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The Effect of Cognitive Load on Empathy Selection

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Abstract

This study investigates the effect of cognitive load on the empathetic decision-making process through two experiments. Experiment 1 (N=30) employed a within-subject design via the Empathy Selection Task (Cameron et al., 2019). In the experiment, participants were required to choose between an empathy focused 'Feel' deck and a non-empathy focused 'Describe' deck under varying levels of cognitive demand, followed by a recognition task. Consistent with the cognitive cost hypothesis, high cognitive load significantly increased empathy avoidance. Experiment 2 (N=30) introduced prior stimulus exposure to the decision-making phase to examine its effects. In contrast to Experiment 1, results indicated no significant association between cognitive load and empathy selection when the target stimulus is pre-exposed. These findings suggest a dissociation between empathic capacity and empathic propensity. Although cognitive load can deter the initiation of empathy, prior exposure to the target can sustain empathic engagement. Suggesting that awareness of empathic demand may offset avoidance.

Keywords: Empathy; cognitive load; empathy selection task; describe; feel

Introduction

Empathy is a concept explored in the early century by philosophers (Hume, 1739; Smith, 1759). Modern psychology drove the core ideas of empathy, such as inner imitation or motor mimicking (Titchener, 1909), and as the field progressed, cognitive scientists reflected on empathy as a different object of study with various properties, including cognitive and affective dimensions of empathy. The capacity to comprehend another's perspective is known as "cognitive empathy", and the emotional response to another's state is "affective empathy" (Davis, 2004; Decety & Jackson, 2004). Moreover, a contemporary perspective into the manifestation of empathy emerges from investigating the diverse features associated with it, likely including the cognitive load from working memory and the cognitive cost of empathising with another person (Cameron et al., 2019; Zaki, 2014).

Empathy covers a broad spectrum, ranging from experiencing concern for other people that strengthens motivation to help (Kevin, 2019) and emotional resonance with another person (Levenson et al., 1992) to the "empathic accuracy" of knowing what another person is thinking or feeling (Ickes, 1997). In its most intensive manifestations, it can obscure the psychological boundary between self and others (Davis et al., 2004; Hodges et al., 2001). Predominantly, empathy is the ability to recognise, comprehend and share the feelings of others (Neroznikova et al., 2020).

Although empathy is the fundamental aspect of human connections, investigating these diverse features offers a modern perspective on the manifestation of empathy as a process that may carry significant cognitive costs. Paying attention and being aware of others' emotions or taking their perspectives into account can be mentally taxing, suggesting a heavy reliance on the cognitive load of working memory (Cameron et al., 2019; Zaki, 2014). By exploring what leads a person to empathise can also reveal the underlying failures or lack of empathy through a lens of social cognitive processes. Integrated with cognitive functions like working memory provides a revolutionary insight into complex human cognition. Recent studies suggest that, given a choice, people tend not to engage in empathy because of the cognitive costs, which function as a barrier to empathy. Cameron et al. (2019) conducted eleven studies with almost 1204 participants to explore the cognitive costs associated with empathy, precisely the perspective-taking aspect. They argue that empathy is not an effortless process; it has cognitive costs.

The mechanism underlying empathy avoidance can be understood within Braver's dual mechanism framework of cognitive control. This cost-benefit analysis can be understood by looking at the difference between proactive and reactive control (Braver, 2012). For example, proactive control happens when people avoid 'feel deck' when they think there will be a cognitive demand and choose the 'describe deck' to skip the work of being good (Cameron et al., 2019). On the other hand, reactive control occurs when a social-emotional stimulus arises immediately and causes an emotional reaction to empathise that may be stronger than the initial drive to save resources (Zaki, 2014).

