058 |
| 11 | -.637\* | .236 | .010 | -1.115 | -.159 |
| 12 | -.434 | .252 | .093 | -.944 | .076 |
| 13 | -.732\* | .258 | .007 | -1.256 | -.209 |
| 14 | -.465\* | .155 | .005 | -.778 | -.152 |
| 15 | -.490\* | .232 | .041 | -.959 | -.021 |
| 7 | 1 | .315 | .327 | .341 | -.347 | .978 |
| 2 | .198 | .327 | .547 | -.463 | .859 |
| 3 | .192 | .258 | .462 | -.331 | .715 |
| 4 | .337 | .200 | .101 | -.068 | .742 |
| 5 | .265 | .151 | .087 | -.040 | .570 |
| 6 | .229 | .166 | .175 | -.107 | .565 |
| 8 | .182 | .103 | .086 | -.027 | .391 |
| 9 | -.004 | .110 | .969 | -.227 | .219 |
| 10 | -.130 | .124 | .301 | -.381 | .121 |
| 11 | -.408\* | .156 | .013 | -.722 | -.093 |
| 12 | -.205 | .187 | .279 | -.583 | .173 |
| 13 | -.503\* | .206 | .019 | -.919 | -.087 |
| 14 | -.236 | .193 | .228 | -.626 | .154 |
| 15 | -.261 | .291 | .376 | -.851 | .329 |
| 8 | 1 | .134 | .349 | .704 | -.572 | .840 |
| 2 | .016 | .361 | .964 | -.715 | .748 |
| 3 | .010 | .285 | .972 | -.567 | .587 |
| 4 | .155 | .230 | .504 | -.310 | .620 |
| 5 | .083 | .192 | .668 | -.306 | .472 |
| 6 | .047 | .193 | .807 | -.343 | .438 |
| 7 | -.182 | .103 | .086 | -.391 | .027 |
| 9 | -.186 | .138 | .187 | -.466 | .094 |
| 10 | -.312\* | .130 | .021 | -.575 | -.049 |
| 11 | -.589\* | .157 | .001 | -.907 | -.271 |
| 12 | -.387 | .203 | .064 | -.797 | .023 |
| 13 | -.685\* | .207 | .002 | -1.104 | -.266 |
| 14 | -.418 | .207 | .051 | -.837 | .001 |
| 15 | -.443 | .297 | .144 | -1.044 | .159 |
| 9 | 1 | .320 | .356 | .374 | -.400 | 1.040 |
| 2 | .203 | .351 | .567 | -.508 | .913 |
| 3 | .196 | .269 | .470 | -.348 | .741 |
| 4 | .341 | .230 | .146 | -.124 | .806 |
| 5 | .269 | .194 | .174 | -.125 | .663 |
| 6 | .233 | .200 | .251 | -.172 | .638 |
| 7 | .004 | .110 | .969 | -.219 | .227 |
| 8 | .186 | .138 | .187 | -.094 | .466 |
| 10 | -.126 | .111 | .265 | -.351 | .100 |
| 11 | -.403\* | .146 | .009 | -.699 | -.107 |
| 12 | -.201 | .149 | .186 | -.503 | .101 |
| 13 | -.499\* | .176 | .007 | -.855 | -.143 |
| 14 | -.232 | .184 | .215 | -.604 | .140 |
| 15 | -.257 | .287 | .377 | -.838 | .325 |
| 10 | 1 | .446 | .394 | .266 | -.353 | 1.244 |
| 2 | .328 | .385 | .399 | -.451 | 1.108 |
| 3 | .322 | .320 | .320 | -.325 | .969 |
| 4 | .467 | .272 | .094 | -.083 | 1.017 |
| 5 | .395 | .206 | .063 | -.023 | .813 |
| 6 | .359 | .206 | .090 | -.058 | .777 |
| 7 | .130 | .124 | .301 | -.121 | .381 |
| 8 | .312\* | .130 | .021 | .049 | .575 |
| 9 | .126 | .111 | .265 | -.100 | .351 |
| 11 | -.277\* | .101 | .009 | -.482 | -.073 |
| 12 | -.075 | .139 | .594 | -.357 | .207 |
| 13 | -.373\* | .158 | .024 | -.694 | -.052 |
| 14 | -.106 | .187 | .575 | -.485 | .273 |
| 15 | -.131 | .311 | .677 | -.761 | .500 |
| 11 | 1 | .723 | .409 | .085 | -.105 | 1.550 |
| 2 | .606 | .401 | .139 | -.205 | 1.417 |
| 3 | .600 | .337 | .083 | -.083 | 1.282 |
| 4 | .745\* | .290 | .014 | .158 | 1.331 |
| 5 | .672\* | .221 | .004 | .226 | 1.119 |
| 6 | .637\* | .236 | .010 | .159 | 1.115 |
| 7 | .408\* | .156 | .013 | .093 | .722 |
| 8 | .589\* | .157 | .001 | .271 | .907 |
| 9 | .403\* | .146 | .009 | .107 | .699 |
| 10 | .277\* | .101 | .009 | .073 | .482 |
| 12 | .202 | .115 | .087 | -.031 | .436 |
| 13 | -.096 | .139 | .496 | -.378 | .186 |
| 14 | .172 | .202 | .402 | -.238 | .581 |
| 15 | .147 | .308 | .636 | -.476 | .770 |
| 12 | 1 | .520 | .409 | .211 | -.308 | 1.349 |
| 2 | .403 | .403 | .323 | -.413 | 1.219 |
| 3 | .397 | .343 | .255 | -.298 | 1.092 |
| 4 | .542 | .306 | .084 | -.077 | 1.161 |
| 5 | .470 | .235 | .052 | -.005 | .945 |
| 6 | .434 | .252 | .093 | -.076 | .944 |
| 7 | .205 | .187 | .279 | -.173 | .583 |
| 8 | .387 | .203 | .064 | -.023 | .797 |
| 9 | .201 | .149 | .186 | -.101 | .503 |
| 10 | .075 | .139 | .594 | -.207 | .357 |
| 11 | -.202 | .115 | .087 | -.436 | .031 |
| 13 | -.298\* | .133 | .031 | -.567 | -.029 |
| 14 | -.031 | .199 | .877 | -.434 | .372 |
| 15 | -.056 | .296 | .852 | -.655 | .544 |
| 13 | 1 | .819\* | .399 | .047 | .010 | 1.627 |
| 2 | .702 | .400 | .088 | -.109 | 1.512 |
| 3 | .695\* | .331 | .042 | .025 | 1.366 |
| 4 | .840\* | .306 | .009 | .221 | 1.460 |
| 5 | .768\* | .262 | .006 | .238 | 1.298 |
| 6 | .732\* | .258 | .007 | .209 | 1.256 |
| 7 | .503\* | .206 | .019 | .087 | .919 |
| 8 | .685\* | .207 | .002 | .266 | 1.104 |
| 9 | .499\* | .176 | .007 | .143 | .855 |
| 10 | .373\* | .158 | .024 | .052 | .694 |
| 11 | .096 | .139 | .496 | -.186 | .378 |
| 12 | .298\* | .133 | .031 | .029 | .567 |
| 14 | .267 | .182 | .151 | -.102 | .636 |
| 15 | .242 | .270 | .375 | -.304 | .789 |
| 14 | 1 | .551 | .288 | .063 | -.031 | 1.134 |
| 2 | .434 | .283 | .134 | -.139 | 1.008 |
| 3 | .428 | .261 | .109 | -.101 | .957 |
| 4 | .573\* | .208 | .009 | .151 | .995 |
| 5 | .501\* | .207 | .020 | .082 | .920 |
| 6 | .465\* | .155 | .005 | .152 | .778 |
| 7 | .236 | .193 | .228 | -.154 | .626 |
| 8 | .418 | .207 | .051 | -.001 | .837 |
| 9 | .232 | .184 | .215 | -.140 | .604 |
| 10 | .106 | .187 | .575 | -.273 | .485 |
| 11 | -.172 | .202 | .402 | -.581 | .238 |
| 12 | .031 | .199 | .877 | -.372 | .434 |
| 13 | -.267 | .182 | .151 | -.636 | .102 |
| 15 | -.025 | .173 | .886 | -.374 | .325 |
| 15 | 1 | .576\* | .237 | .020 | .097 | 1.056 |
| 2 | .459 | .253 | .077 | -.053 | .971 |
| 3 | .453 | .244 | .072 | -.042 | .947 |
| 4 | .598\* | .224 | .011 | .145 | 1.051 |
| 5 | .526 | .267 | .056 | -.014 | 1.065 |
| 6 | .490\* | .232 | .041 | .021 | .959 |
| 7 | .261 | .291 | .376 | -.329 | .851 |
| 8 | .443 | .297 | .144 | -.159 | 1.044 |
| 9 | .257 | .287 | .377 | -.325 | .838 |
| 10 | .131 | .311 | .677 | -.500 | .761 |
| 11 | -.147 | .308 | .636 | -.770 | .476 |
| 12 | .056 | .296 | .852 | -.544 | .655 |
| 13 | -.242 | .270 | .375 | -.789 | .304 |
| 14 | .025 | .173 | .886 | -.325 | .374 |
| No Foreknowledge | Simple | 1 | 2 | .067 | .189 | .723 | -.315 | .450 |
| 3 | .511\* | .242 | .042 | .020 | 1.002 |
| 4 | .283 | .267 | .295 | -.257 | .823 |
| 5 | .336 | .326 | .309 | -.324 | .996 |
| 6 | .474 | .413 | .258 | -.363 | 1.311 |
| 7 | .393 | .485 | .423 | -.589 | 1.375 |
| 8 | .227 | .505 | .656 | -.795 | 1.249 |
| 9 | -.018 | .549 | .974 | -1.129 | 1.094 |
| 10 | .225 | .593 | .707 | -.976 | 1.426 |
| 11 | .453 | .558 | .422 | -.677 | 1.583 |
| 12 | -.018 | .603 | .977 | -1.238 | 1.202 |
| 13 | .142 | .508 | .782 | -.888 | 1.171 |
| 14 | .534 | .456 | .249 | -.389 | 1.457 |
| 15 | .471 | .411 | .258 | -.360 | 1.303 |
| 2 | 1 | -.067 | .189 | .723 | -.450 | .315 |
| 3 | .444\* | .146 | .004 | .148 | .739 |
| 4 | .216 | .199 | .286 | -.187 | .619 |
| 5 | .269 | .226 | .241 | -.188 | .726 |
| 6 | .407 | .313 | .202 | -.227 | 1.041 |
| 7 | .325 | .376 | .393 | -.436 | 1.087 |
| 8 | .159 | .398 | .691 | -.646 | .965 |
| 9 | -.085 | .433 | .845 | -.963 | .792 |
| 10 | .157 | .472 | .741 | -.797 | 1.112 |
| 11 | .386 | .448 | .395 | -.522 | 1.293 |
| 12 | -.085 | .480 | .860 | -1.058 | .887 |
| 13 | .074 | .401 | .855 | -.738 | .886 |
| 14 | .466 | .347 | .187 | -.236 | 1.169 |
