Economic Rationality under Limited Attention: The Effect of Sequential Elimination

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Abstract

Evidence suggests that limited attention to all available options often leads individuals to deviate from preference maximization. We propose a framework incorporating choice procedures where individuals consider at least two available options. We show that choices made under *sequential elimination* (whereby options are eliminated one by one until only one survives) maximize preferences, whereas choices made directly from menus may not. Using a controlled experiment, we find causal evidence that sequential elimination significantly improves choice consistency with preference maximization among subjects with low cognitive ability. Additionally, we examine individual preferences for sequential elimination and their implications.

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1 Introduction

The standard principle of economic rationality requires individual behavior to be consistent with preference maximization. Extensive research, however, suggests that *limited attention*—which entails individuals considering only a limited set of options—often results in choices inconsistent with preference maximization (e.g., Masatlioglu, Nakajima, and Ozbay, 2012; Dean, Özgür Kıbrıs, and Masatlioglu, 2017; Lleras et al., 2017). This issue is prevalent in markets with an overwhelming number of options—such as bank loans (Honka, Hortaçsu, and Vitorino, 2017), health services (Gaynor, Propper, and Seiler, 2016), and insurance plans (Abaluck and Adams-Prassl, 2021)—posing a substantial welfare challenge to economists and policymakers. Despite this wealth of research, a prominent gap persists in the literature concerning the improvement of economic rationality in decision-making.

We present the first study to demonstrate how a simple *choice procedure* can systematically ameliorate choice inconsistency with preference maximization under limited attention. Building on the seminal insights of Simon (1955, 1976) regarding the foundational role of choice procedures in decision-making, we introduce a tractable framework to examine the impacts of choice procedures on the consistency of choices made by a decision maker (DM) with standard preferences and limited attention.[1]

The framework enables a rigorous comparison of choice consistency across two notable but distinct choice procedures. The first is the *direct procedure*, in which the DM chooses directly from menus. In this procedure, limited attention may cause choice inconsistencies due to the DM overlooking the best options on menus. This leads us to investigate *sequential elimination*, where the DM eliminates options one by one until only one survives. This approach has its roots in marketing and psychology, where elimination-based behaviors have been proposed to simplify decision-making by focusing on distinctive features or environmental cues (Tversky, 1972; Gigerenzer and Todd, 1999). More recently, it has gained traction in economics, e.g., as proposed by Manzini and Mariotti (2007) and Masatlioglu and Nakajima (2007), where elimination models

[1] In this paper, standard preferences are defined as complete, transitive, and monotone. Formal details are provided in Section 2.

account for choice inconsistencies.

Our investigation is particularly driven by a synthesis of experimental evidence showing that both *sequential* (Besedeš et al., 2015) and *elimination-based* (Yaniv and Schul, 1997; Sokolova and Krishna, 2016) procedures mitigate choice overload.[2] While sequential elimination appears to integrate the benefits of these two approaches, a thorough analysis is still required to probe its normative role and underlying mechanism in economic rationality. Therefore, we contribute to the literature by providing a choice-theoretic framework of sequential elimination that yields testable implications.

We identify a key yet parsimonious property, referred to as the *minimum attention* property, to establish the DM's choice consistency with preference maximization under sequential elimination. The property indicates that the DM considers at least two options when faced with a menu of multiple options, drawing upon converging evidence from economics and the cognitive sciences. Eye-tracking studies, for instance, consistently show that individuals consider at least two options during decision-making (Krajbich and Rangel, 2011; Reutskaja et al., 2011). Field findings further corroborate this with estimates of the sizes of considered options (Honka, Hortaçsu, and Vitorino, 2017; Barseghyan, Molinari, and Thirkettle, 2021). More essentially, cognitive research demonstrates that adult attention spans extend beyond two objects, providing a robust foundation for the property (see, e.g., Cowan, 2001, for a review).

An intuitive explanation of our theoretical result is that in every elimination round, one of the best options in a menu survives—either by being overlooked or by beating the other considered options. Consequently, sequential elimination decomposes a potentially intractable preference maximization problem into a series of streamlined elimination (sub)problems. Grounded in the theoretical results, we hypothesize that sequential elimination, as compared with the direct procedure, leads to a higher level of consistency in the choices of individuals with limited attention.

We conduct an experiment guided by the framework to test this hypothesis. The experiment evaluates choice consistency through twenty decision problems involving risk, adapted from Kim et al. (2018). Each problem presents eleven distinct options in random order, with each option representing a lottery with an equal probability of yield-

[2] See Section 6 for a review of the evidence.

ing one of two monetary prizes. Although each option is simple, the core challenge of this setup lies in considering all available options across multiple decision problems. Thus, the experiment simulates decision-making conditions of limited attention, enabling a precise interpretation of sequential elimination's effect pertinent to this root cause.