Empathic responses vary across situations depending on contextual, motivational, and attentional influences (Kang et al., 2016). The human cognitive process is composed of limited attentional resources, and the simultaneous execution of multiple tasks could be detrimental to empathy, given its complexity (Blakely et al., 2015). However, limited studies have directly evaluated the

In G. Boleda, I. Dautriche, M. Maldonado, C. Saldana and T. Torrent (Eds.), *Proceedings of the 48th Annual Conference of the Cognitive Science Society*

impact of a cognitive load on empathy. Tremblay et al. (2020) investigated the role of cognitive load in empathic responses by changing the directions of empathy while participants watched 2000-ms video clips of people in pain. The participants were told to either passively watch or actively empathise with the targets. After that, they used a 0-100 visual analogue scale (VAS) to rate both the targets' pain and their own subjective empathy. In a second trial, a Brown-Peterson task was added while the subjects were being watched to make them think more. Previous research had suggested that empathy needs available executive resources. However, Tremblay et al. found that emotional empathy increased significantly both when people were actively empathising and when their brains were under a substantial cognitive load. They found a positive correlation between working memory load and empathy. Even though these studies discuss cognitive load and empathy, they do not make a clear experimental distinction between different types or amounts of load (for example, high vs. low cognitive load). This means it is still unclear how different cognitive demands affect empathy.

Despite the importance of cognitive load as a potential moderator of empathic engagement, experimental literature is limited. What remains unknown is how varying levels of cognitive demand influence the voluntary initiation of empathy when individuals are free to opt out. The EST (Cameron et al., 2019: Ferguson & Inzlicht, 2022) addresses this gap allowing participants to select, on each trial, whether they will adopt an empathic or non-empathic orientation towards a target.

This study will focus on the major questions of how different types of cognitive loads, such as high load and low load, relate to the choice of empathy selection. And how does the cognitive load affect the decision-making response speed when it comes to the empathy selection task? Given previous findings on the cognitive cost of empathy (Cameron et al.,2019), we expect that a higher cognitive load will reduce empathy selection, whereas a lower cognitive load will increase empathy selection, and there will be a significant difference between decision-making time while selecting 'feel' and 'describe'. Here, choosing 'feel' is associated with empathising, and 'describe' is associated with non-empathising.

While experiment 1 examined the impact of cognitive load on empathy selection, experiment 2 seeks to further explicate this relationship by investigating whether the patterns are fixed or can be moderated by stimulus familiarity, demand characteristics, and pre-exposure. Also presenting the target face prior to the selection, experiment 2 investigated whether the "affective pull" of a visible human face could override the "cognitive push" of high mental load. This determines whether empathy avoidance is a default strategy to minimise effort (Law of Least Effort) or is primarily driven by uncertainty about the stimulus (Zhu et al., 2018).

Experiment 1

Method

Participants A priori power analysis using G*power 3.1 (Faul et al., 2009) was done to calculate the sample size of 2 × 2 design to examine how task choice ('feel', 'describe') varies under different levels of cognitive load (high vs. low), given a moderate effect size of 0.25 as a medium effect provides a conservative and theoretically reasonable estimate, with 80% power and an alpha value of 0.05, giving a desired sample size of 30 (14 female,16 male; age range: 20-30 years, M=24.3, SD=2.8). Participants were recruited from the institute pool and all of them provided informed consent.

Apparatus and Materials The tasks were designed using PsychoPy 2024.2.1. The experiment was conducted on a 24-inch monitor with a resolution of 1920x1080 pixels, positioned at a viewing distance of 60 cm from the participant. The images were presented at the center of the screen.

A list of syllables used in this experiment in two conditions, one consisting of 4 syllables (e.g., XTVP) and another of 8 syllables (e.g., PLAMRNTJ), for high load and low load, respectively. There will be 20 high-load letters and 20 low-load letters in a total of 40 randomised trials. There were 40 images from the IIME database (Tewari et al., 2023) for the empathy selection task.

The statistical approach used here is primary analysis which consists of individual trials as the unit of analysis (N=1200 trials; 40 per participant x 30 participants). Chi square tests of independence were used for categorical outcomes and independent- samples t-test for continuous outcomes. Although this approach is not perfect for repeated data we incorporated effect-size estimates (Cramer's V; Cohen's d) contextualise statistical significance.

Procedure Participants have been introduced to four practice trials, consisting of two high-load and two low-load conditions. During these trials, the experimenter prompted participants to select either a 'describe' or 'feel' response to ensure familiarity with the task instructions across all experimental conditions. In the main task (Figure 1), each trial began with a fixation cross presented for 1,500-ms, followed by a 500-ms blank screen. Participants were then presented with randomised high-load and low-load items for 2 seconds. Following the presentation of these letters, participants will engage in the Empathy Selection Task adapted from prior research (Ferguson & Inzlicht, 2022; Cameron et al., 2019). Following the memory induction, participants were presented with a choice between two card decks labelled 'DESCRIBE' and 'FEEL'. The display stayed on the screen until the participant registered a choice via mouse click. In this experiment, the choice was proactive, occurring prior to the presentation of the target stimulus. An image from the IIMI

Emotional Face Database (Tewari et al., 2023) will then be displayed on the screen. Participants were required to complete a written task based on their previous deck selection. The trials will be randomised to prevent order effects and response bias. To conclude each trial and ensure the cognitive load was maintained, participants will complete a recognition test. They must identify the initial target letters from a sequence of three, where two serve as a distractor sequences ensuring they hold the information throughout the decision-making process.