| 15 | .404 | .299 | .185 | -.201 | 1.009 |
| 3 | 1 | -.511\* | .242 | .042 | -1.002 | -.020 |
| 2 | -.444\* | .146 | .004 | -.739 | -.148 |
| 4 | -.228 | .147 | .129 | -.526 | .070 |
| 5 | -.175 | .143 | .227 | -.464 | .114 |
| 6 | -.037 | .256 | .886 | -.555 | .481 |
| 7 | -.119 | .297 | .692 | -.719 | .482 |
| 8 | -.284 | .331 | .395 | -.954 | .385 |
| 9 | -.529 | .368 | .159 | -1.275 | .216 |
| 10 | -.287 | .416 | .495 | -1.129 | .555 |
| 11 | -.058 | .380 | .879 | -.827 | .711 |
| 12 | -.529 | .437 | .233 | -1.413 | .355 |
| 13 | -.370 | .351 | .299 | -1.081 | .341 |
| 14 | .023 | .305 | .942 | -.595 | .640 |
| 15 | -.040 | .288 | .890 | -.623 | .543 |
| 4 | 1 | -.283 | .267 | .295 | -.823 | .257 |
| 2 | -.216 | .199 | .286 | -.619 | .187 |
| 3 | .228 | .147 | .129 | -.070 | .526 |
| 5 | .053 | .142 | .711 | -.235 | .341 |
| 6 | .191 | .195 | .332 | -.203 | .585 |
| 7 | .110 | .272 | .689 | -.441 | .660 |
| 8 | -.056 | .300 | .852 | -.664 | .552 |
| 9 | -.301 | .343 | .386 | -.996 | .394 |
| 10 | -.059 | .380 | .878 | -.827 | .710 |
| 11 | .170 | .362 | .642 | -.564 | .904 |
| 12 | -.301 | .389 | .444 | -1.089 | .487 |
| 13 | -.142 | .317 | .657 | -.783 | .500 |
| 14 | .251 | .293 | .397 | -.342 | .843 |
| 15 | .188 | .279 | .505 | -.377 | .754 |
| 5 | 1 | -.336 | .326 | .309 | -.996 | .324 |
| 2 | -.269 | .226 | .241 | -.726 | .188 |
| 3 | .175 | .143 | .227 | -.114 | .464 |
| 4 | -.053 | .142 | .711 | -.341 | .235 |
| 6 | .138 | .162 | .400 | -.190 | .466 |
| 7 | .056 | .201 | .780 | -.350 | .463 |
| 8 | -.109 | .236 | .646 | -.587 | .368 |
| 9 | -.354 | .266 | .192 | -.893 | .185 |
| 10 | -.112 | .320 | .729 | -.759 | .536 |
| 11 | .117 | .275 | .673 | -.439 | .673 |
| 12 | -.354 | .334 | .296 | -1.030 | .322 |
| 13 | -.195 | .262 | .461 | -.725 | .335 |
| 14 | .198 | .230 | .396 | -.268 | .663 |
| 15 | .135 | .246 | .587 | -.363 | .633 |
| 6 | 1 | -.474 | .413 | .258 | -1.311 | .363 |
| 2 | -.407 | .313 | .202 | -1.041 | .227 |
| 3 | .037 | .256 | .886 | -.481 | .555 |
| 4 | -.191 | .195 | .332 | -.585 | .203 |
| 5 | -.138 | .162 | .400 | -.466 | .190 |
| 7 | -.082 | .143 | .572 | -.372 | .209 |
| 8 | -.247 | .202 | .228 | -.656 | .161 |
| 9 | -.492\* | .229 | .038 | -.957 | -.028 |
| 10 | -.250 | .227 | .279 | -.710 | .210 |
| 11 | -.021 | .222 | .924 | -.471 | .428 |
| 12 | -.492 | .255 | .061 | -1.007 | .023 |
| 13 | -.333 | .213 | .127 | -.765 | .099 |
| 14 | .059 | .207 | .776 | -.360 | .479 |
| 15 | -.003 | .255 | .990 | -.520 | .513 |
| 7 | 1 | -.393 | .485 | .423 | -1.375 | .589 |
| 2 | -.325 | .376 | .393 | -1.087 | .436 |
| 3 | .119 | .297 | .692 | -.482 | .719 |
| 4 | -.110 | .272 | .689 | -.660 | .441 |
| 5 | -.056 | .201 | .780 | -.463 | .350 |
| 6 | .082 | .143 | .572 | -.209 | .372 |
| 8 | -.166 | .147 | .267 | -.464 | .132 |
| 9 | -.411\* | .172 | .022 | -.759 | -.063 |
| 10 | -.168 | .199 | .402 | -.570 | .234 |
| 11 | .060 | .171 | .726 | -.286 | .407 |
| 12 | -.411 | .224 | .075 | -.864 | .043 |
| 13 | -.251 | .170 | .149 | -.596 | .094 |
| 14 | .141 | .193 | .468 | -.249 | .531 |
| 15 | .079 | .260 | .764 | -.448 | .605 |
| 8 | 1 | -.227 | .505 | .656 | -1.249 | .795 |
| 2 | -.159 | .398 | .691 | -.965 | .646 |
| 3 | .284 | .331 | .395 | -.385 | .954 |
| 4 | .056 | .300 | .852 | -.552 | .664 |
| 5 | .109 | .236 | .646 | -.368 | .587 |
| 6 | .247 | .202 | .228 | -.161 | .656 |
| 7 | .166 | .147 | .267 | -.132 | .464 |
| 9 | -.245\* | .113 | .036 | -.473 | -.017 |
| 10 | -.002 | .188 | .990 | -.382 | .378 |
| 11 | .226 | .180 | .218 | -.139 | .591 |
| 12 | -.245 | .211 | .254 | -.673 | .183 |
| 13 | -.085 | .184 | .645 | -.458 | .287 |
| 14 | .307 | .202 | .137 | -.103 | .716 |
| 15 | .244 | .255 | .344 | -.272 | .761 |
| 9 | 1 | .018 | .549 | .974 | -1.094 | 1.129 |
| 2 | .085 | .433 | .845 | -.792 | .963 |
| 3 | .529 | .368 | .159 | -.216 | 1.275 |
| 4 | .301 | .343 | .386 | -.394 | .996 |
| 5 | .354 | .266 | .192 | -.185 | .893 |
| 6 | .492\* | .229 | .038 | .028 | .957 |
| 7 | .411\* | .172 | .022 | .063 | .759 |
| 8 | .245\* | .113 | .036 | .017 | .473 |
| 10 | .242 | .139 | .090 | -.040 | .524 |
| 11 | .471\* | .145 | .002 | .178 | .764 |
| 12 | -6.276E-5 | .182 | 1.000 | -.369 | .369 |
| 13 | .159 | .178 | .377 | -.201 | .520 |
| 14 | .552\* | .205 | .010 | .137 | .966 |
| 15 | .489 | .271 | .079 | -.059 | 1.037 |
| 10 | 1 | -.225 | .593 | .707 | -1.426 | .976 |
| 2 | -.157 | .472 | .741 | -1.112 | .797 |
| 3 | .287 | .416 | .495 | -.555 | 1.129 |
| 4 | .059 | .380 | .878 | -.710 | .827 |
| 5 | .112 | .320 | .729 | -.536 | .759 |
| 6 | .250 | .227 | .279 | -.210 | .710 |
| 7 | .168 | .199 | .402 | -.234 | .570 |
| 8 | .002 | .188 | .990 | -.378 | .382 |
| 9 | -.242 | .139 | .090 | -.524 | .040 |
| 11 | .229 | .149 | .134 | -.073 | .531 |
| 12 | -.242 | .153 | .122 | -.553 | .068 |
| 13 | -.083 | .180 | .647 | -.448 | .282 |
| 14 | .309 | .220 | .168 | -.136 | .754 |
| 15 | .247 | .295 | .408 | -.350 | .843 |
| 11 | 1 | -.453 | .558 | .422 | -1.583 | .677 |
| 2 | -.386 | .448 | .395 | -1.293 | .522 |
| 3 | .058 | .380 | .879 | -.711 | .827 |
| 4 | -.170 | .362 | .642 | -.904 | .564 |
| 5 | -.117 | .275 | .673 | -.673 | .439 |
| 6 | .021 | .222 | .924 | -.428 | .471 |
| 7 | -.060 | .171 | .726 | -.407 | .286 |
| 8 | -.226 | .180 | .218 | -.591 | .139 |
| 9 | -.471\* | .145 | .002 | -.764 | -.178 |
| 10 | -.229 | .149 | .134 | -.531 | .073 |
| 12 | -.471\* | .181 | .013 | -.837 | -.105 |
| 13 | -.312 | .165 | .067 | -.647 | .023 |
| 14 | .081 | .173 | .645 | -.271 | .432 |
| 15 | .018 | .272 | .947 | -.532 | .568 |
| 12 | 1 | .018 | .603 | .977 | -1.202 | 1.238 |
| 2 | .085 | .480 | .860 | -.887 | 1.058 |
| 3 | .529 | .437 | .233 | -.355 | 1.413 |
| 4 | .301 | .389 | .444 | -.487 | 1.089 |
| 5 | .354 | .334 | .296 | -.322 | 1.030 |
| 6 | .492 | .255 | .061 | -.023 | 1.007 |
| 7 | .411 | .224 | .075 | -.043 | .864 |
| 8 | .245 | .211 | .254 | -.183 | .673 |
| 9 | 6.276E-5 | .182 | 1.000 | -.369 | .369 |
| 10 | .242 | .153 | .122 | -.068 | .553 |
| 11 | .471\* | .181 | .013 | .105 | .837 |
| 13 | .159 | .152 | .303 | -.149 | .468 |
| 14 | .552\* | .213 | .014 | .121 | .983 |
| 15 | .489 | .278 | .087 | -.074 | 1.052 |
| 13 | 1 | -.142 | .508 | .782 | -1.171 | .888 |
| 2 | -.074 | .401 | .855 | -.886 | .738 |
| 3 | .370 | .351 | .299 | -.341 | 1.081 |
| 4 | .142 | .317 | .657 | -.500 | .783 |
| 5 | .195 | .262 | .461 | -.335 | .725 |
| 6 | .333 | .213 | .127 | -.099 | .765 |
| 7 | .251 | .170 | .149 | -.094 | .596 |
| 8 | .085 | .184 | .645 | -.287 | .458 |
| 9 | -.159 | .178 | .377 | -.520 | .201 |
| 10 | .083 | .180 | .647 | -.282 | .448 |
| 11 | .312 | .165 | .067 | -.023 | .647 |
| 12 | -.159 | .152 | .303 | -.468 | .149 |
| 14 | .392\* | .134 | .006 | .122 | .663 |
| 15 | .330 | .213 | .130 | -.102 | .761 |
| 14 | 1 | -.534 | .456 | .249 | -1.457 | .389 |
| 2 | -.466 | .347 | .187 | -1.169 | .236 |
| 3 | -.023 | .305 | .942 | -.640 | .595 |
| 4 | -.251 | .293 | .397 | -.843 | .342 |