We assess economic rationality in finite choice sets using a necessary and sufficient criterion from Nishimura, Ok, and Quah (2017), who extend Afriat (1967)'s results to characterize choice consistency with preference maximization across general settings. We refer to this criterion as *GARP*, as it closely resembles the standard Generalized Axiom of Revealed Preference (Afriat, 1967; Varian, 1982). Based on GARP, our primary measures of economic rationality comprise (1) a binary metric indicating choice consistency with preference maximization (i.e., absence of GARP violations) and (2) two discrete metrics capturing deviations from rationality—the number of GARP violations and the Houtman–Maks index (HMI, Houtman and Maks, 1985).

In the main experiment, subjects are randomly assigned to either the *Direct Procedure* or *Sequential Elimination* treatments, which implement the corresponding choice procedures with meticulously controlled instructions and user interfaces.[3] Importantly, we measure cognitive ability using IQ scores from the International Cognitive Ability Resource (ICAR) test (Condon and Revelle, 2014), with *low-IQ* subjects (those scoring at or below the sample median) effectively serving as proxies for individuals with limited attention. To accurately estimate the effect of sequential elimination, we control for factors that may influence rationality, including specific cognitive functions (selective attention and working memory capacity), demographics, and individual attitudes toward inconsistency.

Our central experimental results show that Sequential Elimination significantly improves the economic rationality of low-IQ subjects, boosting their probability of achieving choice consistency by 25.9 percentage points as compared to the Direct Procedure. This improvement represents 61.8% of their estimated probability under the latter. The

[3] See Section 3.1.2 for details of the experimental treatments. Throughout this paper, where initially capitalized, the terms Direct Procedure and Sequential Elimination refer to the respective experimental treatments; otherwise, they indicate their respective general meanings.

procedure also reduces the number of GARP violations and HMI among low-IQ subjects by 70.9% and 43.3%, respectively. The effect remains robust across variants of the measures that further comply with first-order stochastic dominance (FSD), a key normative and more stringent criterion in decision-making under risk (e.g., Choi et al., 2014; Polisson, Quah, and Renou, 2020).[4] These findings provide strong causal evidence supporting our hypothesis.

Furthermore, subjects with IQ scores in the first tercile and those in the first quartile reveal substantial improvements in economic rationality under Sequential Elimination, surpassing those observed among other low-IQ subjects. Meanwhile, *High-IQ* subjects (those scoring above the sample median) demonstrate a high level of rationality, with negligible differences across the two treatments. Yet, Sequential Elimination remarkably enhances rationality in compliance with FSD among subjects with IQ scores in the middle tercile and those in the middle quartiles, suggesting reinforcement of its effect through cognitive ability. This impact remains evident at the aggregate level. Collectively, these findings point to the procedure's broader potential in addressing root causes of rationality deviations beyond limited attention.

Understanding whether sequential elimination aligns with individual preferences is crucial to its real-world applications. To this end, we implement a third treatment, referred to as *Procedure Preference*, in which subjects choose between the Direct Procedure and Sequential Elimination, subsequently making decisions according to their individually selected procedure. We observe a significantly stronger preference for Sequential Elimination among subjects with lower cognitive abilities. Predominantly, 82.1% of low-IQ subjects favor this procedure, while high-IQ subjects show indifference between the two procedures.

Our analysis further indicates comparable levels of economic rationality between subjects selecting Sequential Elimination in the Procedure Preference treatment and those directly assigned to it. Importantly, the Procedure Preference treatment improves economic rationality relative to the Direct Procedure, with an effect paralleling that

[4] Violations of FSD occur when individuals prefer an option over another that offers better outcomes with no additional risk. Such violations generally indicate lower decision-making quality but do not necessarily imply deviations from choice consistency.

attributable to Sequential Elimination in both magnitude and statistical significance. Altogether, these results suggest that offering the procedure non-coercively still yields benefits for individuals who preferentially adopt it. Such an approach is particularly appealing in the design of choice environments, as improving decision-making is in harmony with respecting individual autonomy (Thaler and Sunstein, 2003; Chetty, 2015).

Additional findings shed light on the interplay between sequential elimination, decision time, and economic rationality. To be specific, Sequential Elimination significantly increases decision time as compared to the Direct Procedure, with this difference consistent across IQ groups. In general, longer decision times are positively associated with improved rationality, as indicated by fewer GARP violations and a lower HMI, consistent with prior evidence of the link between slower decision time and fewer errors (see, e.g., Heitz, 2014, for a review). Notably, this association is most pronounced among low-IQ subjects under Sequential Elimination, which we interpret as bolstered by the procedure's mitigation of limited attention.

A closer inspection of the dynamics reveals distinct behavioral patterns during the two procedures. In the Direct Procedure, subjects tend to pay attention to options in the given presentation order, whereas Sequential Elimination results in elimination sequences that deviate from this order, suggesting deliberate consideration throughout. Despite these differences, we find no evidence that presentation order itself affects final choices, which supports the interpretation that choice inconsistencies in the Direct Procedure mainly stem from the inherent limited attention feature.