The experiment has three main phases: first, letters will appear on the screen, and participants will be asked to remember them. Afterwards, participants will select between two card decks labelled ‘feel’ and ‘describe’. If they choose the ‘describe’ deck, they will follow this instruction: “Look at the person in the picture and try to notice details about them. Objectively focus on their external features and appearance. Please write one sentence describing their age and gender.” If they select the ‘feel’ deck, they will follow this instruction: “Look at the person in the picture and try to feel what they feel. Empathically focus on their internal experiences and emotions. Please write one sentence describing their experiences and feelings.” Then, in the third phase, there will be three sequences of letters appearing on the screen; from that, they have to recognise the initially shown letters. The other two act as distractor letters, and the accuracy of this is also measured.

Each participant completed 40 trials, for a total of 1,200. Across the 30 participants in each of experiments 1 and 2, this comprised 600 trials under high cognitive load and 600 trials under low cognitive load in each experiment. The experiment uses a within-subject design with empathy selection (feel’ or ‘describe’), the decision-making time for choosing ‘feel’ or ‘describe’, and cognitive load (high and low). Recognition accuracy is also measured.

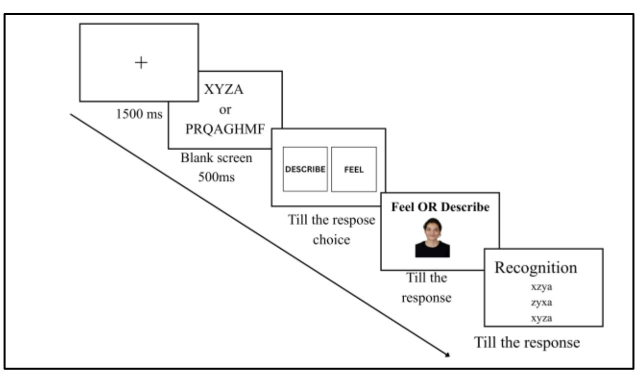

Figure 1: Trial structure of Experiment 1

Results

A chi-square test of independence was conducted to examine whether the choice between 'describe' and 'feel' was influenced by high and low cognitive load. The results revealed a significant association between cognitive load and the empathy selection task, χ^2 (1, N = 1200) = 7.39, p = .007, Cramér’s V = 0.08, indicating a small effect size. When the cognitive load is low, participants chose the 'describe' deck, and the selections were balanced across conditions [(describe = 295, 49.2%, M = 9.83, SD = 3.95); (feel = 305, 50.8%, M = 10.17, SD = 3.9)]. But under high cognitive load, participants chose the ‘describe’ deck more often than the ‘feel’ deck [describe = 342, 57.0%, M = 11.40, SD = 4.43); feel = 258, 43.0%, M = 8.60, SD = 4.38)]. This pattern suggests that cognitive load systematically shifts participants’ task preference. Compared with the low-load condition, participants prefer not to choose the empathy deck under high load. In total, participants chose to ‘describe’ the deck more (M=21.23, SD=7.35) than the ‘feel’ deck (M=18.77, SD=7.35). This overall pattern indicates a general preference for the ‘describe deck’ over the ‘feel deck’, suggesting that participants tended to avoid empathic engagement across conditions. Supporting the empathy selection task findings by Cameron et al. (2019), which provided evidence that empathy is often perceived as cognitively taxing and is avoided when mental resources are limited.