| 5 | -.198 | .230 | .396 | -.663 | .268 |
| 6 | -.059 | .207 | .776 | -.479 | .360 |
| 7 | -.141 | .193 | .468 | -.531 | .249 |
| 8 | -.307 | .202 | .137 | -.716 | .103 |
| 9 | -.552\* | .205 | .010 | -.966 | -.137 |
| 10 | -.309 | .220 | .168 | -.754 | .136 |
| 11 | -.081 | .173 | .645 | -.432 | .271 |
| 12 | -.552\* | .213 | .014 | -.983 | -.121 |
| 13 | -.392\* | .134 | .006 | -.663 | -.122 |
| 15 | -.063 | .128 | .628 | -.322 | .197 |
| 15 | 1 | -.471 | .411 | .258 | -1.303 | .360 |
| 2 | -.404 | .299 | .185 | -1.009 | .201 |
| 3 | .040 | .288 | .890 | -.543 | .623 |
| 4 | -.188 | .279 | .505 | -.754 | .377 |
| 5 | -.135 | .246 | .587 | -.633 | .363 |
| 6 | .003 | .255 | .990 | -.513 | .520 |
| 7 | -.079 | .260 | .764 | -.605 | .448 |
| 8 | -.244 | .255 | .344 | -.761 | .272 |
| 9 | -.489 | .271 | .079 | -1.037 | .059 |
| 10 | -.247 | .295 | .408 | -.843 | .350 |
| 11 | -.018 | .272 | .947 | -.568 | .532 |
| 12 | -.489 | .278 | .087 | -1.052 | .074 |
| 13 | -.330 | .213 | .130 | -.761 | .102 |
| 14 | .063 | .128 | .628 | -.197 | .322 |
| Complex | 1 | 2 | .013 | .146 | .931 | -.282 | .308 |
| 3 | .113 | .132 | .396 | -.153 | .379 |
| 4 | -.070 | .183 | .705 | -.441 | .302 |
| 5 | -.126 | .262 | .634 | -.656 | .405 |
| 6 | .143 | .268 | .598 | -.400 | .686 |
| 7 | -.112 | .312 | .721 | -.744 | .519 |
| 8 | -.151 | .367 | .683 | -.893 | .591 |
| 9 | -.123 | .424 | .773 | -.980 | .734 |
| 10 | -.291 | .389 | .460 | -1.079 | .497 |
| 11 | -.197 | .433 | .652 | -1.074 | .680 |
| 12 | .191 | .351 | .589 | -.519 | .902 |
| 13 | .259 | .337 | .448 | -.424 | .942 |
| 14 | -.048 | .311 | .879 | -.678 | .583 |
| 15 | .231 | .252 | .367 | -.280 | .742 |
| 2 | 1 | -.013 | .146 | .931 | -.308 | .282 |
| 3 | .100 | .130 | .444 | -.162 | .362 |
| 4 | -.083 | .177 | .642 | -.440 | .275 |
| 5 | -.138 | .232 | .555 | -.609 | .332 |
| 6 | .130 | .262 | .622 | -.400 | .659 |
| 7 | -.125 | .307 | .687 | -.748 | .497 |
| 8 | -.163 | .373 | .664 | -.918 | .591 |
| 9 | -.136 | .409 | .742 | -.963 | .692 |
| 10 | -.304 | .376 | .425 | -1.065 | .458 |
| 11 | -.210 | .436 | .634 | -1.093 | .674 |
| 12 | .179 | .344 | .607 | -.518 | .876 |
| 13 | .246 | .342 | .476 | -.446 | .939 |
| 14 | -.060 | .324 | .853 | -.717 | .596 |
| 15 | .218 | .267 | .420 | -.323 | .759 |
| 3 | 1 | -.113 | .132 | .396 | -.379 | .153 |
| 2 | -.100 | .130 | .444 | -.362 | .162 |
| 4 | -.183 | .147 | .222 | -.481 | .116 |
| 5 | -.238 | .241 | .328 | -.726 | .249 |
| 6 | .030 | .216 | .891 | -.407 | .466 |
| 7 | -.225 | .271 | .411 | -.773 | .323 |
| 8 | -.263 | .345 | .450 | -.962 | .435 |
| 9 | -.236 | .392 | .551 | -1.030 | .558 |
| 10 | -.404 | .359 | .267 | -1.130 | .322 |
| 11 | -.310 | .409 | .453 | -1.138 | .518 |
| 12 | .079 | .321 | .808 | -.571 | .728 |
| 13 | .146 | .312 | .643 | -.485 | .777 |
| 14 | -.161 | .304 | .601 | -.776 | .455 |
| 15 | .118 | .236 | .622 | -.361 | .596 |
| 4 | 1 | .070 | .183 | .705 | -.302 | .441 |
| 2 | .083 | .177 | .642 | -.275 | .440 |
| 3 | .183 | .147 | .222 | -.116 | .481 |
| 5 | -.056 | .170 | .746 | -.400 | .289 |
| 6 | .212 | .179 | .241 | -.149 | .574 |
| 7 | -.042 | .185 | .820 | -.417 | .332 |
| 8 | -.081 | .271 | .768 | -.630 | .469 |
| 9 | -.053 | .321 | .870 | -.703 | .597 |
| 10 | -.221 | .293 | .456 | -.814 | .373 |
| 11 | -.127 | .358 | .725 | -.853 | .598 |
| 12 | .261 | .261 | .322 | -.266 | .789 |
| 13 | .329 | .247 | .192 | -.172 | .829 |
| 14 | .022 | .257 | .931 | -.498 | .542 |
| 15 | .301 | .229 | .196 | -.162 | .763 |
| 5 | 1 | .126 | .262 | .634 | -.405 | .656 |
| 2 | .138 | .232 | .555 | -.332 | .609 |
| 3 | .238 | .241 | .328 | -.249 | .726 |
| 4 | .056 | .170 | .746 | -.289 | .400 |
| 6 | .268 | .184 | .153 | -.104 | .640 |
| 7 | .013 | .160 | .935 | -.311 | .338 |
| 8 | -.025 | .197 | .899 | -.424 | .373 |
| 9 | .002 | .225 | .991 | -.454 | .459 |
| 10 | -.165 | .217 | .452 | -.605 | .275 |
| 11 | -.071 | .276 | .797 | -.630 | .487 |
| 12 | .317 | .202 | .125 | -.092 | .726 |
| 13 | .384 | .219 | .087 | -.059 | .828 |
| 14 | .078 | .223 | .729 | -.374 | .529 |
| 15 | .356 | .222 | .118 | -.094 | .806 |
| 6 | 1 | -.143 | .268 | .598 | -.686 | .400 |
| 2 | -.130 | .262 | .622 | -.659 | .400 |
| 3 | -.030 | .216 | .891 | -.466 | .407 |
| 4 | -.212 | .179 | .241 | -.574 | .149 |
| 5 | -.268 | .184 | .153 | -.640 | .104 |
| 7 | -.255 | .126 | .051 | -.511 | .001 |
| 8 | -.293 | .197 | .145 | -.692 | .106 |
| 9 | -.266 | .219 | .232 | -.708 | .177 |
| 10 | -.433\* | .192 | .030 | -.822 | -.045 |
| 11 | -.340 | .260 | .199 | -.866 | .186 |
| 12 | .049 | .189 | .797 | -.333 | .431 |
| 13 | .116 | .190 | .545 | -.269 | .501 |
| 14 | -.190 | .217 | .386 | -.630 | .249 |
| 15 | .088 | .196 | .657 | -.310 | .486 |
| 7 | 1 | .112 | .312 | .721 | -.519 | .744 |
| 2 | .125 | .307 | .687 | -.497 | .748 |
| 3 | .225 | .271 | .411 | -.323 | .773 |
| 4 | .042 | .185 | .820 | -.332 | .417 |
| 5 | -.013 | .160 | .935 | -.338 | .311 |
| 6 | .255 | .126 | .051 | -.001 | .511 |
| 8 | -.038 | .157 | .808 | -.356 | .279 |
| 9 | -.011 | .178 | .952 | -.371 | .350 |
| 10 | -.178 | .154 | .252 | -.489 | .132 |
| 11 | -.085 | .236 | .721 | -.562 | .392 |
| 12 | .304 | .176 | .092 | -.052 | .659 |
| 13 | .371\* | .168 | .034 | .030 | .712 |
| 14 | .065 | .207 | .756 | -.353 | .483 |
| 15 | .343 | .215 | .118 | -.091 | .777 |
| 8 | 1 | .151 | .367 | .683 | -.591 | .893 |
| 2 | .163 | .373 | .664 | -.591 | .918 |
| 3 | .263 | .345 | .450 | -.435 | .962 |
| 4 | .081 | .271 | .768 | -.469 | .630 |
| 5 | .025 | .197 | .899 | -.373 | .424 |
| 6 | .293 | .197 | .145 | -.106 | .692 |
| 7 | .038 | .157 | .808 | -.279 | .356 |
| 9 | .028 | .157 | .862 | -.290 | .346 |
| 10 | -.140 | .175 | .427 | -.494 | .213 |
| 11 | -.046 | .147 | .753 | -.343 | .250 |
| 12 | .342\* | .134 | .015 | .071 | .614 |
| 13 | .409\* | .172 | .022 | .062 | .757 |
| 14 | .103 | .233 | .661 | -.369 | .575 |
| 15 | .381 | .241 | .122 | -.107 | .869 |
| 9 | 1 | .123 | .424 | .773 | -.734 | .980 |
| 2 | .136 | .409 | .742 | -.692 | .963 |
| 3 | .236 | .392 | .551 | -.558 | 1.030 |
| 4 | .053 | .321 | .870 | -.597 | .703 |
| 5 | -.002 | .225 | .991 | -.459 | .454 |
| 6 | .266 | .219 | .232 | -.177 | .708 |
| 7 | .011 | .178 | .952 | -.350 | .371 |
| 8 | -.028 | .157 | .862 | -.346 | .290 |
| 10 | -.168 | .130 | .203 | -.430 | .095 |
| 11 | -.074 | .181 | .686 | -.441 | .293 |
| 12 | .315 | .173 | .077 | -.036 | .665 |
| 13 | .382 | .190 | .052 | -.004 | .767 |
| 14 | .075 | .239 | .754 | -.409 | .560 |
| 15 | .354 | .282 | .217 | -.217 | .924 |
| 10 | 1 | .291 | .389 | .460 | -.497 | 1.079 |
| 2 | .304 | .376 | .425 | -.458 | 1.065 |
| 3 | .404 | .359 | .267 | -.322 | 1.130 |
| 4 | .221 | .293 | .456 | -.373 | .814 |
| 5 | .165 | .217 | .452 | -.275 | .605 |
| 6 | .433\* | .192 | .030 | .045 | .822 |
| 7 | .178 | .154 | .252 | -.132 | .489 |
| 8 | .140 | .175 | .427 | -.213 | .494 |
| 9 | .168 | .130 | .203 | -.095 | .430 |
| 11 | .094 | .184 | .614 | -.280 | .467 |
| 12 | .482\* | .175 | .009 | .128 | .836 |
| 13 | .550\* | .169 | .002 | .208 | .891 |
| 14 | .243 | .201 | .234 | -.163 | .650 |
| 15 | .521\* | .242 | .037 | .032 | 1.011 |
| 11 | 1 | .197 | .433 | .652 | -.680 | 1.074 |
| 2 | .210 | .436 | .634 | -.674 | 1.093 |
| 3 | .310 | .409 | .453 | -.518 | 1.138 |
| 4 | .127 | .358 | .725 | -.598 | .853 |
| 5 | .071 | .276 | .797 | -.487 | .630 |
| 6 | .340 | .260 | .199 | -.186 | .866 |
| 7 | .085 | .236 | .721 | -.392 | .562 |
| 8 | .046 | .147 | .753 | -.250 | .343 |
| 9 | .074 | .181 | .686 | -.293 | .441 |
| 10 | -.094 | .184 | .614 | -.467 | .280 |
| 12 | .388\* | .158 | .019 | .068 | .709 |
| 13 | .456\* | .198 | .027 | .056 | .856 |
| 14 | .149 | .220 | .502 | -.297 | .596 |
| 15 | .428 | .257 | .105 | -.094 | .949 |
| 12 | 1 | -.191 | .351 | .589 | -.902 | .519 |
| 2 | -.179 | .344 | .607 | -.876 | .518 |
| 3 | -.079 | .321 | .808 | -.728 | .571 |
| 4 | -.261 | .261 | .322 | -.789 | .266 |
| 5 | -.317 | .202 | .125 | -.726 | .092 |
| 6 | -.049 | .189 | .797 | -.431 | .333 |
| 7 | -.304 | .176 | .092 | -.659 | .052 |
| 8 | -.342\* | .134 | .015 | -.614 | -.071 |
| 9 | -.315 | .173 | .077 | -.665 | .036 |
| 10 | -.482\* | .175 | .009 | -.836 | -.128 |
| 11 | -.388\* | .158 | .019 | -.709 | -.068 |
| 13 | .067 | .115 | .563 | -.166 | .301 |
| 14 | -.239 | .158 | .139 | -.560 | .081 |
| 15 | .039 | .170 | .819 | -.305 | .383 |
| 13 | 1 | -.259 | .337 | .448 | -.942 | .424 |
| 2 | -.246 | .342 | .476 | -.939 | .446 |
| 3 | -.146 | .312 | .643 | -.777 | .485 |
| 4 | -.329 | .247 | .192 | -.829 | .172 |
| 5 | -.384 | .219 | .087 | -.828 | .059 |
| 6 | -.116 | .190 | .545 | -.501 | .269 |
| 7 | -.371\* | .168 | .034 | -.712 | -.030 |
| 8 | -.409\* | .172 | .022 | -.757 | -.062 |
| 9 | -.382 | .190 | .052 | -.767 | .004 |
| 10 | -.550\* | .169 | .002 | -.891 | -.208 |
| 11 | -.456\* | .198 | .027 | -.856 | -.056 |
| 12 | -.067 | .115 | .563 | -.301 | .166 |
| 14 | -.306\* | .150 | .048 | -.610 | -.002 |
| 15 | -.028 | .168 | .868 | -.369 | .313 |
| 14 | 1 | .048 | .311 | .879 | -.583 | .678 |
| 2 | .060 | .324 | .853 | -.596 | .717 |
| 3 | .161 | .304 | .601 | -.455 | .776 |
| 4 | -.022 | .257 | .931 | -.542 | .498 |
| 5 | -.078 | .223 | .729 | -.529 | .374 |
| 6 | .190 | .217 | .386 | -.249 | .630 |
| 7 | -.065 | .207 | .756 | -.483 | .353 |
| 8 | -.103 | .233 | .661 | -.575 | .369 |
| 9 | -.075 | .239 | .754 | -.560 | .409 |
| 10 | -.243 | .201 | .234 | -.650 | .163 |
| 11 | -.149 | .220 | .502 | -.596 | .297 |
| 12 | .239 | .158 | .139 | -.081 | .560 |
| 13 | .306\* | .150 | .048 | .002 | .610 |
| 15 | .278\* | .137 | .050 | .000 | .556 |
| 15 | 1 | -.231 | .252 | .367 | -.742 | .280 |
| 2 | -.218 | .267 | .420 | -.759 | .323 |
| 3 | -.118 | .236 | .622 | -.596 | .361 |
| 4 | -.301 | .229 | .196 | -.763 | .162 |
| 5 | -.356 | .222 | .118 | -.806 | .094 |
| 6 | -.088 | .196 | .657 | -.486 | .310 |
| 7 | -.343 | .215 | .118 | -.777 | .091 |
| 8 | -.381 | .241 | .122 | -.869 | .107 |
| 9 | -.354 | .282 | .217 | -.924 | .217 |
| 10 | -.521\* | .242 | .037 | -1.011 | -.032 |
| 11 | -.428 | .257 | .105 | -.949 | .094 |
| 12 | -.039 | .170 | .819 | -.383 | .305 |
| 13 | .028 | .168 | .868 | -.313 | .369 |
| 14 | -.278\* | .137 | .050 | -.556 | .000 |
| Based on estimated marginal means | | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | | |

**Appendix 8 – Means tables for 2(working memory group) × 2(Foreknowledge) × 2(distracter type) × 15(time, seconds) mixed ANOVA - Heart Rate**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Main effect of Foreknowledge** | | | | |
| Measure: MEASURE\_1 | | | | |
| Foreknowledge | Mean | Std. Error | 95% Confidence Interval | |
| Lower Bound | Upper Bound |
| No Foreknowledge | 88.882 | 1.867 | 85.102 | 92.662 |
| Foreknowledge | 87.540 | 1.915 | 83.664 | 91.417 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Pairwise Comparisons - Foreknowledge** | | | | | | |
| Measure: MEASURE\_1 | | | | | | |
| (I) Foreknowledge | (J) Foreknowledge | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| No Foreknowledge | Foreknowledge | 1.342\* | .555 | .021 | .217 | 2.466 |
| Foreknowledge | No Foreknowledge | -1.342\* | .555 | .021 | -2.466 | -.217 |
| Based on estimated marginal means | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Main effect of Time** | | | | |
| Measure: MEASURE\_1 | | | | |
| Time | Mean | Std. Error | 95% Confidence Interval | |
| Lower Bound | Upper Bound |
| 1 | 88.857 | 1.898 | 85.015 | 92.699 |
| 2 | 87.454 | 1.744 | 83.923 | 90.986 |
| 3 | 87.083 | 1.872 | 83.294 | 90.872 |
| 4 | 87.689 | 1.962 | 83.719 | 91.660 |
| 5 | 88.819 | 1.980 | 84.812 | 92.827 |
| 6 | 89.063 | 2.021 | 84.972 | 93.153 |
| 7 | 89.392 | 2.005 | 85.333 | 93.451 |
| 8 | 88.530 | 2.012 | 84.457 | 92.603 |
| 9 | 87.905 | 1.963 | 83.931 | 91.879 |
| 10 | 87.558 | 1.950 | 83.610 | 91.505 |
| 11 | 87.601 | 1.903 | 83.748 | 91.454 |
| 12 | 88.299 | 1.835 | 84.584 | 92.015 |
| 13 | 87.821 | 1.925 | 83.924 | 91.717 |
| 14 | 88.597 | 1.964 | 84.622 | 92.573 |
| 15 | 88.499 | 1.854 | 84.745 | 92.253 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Pairwise Comparisons - Time** | | | | | | |
| Measure: MEASURE\_1 | | | | | | |
| (I) Time | (J) Time | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| 1 | 2 | 1.403\* | .391 | .001 | .612 | 2.193 |
| 3 | 1.774\* | .483 | .001 | .797 | 2.752 |
| 4 | 1.168 | .618 | .067 | -.084 | 2.419 |
| 5 | .038 | .702 | .957 | -1.383 | 1.459 |
| 6 | -.205 | .752 | .786 | -1.728 | 1.317 |
| 7 | -.535 | .796 | .506 | -2.147 | 1.077 |
| 8 | .327 | .609 | .595 | -.906 | 1.560 |
| 9 | .952 | .643 | .147 | -.350 | 2.254 |
| 10 | 1.299 | .762 | .096 | -.244 | 2.842 |
| 11 | 1.256 | .707 | .084 | -.175 | 2.687 |
| 12 | .558 | .783 | .481 | -1.027 | 2.142 |
| 13 | 1.036 | .745 | .172 | -.472 | 2.544 |
| 14 | .260 | .839 | .758 | -1.438 | 1.957 |
| 15 | .358 | .899 | .693 | -1.463 | 2.179 |
| 2 | 1 | -1.403\* | .391 | .001 | -2.193 | -.612 |
| 3 | .372 | .432 | .395 | -.502 | 1.246 |
| 4 | -.235 | .604 | .699 | -1.457 | .987 |
| 5 | -1.365 | .717 | .065 | -2.817 | .087 |
| 6 | -1.608\* | .744 | .037 | -3.113 | -.103 |
| 7 | -1.938\* | .842 | .027 | -3.642 | -.233 |
| 8 | -1.076 | .654 | .108 | -2.400 | .248 |
| 9 | -.450 | .664 | .501 | -1.794 | .893 |
| 10 | -.103 | .784 | .896 | -1.690 | 1.483 |
| 11 | -.147 | .722 | .840 | -1.608 | 1.314 |
| 12 | -.845 | .715 | .245 | -2.293 | .603 |
| 13 | -.366 | .773 | .638 | -1.931 | 1.198 |
| 14 | -1.143 | .851 | .187 | -2.865 | .579 |
| 15 | -1.045 | .859 | .232 | -2.784 | .695 |
| 3 | 1 | -1.774\* | .483 | .001 | -2.752 | -.797 |
| 2 | -.372 | .432 | .395 | -1.246 | .502 |
| 4 | -.607 | .589 | .309 | -1.799 | .585 |
| 5 | -1.736\* | .603 | .006 | -2.956 | -.517 |
| 6 | -1.980\* | .653 | .004 | -3.303 | -.657 |
| 7 | -2.309\* | .840 | .009 | -4.009 | -.609 |
| 8 | -1.448\* | .612 | .023 | -2.686 | -.209 |
| 9 | -.822 | .627 | .198 | -2.092 | .447 |
| 10 | -.475 | .796 | .554 | -2.087 | 1.136 |