Regarding Decision latency an independent samples t-test is performed to compare RTs between load conditions. In response time under high-load conditions, choosing the describe deck (M= 3.176 sec, SD= 1.19 sec) is slower than choosing the ‘feel’ deck (M= 2.806 sec, SD=1.29 sec). In low-load conditions, the RT for choosing the ‘describe’ deck is (M=2.307 sec, SD=0.99 sec) and for the ‘feel’ deck is (M=2.195 sec, SD=0.87 sec). In sum these findings imply that high cognitive load amplifies decision difficulty, even when participants ultimately favour the less empathically demanding option. This indicates that longer RTs may reflect increased decision conflict under high cognitive load, even when empathic engagement is minimal.

RTs were compared using an independent sample t-test and the results revealed a statistically significant difference between the load groups [t(1198) = -6.13, p < .001, Cohen's d = 0.35].Participants responded significantly faster in the low cognitive load condition (M = 2.34 sec, SD = 2.08 sec) compared to the high cognitive load condition (M = 3.09 sec, SD = 2.11 sec). The results suggested that increased cognitive demands led to measurably slower response times. An independent samples t-test revealed no statistically significant difference in response times between the ‘describe’ (M = 2.81, SD = 2.35, n = 637) and ‘feel’ (M = 2.61, SD = 1.84, n = 563) conditions, t(1198) = 1.62, indicating that task type had minimal practical influence on response speed. These findings indicate that higher cognitive load leads to a preference for the ‘describe deck’ over the ‘feel deck’, which may be due to differences in processing demands between the two conditions.

Recognition accuracy of the response rates was calculated to verify the task engagement. A chi-square test of independence revealed a significant association between cognitive load condition (high vs. low) and response accuracy, [$\chi^2(1, N = 1200) = 42.09$, $p < .001$, Cramer's V = 0.19]. Accuracy rates differed markedly between the two conditions. In the high cognitive load condition, responses were correct on 80.0% of trials (480 of 600), compared to 92.8% (557 of 600) in the low cognitive load condition. This shows more accuracy in the low-load condition. For the 'describe' deck, participants responded correctly 86.0% of the time (548 of 637 trials), compared to 86.9% accuracy (489 of 563 trials) for the 'feel' deck, which indicates that one task wasn't harder than the other; both tasks required roughly the same amount of effort to get a "correct" response.

Experiment 2

Method

Procedure Experiment 2 was conducted to understand empathy regulation by introducing critical manipulation, such as pre-exposure to the target stimulus. The primary rationale for Experiment 2 was to see the difference in empathy selection when the target stimulus is presented first, and then they must choose between 'feel' or 'describe'. In standard EST paradigms (as in Experiment 1), participants choose a deck before knowing who or what they will see, thereby avoiding the potential cost of an unknown stimulus. However, empathy in the real world often occurs after an emotional trigger is already present.

This is the same as experiment 1, and the only change introduced here is pre-exposure of the target stimulus. Participants, apparatus and material are the same as in experiment 1. Experiment 2 used a design identical to Experiment 1, with a new participant group distinct from that used in Experiment, a sample size of $N = 30$ (14 males and 16 females). The only systematic change from experiment 1 was the introduction of the target stimuli in the choice selection. By keeping the apparatus and materials constant while altering the pre-exposure to the stimuli.

Results

A chi-square test was conducted to examine whether the decision choice between 'describe' and 'feel' was influenced by cognitive load. The results indicated no significant association between cognitive load and deck selection, χ^2 (1, N = 1200) = 0.01, $p = .915$. Participants' choices remained statistically consistent across both the high-load and low-load conditions. When cognitive load is low, participants selected 'feed deck' 59% of the time (n= 354/600), and the describe deck 41% of the time (n=246/600), and in high cognitive load participant choose the 'feel deck' 59.5% of time (n=354/600) and the 'describe deck' 40.5% of time (n-243/600). The pre-exposure made 'feel deck' familiar enough that participant no longer avoided empathising to save cognitive cost.

Independent sample t-tests were conducted to examine differences in response time (RT) across load conditions and empathy selection. There was no significant difference in RT between high-load and low-load conditions, t (1196) = 0.045, $p = .968$. Specifically, for 'feel' selections, RTs remained nearly identical across low load (M = 25.17s, SD = 30.33) and high load (M = 25.25s, SD = 26.36). Similarly, RTs for 'describe' selections did not differ significantly between load levels, t (1196) = 0.627, $p = .531$. While high-load conditions showed notably lower variability (lower SD), the overall speed of responses was not significantly influenced by cognitive load.