| 11 | -.518 | .685 | .454 | -1.905 | .868 |
| 12 | -1.217 | .749 | .113 | -2.734 | .300 |
| 13 | -.738 | .710 | .305 | -2.175 | .699 |
| 14 | -1.515 | .827 | .075 | -3.189 | .159 |
| 15 | -1.416 | .830 | .096 | -3.096 | .263 |
| 4 | 1 | -1.168 | .618 | .067 | -2.419 | .084 |
| 2 | .235 | .604 | .699 | -.987 | 1.457 |
| 3 | .607 | .589 | .309 | -.585 | 1.799 |
| 5 | -1.130 | .625 | .079 | -2.395 | .135 |
| 6 | -1.373\* | .658 | .044 | -2.705 | -.041 |
| 7 | -1.703 | .866 | .057 | -3.457 | .052 |
| 8 | -.841 | .723 | .252 | -2.304 | .622 |
| 9 | -.216 | .693 | .758 | -1.619 | 1.188 |
| 10 | .132 | .782 | .867 | -1.452 | 1.715 |
| 11 | .088 | .732 | .905 | -1.393 | 1.570 |
| 12 | -.610 | .797 | .449 | -2.223 | 1.003 |
| 13 | -.131 | .767 | .865 | -1.685 | 1.422 |
| 14 | -.908 | .904 | .322 | -2.738 | .922 |
| 15 | -.810 | 1.065 | .452 | -2.965 | 1.346 |
| 5 | 1 | -.038 | .702 | .957 | -1.459 | 1.383 |
| 2 | 1.365 | .717 | .065 | -.087 | 2.817 |
| 3 | 1.736\* | .603 | .006 | .517 | 2.956 |
| 4 | 1.130 | .625 | .079 | -.135 | 2.395 |
| 6 | -.243 | .450 | .592 | -1.155 | .668 |
| 7 | -.573 | .638 | .375 | -1.864 | .719 |
| 8 | .289 | .543 | .598 | -.810 | 1.388 |
| 9 | .914 | .573 | .119 | -.245 | 2.074 |
| 10 | 1.261 | .686 | .074 | -.128 | 2.651 |
| 11 | 1.218 | .682 | .082 | -.163 | 2.599 |
| 12 | .520 | .687 | .454 | -.871 | 1.911 |
| 13 | .998 | .677 | .148 | -.372 | 2.369 |
| 14 | .222 | .836 | .792 | -1.471 | 1.915 |
| 15 | .320 | .872 | .716 | -1.446 | 2.086 |
| 6 | 1 | .205 | .752 | .786 | -1.317 | 1.728 |
| 2 | 1.608\* | .744 | .037 | .103 | 3.113 |
| 3 | 1.980\* | .653 | .004 | .657 | 3.303 |
| 4 | 1.373\* | .658 | .044 | .041 | 2.705 |
| 5 | .243 | .450 | .592 | -.668 | 1.155 |
| 7 | -.329 | .489 | .505 | -1.319 | .660 |
| 8 | .532 | .520 | .313 | -.521 | 1.586 |
| 9 | 1.158 | .577 | .052 | -.011 | 2.326 |
| 10 | 1.505\* | .620 | .020 | .250 | 2.759 |
| 11 | 1.461\* | .656 | .032 | .133 | 2.790 |
| 12 | .763 | .602 | .213 | -.455 | 1.981 |
| 13 | 1.242 | .625 | .054 | -.024 | 2.507 |
| 14 | .465 | .677 | .496 | -.906 | 1.837 |
| 15 | .564 | .821 | .497 | -1.099 | 2.226 |
| 7 | 1 | .535 | .796 | .506 | -1.077 | 2.147 |
| 2 | 1.938\* | .842 | .027 | .233 | 3.642 |
| 3 | 2.309\* | .840 | .009 | .609 | 4.009 |
| 4 | 1.703 | .866 | .057 | -.052 | 3.457 |
| 5 | .573 | .638 | .375 | -.719 | 1.864 |
| 6 | .329 | .489 | .505 | -.660 | 1.319 |
| 8 | .862 | .430 | .052 | -.009 | 1.732 |
| 9 | 1.487\* | .630 | .023 | .212 | 2.762 |
| 10 | 1.834\* | .586 | .003 | .648 | 3.020 |
| 11 | 1.791\* | .739 | .020 | .294 | 3.288 |
| 12 | 1.092 | .732 | .144 | -.389 | 2.574 |
| 13 | 1.571\* | .700 | .031 | .154 | 2.988 |
| 14 | .795 | .715 | .273 | -.652 | 2.242 |
| 15 | .893 | .867 | .309 | -.861 | 2.647 |
| 8 | 1 | -.327 | .609 | .595 | -1.560 | .906 |
| 2 | 1.076 | .654 | .108 | -.248 | 2.400 |
| 3 | 1.448\* | .612 | .023 | .209 | 2.686 |
| 4 | .841 | .723 | .252 | -.622 | 2.304 |
| 5 | -.289 | .543 | .598 | -1.388 | .810 |
| 6 | -.532 | .520 | .313 | -1.586 | .521 |
| 7 | -.862 | .430 | .052 | -1.732 | .009 |
| 9 | .625 | .372 | .101 | -.127 | 1.378 |
| 10 | .973 | .566 | .094 | -.173 | 2.118 |
| 11 | .929 | .600 | .130 | -.286 | 2.144 |
| 12 | .231 | .676 | .735 | -1.138 | 1.599 |
| 13 | .710 | .631 | .268 | -.567 | 1.987 |
| 14 | -.067 | .736 | .928 | -1.558 | 1.424 |
| 15 | .031 | .796 | .969 | -1.579 | 1.642 |
| 9 | 1 | -.952 | .643 | .147 | -2.254 | .350 |
| 2 | .450 | .664 | .501 | -.893 | 1.794 |
| 3 | .822 | .627 | .198 | -.447 | 2.092 |
| 4 | .216 | .693 | .758 | -1.188 | 1.619 |
| 5 | -.914 | .573 | .119 | -2.074 | .245 |
| 6 | -1.158 | .577 | .052 | -2.326 | .011 |
| 7 | -1.487\* | .630 | .023 | -2.762 | -.212 |
| 8 | -.625 | .372 | .101 | -1.378 | .127 |
| 10 | .347 | .397 | .388 | -.457 | 1.152 |
| 11 | .304 | .398 | .450 | -.502 | 1.110 |
| 12 | -.395 | .546 | .474 | -1.500 | .711 |
| 13 | .084 | .516 | .871 | -.961 | 1.129 |
| 14 | -.692 | .692 | .324 | -2.094 | .709 |
| 15 | -.594 | .690 | .395 | -1.991 | .803 |
| 10 | 1 | -1.299 | .762 | .096 | -2.842 | .244 |
| 2 | .103 | .784 | .896 | -1.483 | 1.690 |
| 3 | .475 | .796 | .554 | -1.136 | 2.087 |
| 4 | -.132 | .782 | .867 | -1.715 | 1.452 |
| 5 | -1.261 | .686 | .074 | -2.651 | .128 |
| 6 | -1.505\* | .620 | .020 | -2.759 | -.250 |
| 7 | -1.834\* | .586 | .003 | -3.020 | -.648 |
| 8 | -.973 | .566 | .094 | -2.118 | .173 |
| 9 | -.347 | .397 | .388 | -1.152 | .457 |
| 11 | -.043 | .466 | .926 | -.986 | .899 |
| 12 | -.742 | .603 | .226 | -1.962 | .479 |
| 13 | -.263 | .512 | .610 | -1.298 | .773 |
| 14 | -1.039 | .687 | .138 | -2.429 | .350 |
| 15 | -.941 | .756 | .221 | -2.471 | .588 |
| 11 | 1 | -1.256 | .707 | .084 | -2.687 | .175 |
| 2 | .147 | .722 | .840 | -1.314 | 1.608 |
| 3 | .518 | .685 | .454 | -.868 | 1.905 |
| 4 | -.088 | .732 | .905 | -1.570 | 1.393 |
| 5 | -1.218 | .682 | .082 | -2.599 | .163 |
| 6 | -1.461\* | .656 | .032 | -2.790 | -.133 |
| 7 | -1.791\* | .739 | .020 | -3.288 | -.294 |
| 8 | -.929 | .600 | .130 | -2.144 | .286 |
| 9 | -.304 | .398 | .450 | -1.110 | .502 |
| 10 | .043 | .466 | .926 | -.899 | .986 |
| 12 | -.698 | .361 | .061 | -1.429 | .033 |
| 13 | -.220 | .365 | .551 | -.958 | .519 |
| 14 | -.996 | .597 | .104 | -2.206 | .213 |
| 15 | -.898 | .704 | .210 | -2.323 | .527 |
| 12 | 1 | -.558 | .783 | .481 | -2.142 | 1.027 |
| 2 | .845 | .715 | .245 | -.603 | 2.293 |
| 3 | 1.217 | .749 | .113 | -.300 | 2.734 |
| 4 | .610 | .797 | .449 | -1.003 | 2.223 |
| 5 | -.520 | .687 | .454 | -1.911 | .871 |
| 6 | -.763 | .602 | .213 | -1.981 | .455 |
| 7 | -1.092 | .732 | .144 | -2.574 | .389 |
| 8 | -.231 | .676 | .735 | -1.599 | 1.138 |
| 9 | .395 | .546 | .474 | -.711 | 1.500 |
| 10 | .742 | .603 | .226 | -.479 | 1.962 |
| 11 | .698 | .361 | .061 | -.033 | 1.429 |
| 13 | .479 | .401 | .240 | -.332 | 1.290 |
| 14 | -.298 | .548 | .590 | -1.406 | .811 |
| 15 | -.200 | .678 | .770 | -1.571 | 1.172 |
| 13 | 1 | -1.036 | .745 | .172 | -2.544 | .472 |
| 2 | .366 | .773 | .638 | -1.198 | 1.931 |
| 3 | .738 | .710 | .305 | -.699 | 2.175 |
| 4 | .131 | .767 | .865 | -1.422 | 1.685 |
| 5 | -.998 | .677 | .148 | -2.369 | .372 |
| 6 | -1.242 | .625 | .054 | -2.507 | .024 |
| 7 | -1.571\* | .700 | .031 | -2.988 | -.154 |
| 8 | -.710 | .631 | .268 | -1.987 | .567 |
| 9 | -.084 | .516 | .871 | -1.129 | .961 |
| 10 | .263 | .512 | .610 | -.773 | 1.298 |
| 11 | .220 | .365 | .551 | -.519 | .958 |
| 12 | -.479 | .401 | .240 | -1.290 | .332 |
| 14 | -.777 | .457 | .098 | -1.702 | .149 |
| 15 | -.678 | .644 | .299 | -1.982 | .626 |
| 14 | 1 | -.260 | .839 | .758 | -1.957 | 1.438 |
| 2 | 1.143 | .851 | .187 | -.579 | 2.865 |
| 3 | 1.515 | .827 | .075 | -.159 | 3.189 |
| 4 | .908 | .904 | .322 | -.922 | 2.738 |
| 5 | -.222 | .836 | .792 | -1.915 | 1.471 |
| 6 | -.465 | .677 | .496 | -1.837 | .906 |
| 7 | -.795 | .715 | .273 | -2.242 | .652 |
| 8 | .067 | .736 | .928 | -1.424 | 1.558 |
| 9 | .692 | .692 | .324 | -.709 | 2.094 |
| 10 | 1.039 | .687 | .138 | -.350 | 2.429 |
| 11 | .996 | .597 | .104 | -.213 | 2.206 |
| 12 | .298 | .548 | .590 | -.811 | 1.406 |
| 13 | .777 | .457 | .098 | -.149 | 1.702 |
| 15 | .098 | .529 | .854 | -.973 | 1.170 |
| 15 | 1 | -.358 | .899 | .693 | -2.179 | 1.463 |
| 2 | 1.045 | .859 | .232 | -.695 | 2.784 |
| 3 | 1.416 | .830 | .096 | -.263 | 3.096 |
| 4 | .810 | 1.065 | .452 | -1.346 | 2.965 |
| 5 | -.320 | .872 | .716 | -2.086 | 1.446 |
| 6 | -.564 | .821 | .497 | -2.226 | 1.099 |
| 7 | -.893 | .867 | .309 | -2.647 | .861 |
| 8 | -.031 | .796 | .969 | -1.642 | 1.579 |
| 9 | .594 | .690 | .395 | -.803 | 1.991 |
| 10 | .941 | .756 | .221 | -.588 | 2.471 |
| 11 | .898 | .704 | .210 | -.527 | 2.323 |
| 12 | .200 | .678 | .770 | -1.172 | 1.571 |
| 13 | .678 | .644 | .299 | -.626 | 1.982 |
| 14 | -.098 | .529 | .854 | -1.170 | .973 |
| Based on estimated marginal means | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | |

**Appendix 9 – Means tables for 2(working memory group) × 2(Foreknowledge) × 2(Foreknowledge) × 3(distracter type) mixed ANOVA - Phasic Pupil response**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Within-Subjects Effects** | | | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | | | |
| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Powera |
| Foreknowledge | Sphericity Assumed | .011 | 1 | .011 | .699 | .410 | .024 | .699 | .127 |
| Greenhouse-Geisser | .011 | 1.000 | .011 | .699 | .410 | .024 | .699 | .127 |
| Huynh-Feldt | .011 | 1.000 | .011 | .699 | .410 | .024 | .699 | .127 |
| Lower-bound | .011 | 1.000 | .011 | .699 | .410 | .024 | .699 | .127 |
| Foreknowledge \* WMCGROUP | Sphericity Assumed | .052 | 1 | .052 | 3.354 | .078 | .107 | 3.354 | .424 |
| Greenhouse-Geisser | .052 | 1.000 | .052 | 3.354 | .078 | .107 | 3.354 | .424 |
| Huynh-Feldt | .052 | 1.000 | .052 | 3.354 | .078 | .107 | 3.354 | .424 |
| Lower-bound | .052 | 1.000 | .052 | 3.354 | .078 | .107 | 3.354 | .424 |
| Error(Foreknowledge) | Sphericity Assumed | .430 | 28 | .015 |  |  |  |  |  |
| Greenhouse-Geisser | .430 | 28.000 | .015 |  |  |  |  |  |
| Huynh-Feldt | .430 | 28.000 | .015 |  |  |  |  |  |
| Lower-bound | .430 | 28.000 | .015 |  |  |  |  |  |
| DistracterType | Sphericity Assumed | .158 | 2 | .079 | 8.197 | .001 | .226 | 16.393 | .951 |
| Greenhouse-Geisser | .158 | 1.822 | .087 | 8.197 | .001 | .226 | 14.930 | .936 |
| Huynh-Feldt | .158 | 2.000 | .079 | 8.197 | .001 | .226 | 16.393 | .951 |
| Lower-bound | .158 | 1.000 | .158 | 8.197 | .008 | .226 | 8.197 | .789 |
| DistracterType \* WMCGROUP | Sphericity Assumed | .010 | 2 | .005 | .518 | .598 | .018 | 1.036 | .131 |
| Greenhouse-Geisser | .010 | 1.822 | .005 | .518 | .582 | .018 | .944 | .127 |
| Huynh-Feldt | .010 | 2.000 | .005 | .518 | .598 | .018 | 1.036 | .131 |
| Lower-bound | .010 | 1.000 | .010 | .518 | .478 | .018 | .518 | .107 |
| Error(DistracterType) | Sphericity Assumed | .539 | 56 | .010 |  |  |  |  |  |
| Greenhouse-Geisser | .539 | 51.002 | .011 |  |  |  |  |  |
| Huynh-Feldt | .539 | 56.000 | .010 |  |  |  |  |  |
| Lower-bound | .539 | 28.000 | .019 |  |  |  |  |  |
| Exposure | Sphericity Assumed | .032 | 1 | .032 | .732 | .399 | .025 | .732 | .131 |
| Greenhouse-Geisser | .032 | 1.000 | .032 | .732 | .399 | .025 | .732 | .131 |
| Huynh-Feldt | .032 | 1.000 | .032 | .732 | .399 | .025 | .732 | .131 |
| Lower-bound | .032 | 1.000 | .032 | .732 | .399 | .025 | .732 | .131 |
| Exposure \* WMCGROUP | Sphericity Assumed | .010 | 1 | .010 | .240 | .628 | .008 | .240 | .076 |
| Greenhouse-Geisser | .010 | 1.000 | .010 | .240 | .628 | .008 | .240 | .076 |
| Huynh-Feldt | .010 | 1.000 | .010 | .240 | .628 | .008 | .240 | .076 |
| Lower-bound | .010 | 1.000 | .010 | .240 | .628 | .008 | .240 | .076 |
| Error(Exposure) | Sphericity Assumed | 1.221 | 28 | .044 |  |  |  |  |  |
| Greenhouse-Geisser | 1.221 | 28.000 | .044 |  |  |  |  |  |
| Huynh-Feldt | 1.221 | 28.000 | .044 |  |  |  |  |  |
| Lower-bound | 1.221 | 28.000 | .044 |  |  |  |  |  |
| Foreknowledge \* DistracterType | Sphericity Assumed | .011 | 2 | .006 | .777 | .465 | .027 | 1.554 | .176 |
| Greenhouse-Geisser | .011 | 1.955 | .006 | .777 | .462 | .027 | 1.519 | .174 |
| Huynh-Feldt | .011 | 2.000 | .006 | .777 | .465 | .027 | 1.554 | .176 |
| Lower-bound | .011 | 1.000 | .011 | .777 | .386 | .027 | .777 | .136 |
| Foreknowledge \* DistracterType \* WMCGROUP | Sphericity Assumed | .002 | 2 | .001 | .124 | .883 | .004 | .248 | .068 |
| Greenhouse-Geisser | .002 | 1.955 | .001 | .124 | .879 | .004 | .243 | .068 |
| Huynh-Feldt | .002 | 2.000 | .001 | .124 | .883 | .004 | .248 | .068 |
| Lower-bound | .002 | 1.000 | .002 | .124 | .727 | .004 | .124 | .063 |
| Error(Foreknowledge\*DistracterType) | Sphericity Assumed | .404 | 56 | .007 |  |  |  |  |  |
| Greenhouse-Geisser | .404 | 54.728 | .007 |  |  |  |  |  |
| Huynh-Feldt | .404 | 56.000 | .007 |  |  |  |  |  |
| Lower-bound | .404 | 28.000 | .014 |  |  |  |  |  |
| Foreknowledge \* Exposure | Sphericity Assumed | .018 | 1 | .018 | .768 | .388 | .027 | .768 | .135 |
| Greenhouse-Geisser | .018 | 1.000 | .018 | .768 | .388 | .027 | .768 | .135 |
| Huynh-Feldt | .018 | 1.000 | .018 | .768 | .388 | .027 | .768 | .135 |
| Lower-bound | .018 | 1.000 | .018 | .768 | .388 | .027 | .768 | .135 |
| Foreknowledge \* Exposure \* WMCGROUP | Sphericity Assumed | .084 | 1 | .084 | 3.505 | .072 | .111 | 3.505 | .440 |
| Greenhouse-Geisser | .084 | 1.000 | .084 | 3.505 | .072 | .111 | 3.505 | .440 |
| Huynh-Feldt | .084 | 1.000 | .084 | 3.505 | .072 | .111 | 3.505 | .440 |
| Lower-bound | .084 | 1.000 | .084 | 3.505 | .072 | .111 | 3.505 | .440 |
| Error(Foreknowledge\*Exposure) | Sphericity Assumed | .674 | 28 | .024 |  |  |  |  |  |
| Greenhouse-Geisser | .674 | 28.000 | .024 |  |  |  |  |  |
| Huynh-Feldt | .674 | 28.000 | .024 |  |  |  |  |  |
| Lower-bound | .674 | 28.000 | .024 |  |  |  |  |  |
| DistracterType \* Exposure | Sphericity Assumed | .028 | 2 | .014 | 3.464 | .038 | .110 | 6.927 | .625 |
| Greenhouse-Geisser | .028 | 1.966 | .014 | 3.464 | .039 | .110 | 6.811 | .620 |
| Huynh-Feldt | .028 | 2.000 | .014 | 3.464 | .038 | .110 | 6.927 | .625 |
| Lower-bound | .028 | 1.000 | .028 | 3.464 | .073 | .110 | 3.464 | .435 |
| DistracterType \* Exposure \* WMCGROUP | Sphericity Assumed | .005 | 2 | .002 | .587 | .559 | .021 | 1.174 | .143 |
| Greenhouse-Geisser | .005 | 1.966 | .002 | .587 | .557 | .021 | 1.154 | .142 |
| Huynh-Feldt | .005 | 2.000 | .002 | .587 | .559 | .021 | 1.174 | .143 |
| Lower-bound | .005 | 1.000 | .005 | .587 | .450 | .021 | .587 | .115 |
| Error(DistracterType\*Exposure) | Sphericity Assumed | .223 | 56 | .004 |  |  |  |  |  |
| Greenhouse-Geisser | .223 | 55.061 | .004 |  |  |  |  |  |
| Huynh-Feldt | .223 | 56.000 | .004 |  |  |  |  |  |
| Lower-bound | .223 | 28.000 | .008 |  |  |  |  |  |
| Foreknowledge \* DistracterType \* Exposure | Sphericity Assumed | .027 | 2 | .014 | 2.200 | .120 | .073 | 4.400 | .431 |