Response accuracy rates were calculated to verify task engagement and determine the efficacy of the load manipulation. An independent samples t-test revealed a significant difference in accuracy between load conditions, t (1196) = 4.63, $p < .001$, with lower accuracy observed under high cognitive load (M = 80.0%) compared to low cognitive load (M = 92.8%). However, there was no significant difference in accuracy between empathy selections (feel or describe), t (1196) = 1.06, $p = .290$. This suggests that while the load manipulation successfully taxed cognitive resources, it did not selectively impair performance on one task over the other.

Unlike experiment one, there was no significant association between cognitive load and deck selection participants first viewed the target image and then choose whether to engage in the 'feel' or 'describe' selection.

Discussion

In this paper, we investigated two types of cognitive load at different high and low levels to determine people's preference for empathy. Three major findings emerge from the study are; first, high cognitive load leads to increased empathy avoidance (Experiment 1), which aligns with cognitive cost hypothesis of Cameron et al. (2019). Second, pre- exposure to the target face with deck selection abolished the effect of load on empathy choice (Experiment 2), even though the load manipulation was effective as reflected in recognition accuracy. Third, this dissociation implicates distinct regulatory mechanisms such as proactive avoidance and reactive engagement that give rise to a single motivated system. As hypothesised in Experiment 1, the high cognitive load would avoid empathy selection, and the low load would encourage it. Developing from the early conceptualisations of empathy as cognitively costly and amenable to regulation through effort modulation or stimulus exposure (Hodges & Klein, 2001), the first experiment illustrates how high cognitive load comes with avoidance of empathic engagement to conserve cognitive resources. When participants were required to choose between the 'feel' and 'describe' decks before seeing the target, their choices reflected a tendency to minimise effort. In line with the Law of Least Effort (Chang, 2016), participants consistently selected the objectively less demanding task, likely as a way of conserving limited cognitive resources (Moche et al., 2021; Cameron & Ferguson, 2021). In this situation, the 'feel' deck functioned as an uncertain option that carried the possibility of greater cognitive cost, which appeared to prompt a pre-emptive reduction in empathic engagement. Nevertheless, this pattern did not appear in Experiment 2. When participants were shown the target face prior to making their choice, cognitive load no longer influenced deck selection.

By integrating the results of experiment 1 and experiment 2, we uncover a sophisticated model of empathy regulation that relies on a distinction between proactive and reactive cognitive control (Mäki-Marttunen et al., 2019). A critical insight from the combined data is the dissociation between empathic ability (the capacity to perform accurately) and empathic propensity (the willingness to engage) (Ferguson & Cameron, 2024). The results confirm that people may continue to choose emotional engagement even when their cognitive performance is cognitively taxing, provided the social trigger is salient enough to maintain motivational weight. Empathy is not just a "default" that breaks under cognitive load; it is a regulated decision that remains robust when the social context provides sufficient information to make the interaction feel meaningful or intuitive.

In conclusion, our findings reveal empathy emerged as a motivated choice shaped by cognitive load as well as social cues. While cognitive load serves as a significant barrier to empathic engagement, this does not preclude progress. Experiment 1 concluded that increased cognitive demand can lead to slower response time for decision choice and a significant shift from 'feel' to 'describe' selections. Experiment 2, however, revealed that pre-exposure to stimuli can act as a cognitive buffer, which can stabilise choice patterns and response speeds despite high mental demand present. High load triggers proactive avoidance of effort (Experiment 1), while seeing the images first sparks reactive engagement despite strain (Experiment 2), separating ability from willingness. The findings from this study advance understanding of empathy as a motivated, regulated process rather than an automatic social process. This also examines how high cognitive load operates as a proactive barrier to empathic engagement when the target is unknown to the participants, but a reactive pull of a prior exposure to the target can override this barrier sustaining empathic choice under different cognitive demands. This dissociation has implications for how empathy failures are conceptualised and addressed in applied settings.

Limitations and Future directions

Several limitations need to be acknowledged. The primary analysis treated individuals' trials rather than participants as the unit of analysis. And both experiments used a binary choice between two decks, future paradigms should explore more graded empathy effort along a continuum employing the resource allocation model of motivated empathy (Cameron & Ferguson, 2021). However, incorporating neuroimaging or psychophysiological methods would also allow direct examination of the neural linking of cognitive load and empathy, extending the present findings to have a mechanistic account.

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