| Greenhouse-Geisser | .027 | 1.975 | .014 | 2.200 | .121 | .073 | 4.344 | .428 |
| Huynh-Feldt | .027 | 2.000 | .014 | 2.200 | .120 | .073 | 4.400 | .431 |
| Lower-bound | .027 | 1.000 | .027 | 2.200 | .149 | .073 | 2.200 | .299 |
| Foreknowledge \* DistracterType \* Exposure \* WMCGROUP | Sphericity Assumed | .013 | 2 | .007 | 1.053 | .356 | .036 | 2.107 | .225 |
| Greenhouse-Geisser | .013 | 1.975 | .007 | 1.053 | .355 | .036 | 2.080 | .224 |
| Huynh-Feldt | .013 | 2.000 | .007 | 1.053 | .356 | .036 | 2.107 | .225 |
| Lower-bound | .013 | 1.000 | .013 | 1.053 | .314 | .036 | 1.053 | .168 |
| Error(Foreknowledge\*DistracterType\*Exposure) | Sphericity Assumed | .348 | 56 | .006 |  |  |  |  |  |
| Greenhouse-Geisser | .348 | 55.289 | .006 |  |  |  |  |  |
| Huynh-Feldt | .348 | 56.000 | .006 |  |  |  |  |  |
| Lower-bound | .348 | 28.000 | .012 |  |  |  |  |  |
| a. Computed using alpha = .05 | | | | | | | | | |

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| **Pairwise Comparisons – Exposure x Distracter Type** | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | |
| Exposure | (I) DistracterType | (J) DistracterType | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Pre-Exposure | Deviant | Simple | .026 | .017 | .144 | -.009 | .062 |
| Complex | -.018 | .018 | .311 | -.055 | .018 |
| Simple | Deviant | -.026 | .017 | .144 | -.062 | .009 |
| Complex | -.045\* | .017 | .013 | -.079 | -.010 |
| Complex | Deviant | .018 | .018 | .311 | -.018 | .055 |
| Simple | .045\* | .017 | .013 | .010 | .079 |
| Exposure | Deviant | Simple | -.006 | .009 | .478 | -.024 | .012 |
| Complex | -.060\* | .014 | .000 | -.088 | -.031 |
| Simple | Deviant | .006 | .009 | .478 | -.012 | .024 |
| Complex | -.053\* | .015 | .001 | -.083 | -.023 |
| Complex | Deviant | .060\* | .014 | .000 | .031 | .088 |
| Simple | .053\* | .015 | .001 | .023 | .083 |
| Based on estimated marginal means | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | |

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|  | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | |
| DistracterType | (I) Exposure | (J) Exposure | Mean Difference (I-J) | Std. Error | Sig.a | 95% Confidence Interval for Differencea | |
| Lower Bound | Upper Bound |
| Deviant | Pre-Exposure | Exposure | .043 | .023 | .075 | -.005 | .092 |
| Exposure | Pre-Exposure | -.043 | .023 | .075 | -.092 | .005 |
| Simple | Pre-Exposure | Exposure | .011 | .026 | .671 | -.042 | .064 |
| Exposure | Pre-Exposure | -.011 | .026 | .671 | -.064 | .042 |
| Complex | Pre-Exposure | Exposure | .002 | .023 | .917 | -.045 | .049 |
| Exposure | Pre-Exposure | -.002 | .023 | .917 | -.049 | .045 |
| Based on estimated marginal means | | | | | | | |
| a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | |

**Appendix 10 – Means tables for 2(working memory group) × 2(Exposure) × 2(Foreknowledge) × 3(distracter type) mixed ANOVA - Tonic Pupil response**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tests of Within-Subjects Effects** | | | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | | | |
| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Powera |
| Foreknowledge | Sphericity Assumed | .084 | 1 | .084 | 1.399 | .247 | .048 | 1.399 | .208 |
| Greenhouse-Geisser | .084 | 1.000 | .084 | 1.399 | .247 | .048 | 1.399 | .208 |
| Huynh-Feldt | .084 | 1.000 | .084 | 1.399 | .247 | .048 | 1.399 | .208 |
| Lower-bound | .084 | 1.000 | .084 | 1.399 | .247 | .048 | 1.399 | .208 |
| Foreknowledge \* WMCGROUP | Sphericity Assumed | .031 | 1 | .031 | .515 | .479 | .018 | .515 | .107 |
| Greenhouse-Geisser | .031 | 1.000 | .031 | .515 | .479 | .018 | .515 | .107 |
| Huynh-Feldt | .031 | 1.000 | .031 | .515 | .479 | .018 | .515 | .107 |
| Lower-bound | .031 | 1.000 | .031 | .515 | .479 | .018 | .515 | .107 |
| Error(Foreknowledge) | Sphericity Assumed | 1.686 | 28 | .060 |  |  |  |  |  |
| Greenhouse-Geisser | 1.686 | 28.000 | .060 |  |  |  |  |  |
| Huynh-Feldt | 1.686 | 28.000 | .060 |  |  |  |  |  |
| Lower-bound | 1.686 | 28.000 | .060 |  |  |  |  |  |
| DistracterType | Sphericity Assumed | .024 | 3 | .008 | 1.182 | .322 | .041 | 3.546 | .307 |
| Greenhouse-Geisser | .024 | 2.592 | .009 | 1.182 | .320 | .041 | 3.064 | .284 |
| Huynh-Feldt | .024 | 2.982 | .008 | 1.182 | .321 | .041 | 3.525 | .306 |
| Lower-bound | .024 | 1.000 | .024 | 1.182 | .286 | .041 | 1.182 | .183 |
| DistracterType \* WMCGROUP | Sphericity Assumed | .026 | 3 | .009 | 1.305 | .278 | .045 | 3.915 | .337 |
| Greenhouse-Geisser | .026 | 2.592 | .010 | 1.305 | .280 | .045 | 3.383 | .311 |
| Huynh-Feldt | .026 | 2.982 | .009 | 1.305 | .278 | .045 | 3.891 | .335 |
| Lower-bound | .026 | 1.000 | .026 | 1.305 | .263 | .045 | 1.305 | .197 |
| Error(DistracterType) | Sphericity Assumed | .565 | 84 | .007 |  |  |  |  |  |
| Greenhouse-Geisser | .565 | 72.580 | .008 |  |  |  |  |  |
| Huynh-Feldt | .565 | 83.494 | .007 |  |  |  |  |  |
| Lower-bound | .565 | 28.000 | .020 |  |  |  |  |  |
| Exposure | Sphericity Assumed | .027 | 1 | .027 | .514 | .479 | .018 | .514 | .107 |
| Greenhouse-Geisser | .027 | 1.000 | .027 | .514 | .479 | .018 | .514 | .107 |
| Huynh-Feldt | .027 | 1.000 | .027 | .514 | .479 | .018 | .514 | .107 |
| Lower-bound | .027 | 1.000 | .027 | .514 | .479 | .018 | .514 | .107 |
| Exposure \* WMCGROUP | Sphericity Assumed | .038 | 1 | .038 | .711 | .406 | .025 | .711 | .129 |
| Greenhouse-Geisser | .038 | 1.000 | .038 | .711 | .406 | .025 | .711 | .129 |
| Huynh-Feldt | .038 | 1.000 | .038 | .711 | .406 | .025 | .711 | .129 |
| Lower-bound | .038 | 1.000 | .038 | .711 | .406 | .025 | .711 | .129 |
| Error(Exposure) | Sphericity Assumed | 1.486 | 28 | .053 |  |  |  |  |  |
| Greenhouse-Geisser | 1.486 | 28.000 | .053 |  |  |  |  |  |
| Huynh-Feldt | 1.486 | 28.000 | .053 |  |  |  |  |  |
| Lower-bound | 1.486 | 28.000 | .053 |  |  |  |  |  |
| Foreknowledge \* DistracterType | Sphericity Assumed | .034 | 3 | .011 | 2.996 | .035 | .097 | 8.988 | .688 |
| Greenhouse-Geisser | .034 | 2.281 | .015 | 2.996 | .050 | .097 | 6.835 | .599 |
| Huynh-Feldt | .034 | 2.583 | .013 | 2.996 | .043 | .097 | 7.740 | .639 |
| Lower-bound | .034 | 1.000 | .034 | 2.996 | .094 | .097 | 2.996 | .387 |
| Foreknowledge \* DistracterType \* WMCGROUP | Sphericity Assumed | .004 | 3 | .001 | .335 | .800 | .012 | 1.004 | .113 |
| Greenhouse-Geisser | .004 | 2.281 | .002 | .335 | .745 | .012 | .764 | .104 |
| Huynh-Feldt | .004 | 2.583 | .001 | .335 | .770 | .012 | .865 | .108 |
| Lower-bound | .004 | 1.000 | .004 | .335 | .567 | .012 | .335 | .086 |
| Error(Foreknowledge\*DistracterType) | Sphericity Assumed | .322 | 84 | .004 |  |  |  |  |  |
| Greenhouse-Geisser | .322 | 63.880 | .005 |  |  |  |  |  |
| Huynh-Feldt | .322 | 72.337 | .004 |  |  |  |  |  |
| Lower-bound | .322 | 28.000 | .012 |  |  |  |  |  |
| Foreknowledge \* Exposure | Sphericity Assumed | .050 | 1 | .050 | 8.355 | .007 | .230 | 8.355 | .797 |
| Greenhouse-Geisser | .050 | 1.000 | .050 | 8.355 | .007 | .230 | 8.355 | .797 |
| Huynh-Feldt | .050 | 1.000 | .050 | 8.355 | .007 | .230 | 8.355 | .797 |
| Lower-bound | .050 | 1.000 | .050 | 8.355 | .007 | .230 | 8.355 | .797 |
| Foreknowledge \* Exposure \* WMCGROUP | Sphericity Assumed | .008 | 1 | .008 | 1.295 | .265 | .044 | 1.295 | .196 |
| Greenhouse-Geisser | .008 | 1.000 | .008 | 1.295 | .265 | .044 | 1.295 | .196 |
| Huynh-Feldt | .008 | 1.000 | .008 | 1.295 | .265 | .044 | 1.295 | .196 |
| Lower-bound | .008 | 1.000 | .008 | 1.295 | .265 | .044 | 1.295 | .196 |
| Error(Foreknowledge\*Exposure) | Sphericity Assumed | .167 | 28 | .006 |  |  |  |  |  |
| Greenhouse-Geisser | .167 | 28.000 | .006 |  |  |  |  |  |
| Huynh-Feldt | .167 | 28.000 | .006 |  |  |  |  |  |
| Lower-bound | .167 | 28.000 | .006 |  |  |  |  |  |
| DistracterType \* Exposure | Sphericity Assumed | .005 | 3 | .002 | .542 | .655 | .019 | 1.626 | .157 |
| Greenhouse-Geisser | .005 | 2.790 | .002 | .542 | .642 | .019 | 1.512 | .153 |
| Huynh-Feldt | .005 | 3.000 | .002 | .542 | .655 | .019 | 1.626 | .157 |
| Lower-bound | .005 | 1.000 | .005 | .542 | .468 | .019 | .542 | .110 |
| DistracterType \* Exposure \* WMCGROUP | Sphericity Assumed | .007 | 3 | .002 | .683 | .565 | .024 | 2.048 | .189 |
| Greenhouse-Geisser | .007 | 2.790 | .002 | .683 | .555 | .024 | 1.905 | .183 |
| Huynh-Feldt | .007 | 3.000 | .002 | .683 | .565 | .024 | 2.048 | .189 |
| Lower-bound | .007 | 1.000 | .007 | .683 | .416 | .024 | .683 | .126 |
| Error(DistracterType\*Exposure) | Sphericity Assumed | .277 | 84 | .003 |  |  |  |  |  |
| Greenhouse-Geisser | .277 | 78.131 | .004 |  |  |  |  |  |
| Huynh-Feldt | .277 | 84.000 | .003 |  |  |  |  |  |
| Lower-bound | .277 | 28.000 | .010 |  |  |  |  |  |
| Foreknowledge \* DistracterType \* Exposure | Sphericity Assumed | .003 | 3 | .001 | .424 | .736 | .015 | 1.272 | .131 |
| Greenhouse-Geisser | .003 | 2.841 | .001 | .424 | .726 | .015 | 1.205 | .129 |
| Huynh-Feldt | .003 | 3.000 | .001 | .424 | .736 | .015 | 1.272 | .131 |
| Lower-bound | .003 | 1.000 | .003 | .424 | .520 | .015 | .424 | .096 |
| Foreknowledge \* DistracterType \* Exposure \* WMCGROUP | Sphericity Assumed | .008 | 3 | .003 | .922 | .434 | .032 | 2.767 | .245 |
| Greenhouse-Geisser | .008 | 2.841 | .003 | .922 | .430 | .032 | 2.621 | .238 |
| Huynh-Feldt | .008 | 3.000 | .003 | .922 | .434 | .032 | 2.767 | .245 |
| Lower-bound | .008 | 1.000 | .008 | .922 | .345 | .032 | .922 | .153 |
| Error(Foreknowledge\*DistracterType\*Exposure) | Sphericity Assumed | .230 | 84 | .003 |  |  |  |  |  |
| Greenhouse-Geisser | .230 | 79.551 | .003 |  |  |  |  |  |
| Huynh-Feldt | .230 | 84.000 | .003 |  |  |  |  |  |
| Lower-bound | .230 | 28.000 | .008 |  |  |  |  |  |
| a. Computed using alpha = .05 | | | | | | | | | |

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| **Pairwise Comparisons – Foreknowledge x Distracter Type** | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | |
| DistracterType | (I) Foreknowledge | (J) Foreknowledge | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Steady | No Foreknowledge | No Foreknowledge | -.015 | .025 | .551 | -.066 | .036 |
| No Foreknowledge | No Foreknowledge | .015 | .025 | .551 | -.036 | .066 |
| Deviant | No Foreknowledge | No Foreknowledge | -.010 | .021 | .641 | -.054 | .034 |
| No Foreknowledge | No Foreknowledge | .010 | .021 | .641 | -.034 | .054 |
| Simple | No Foreknowledge | No Foreknowledge | -.028 | .027 | .308 | -.082 | .027 |
| No Foreknowledge | No Foreknowledge | .028 | .027 | .308 | -.027 | .082 |
| Complex | No Foreknowledge | No Foreknowledge | -.054\* | .025 | .042 | -.106 | -.002 |
| No Foreknowledge | No Foreknowledge | .054\* | .025 | .042 | .002 | .106 |
| Based on estimated marginal means | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | |

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|  | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | |
| Foreknowledge | (I) DistracterType | (J) DistracterType | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| No Foreknowledge | Steady | Deviant | -.013 | .012 | .315 | -.038 | .013 |
| Simple | -.009 | .015 | .569 | -.040 | .023 |
| Complex | .001 | .011 | .954 | -.022 | .023 |
| Deviant | Steady | .013 | .012 | .315 | -.013 | .038 |
| Simple | .004 | .018 | .835 | -.033 | .040 |
| Complex | .013 | .012 | .272 | -.011 | .037 |
| Simple | Steady | .009 | .015 | .569 | -.023 | .040 |
| Deviant | -.004 | .018 | .835 | -.040 | .033 |
| Complex | .009 | .013 | .482 | -.018 | .037 |
| Complex | Steady | -.001 | .011 | .954 | -.023 | .022 |
| Deviant | -.013 | .012 | .272 | -.037 | .011 |
| Simple | -.009 | .013 | .482 | -.037 | .018 |
| Foreknowledge | Steady | Deviant | -.008 | .010 | .454 | -.028 | .013 |
| Simple | -.021 | .013 | .105 | -.048 | .005 |
| Complex | -.039\* | .013 | .005 | -.065 | -.013 |
| Deviant | Steady | .008 | .010 | .454 | -.013 | .028 |
| Simple | -.014 | .015 | .355 | -.044 | .016 |
| Complex | -.031 | .016 | .068 | -.064 | .003 |
| Simple | Steady | .021 | .013 | .105 | -.005 | .048 |
| Deviant | .014 | .015 | .355 | -.016 | .044 |
| Complex | -.017 | .011 | .124 | -.039 | .005 |
| Complex | Steady | .039\* | .013 | .005 | .013 | .065 |
| Deviant | .031 | .016 | .068 | -.003 | .064 |
| Simple | .017 | .011 | .124 | -.005 | .039 |
| Based on estimated marginal means | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | |

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| **Pairwise Comparisons – Foreknowledge x Exposure** | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | |
| Foreknowledge | (I) Exposure | (J) Exposure | Mean Difference (I-J) | Std. Error | Sig.a | 95% Confidence Interval for Differencea | |
| Lower Bound | Upper Bound |
| No Foreknowledge | Pre-Exposure | Pre-Exposure | -.036 | .022 | .110 | -.080 | .009 |
| Pre-Exposure | Pre-Exposure | .036 | .022 | .110 | -.009 | .080 |
| Foreknowledge | Pre-Exposure | Pre-Exposure | .005 | .023 | .819 | -.042 | .053 |
| Pre-Exposure | Pre-Exposure | -.005 | .023 | .819 | -.053 | .042 |
| Based on estimated marginal means | | | | | | | |
| a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | |

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|  | | | | | | | |
| Measure: MEASURE\_1 | | | | | | | |
| Exposure | (I) Foreknowledge | (J) Foreknowledge | Mean Difference (I-J) | Std. Error | Sig.b | 95% Confidence Interval for Differenceb | |
| Lower Bound | Upper Bound |
| Pre-Exposure | No Foreknowledge | Foreknowledge | -.047\* | .022 | .042 | -.093 | -.002 |
| Foreknowledge | No Foreknowledge | .047\* | .022 | .042 | .002 | .093 |
| Exposure | No Foreknowledge | Foreknowledge | -.006 | .025 | .807 | -.058 | .045 |
| Foreknowledge | No Foreknowledge | .006 | .025 | .807 | -.045 | .058 |
| Based on estimated marginal means | | | | | | | |
| \*. The mean difference is significant at the .05 level. | | | | | | | |
| b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments). | | | | | | | |