Emerging studies indicate that revising choices can improve conformity with relatively straightforward axioms, such as transitivity and FSD (e.g., Benjamin, Fontana, and Kimball, 2020; Nielsen and Rehbeck, 2022; Breig and Feldman, 2024). Nonetheless, the effectiveness of this procedure remains to be confirmed in contexts where limited attention looms, which may still impede reconsideration during choice revision, contrasting with sequential elimination. To explore this, our experiment incorporates a choice revision mechanism. We find some supporting evidence that revisions enhance rationality in compliance with FSD, albeit mainly among high-IQ subjects and not more broadly across the primary measures. This finding illuminates the persistence of limited attention, thereby underscoring the distinctive role of Sequential Elimination in addressing this pervasive issue.

The remainder of the paper is organized as follows. Section 2 introduces the framework from which the hypothesis is derived. Section 3 details the experimental design. Section 4 presents the experimental results. Section 5 provides further discussion of the findings. Section 6 situates the findings within the related literature, and Section 7 offers concluding remarks.

2 Framework

Let X be a nonempty finite subset of $\mathbb{R}^n_+$, consisting of *options* denoted by x, y, and z, each representing a bundle of n goods. Let $\mathscr{X}$ be a nonempty set of nonempty subsets of X; this is the set of *menus* with typical elements A, B. Formally, a *choice function c* assigns to every $A \in \mathscr{X}$ a unique element $c(A)$ in A, indicating that the DM chooses the option $c(A)$ from the menu A. Let $\succeq$ be a complete, transitive, and monotone *preference relation* on X.[5]

We consider that the DM has limited attention. Specifically, when faced with a menu A, the DM pays attention to a limited set of options on the menu, $\gamma(A)$, known as the *consideration set*. The DM's consideration set formation satisfies the minimum attention property, i.e., he pays attention to at least two options when A comprises multiple options. Formally, a *consideration set mapping* γ assigns to every $A \in \mathscr{X}$ a subset of A such that $|\gamma(A)| \geq \min\{|A|, 2\}$. A consideration set mapping is said to be a *full consideration* if for all $A \in \mathscr{X}$, $\gamma(A) = A$.

2.1 Direct Procedure

In the direct procedure, the DM chooses an option that is preferred to all the others in his consideration set within a menu. The following definition is adapted from Masatlioglu, Nakajima, and Ozbay (2012).

[5]For two vectors $x, y \in \mathbb{R}^n_+$, we write $x \geq y$ if $x_k \geq y_k$ for all $k = 1, \ldots, n$; and $x \gg y$ if $x_k > y_k$ for all $k = 1, \ldots, n$. A preference relation $\succeq$ is monotone if $x \geq y$ implies $x \succeq y$ and $x \gg y$ implies $x \succeq y$ but not $y \succeq x$. This is also known as the *weak monotonicity* property.

Definition 1. A choice function c is a *direct choice* if there exist a preference relation $\succeq$ and a consideration set mapping γ such that for every $A \in \mathscr{X}$, $c(A)$ is the $\succeq$-best option in $\gamma(A)$. Further, c is a *direct choice with full consideration* if γ is a full consideration.

To assess economic rationality, we employ a testable criterion adapted from Nishimura, Ok, and Quah (2017). They develop an intuitive and empirically feasible test of choice consistency with preference maximization, extending Afriat (1967)'s results beyond the classical consumption choice setting.[6]

We now introduce our adaptation to this setting. For any $x, y \in X$, we denote that xR^D (R^S, respectively) y if there exist some $A, B \in \mathscr{X}$ and $z \in A$ such that $c(A) = x$, $c(B) = y$, and $z \geq$ ($\gg$, respectively) y. We denote xRy if there exists a sequence $x, z_1, z_2 \ldots, z_k, y$ such that $xR^D z_1$, $z_1 R^D z_2, \ldots$, $z_k R^D y$; that is, R is the transitive closure of R^D. For convenience, we refer to this criterion as GARP, as it closely resembles the Generalized Axiom of Revealed Preference.[7] Formally,

Definition 2 (GARP)**.** A choice function c is said to satisfy GARP if, for any $x, y \in X$, xRy implies that $yR^S x$ does not hold.

Unless the DM considers every available option under the direct procedure, his choices do not necessarily satisfy GARP, as the following example shows. Consider two menus, $A = \{x, y, z\}$ and $B = \{u, v, w\}$ with $z \gg u$ and $w \gg x$. Suppose that the DM's preferences are described by $z \succeq w \succeq x \succeq u \succeq v \succeq y$ and his consideration sets are $\gamma(A) = \{x, y\}$ and $\gamma(B) = \{u, v\}$. Consequently, the DM's choices under the direct procedure are $c(A) = x$ and $c(B) = u$. In this case, we have xRu but $uR^S x$, and we say that the ordered pair (x, u) constitutes a violation of GARP.

How does the number of GARP violations depend on the size of consideration sets under the direct procedure? Consider a different case where the DM has full consideration. In this case, his choices under the direct procedure are $\tilde{c}(A) = z$ and $\tilde{c}(B) = w$, satisfying GARP. Intuitively, the number of GARP violations weakly decreases in the

[6] As stated in Theorem 1 of Nishimura, Ok, and Quah (2017), their results apply to any preference relation and any choice function, imposing no conditions on their domains.

[7] Cosaert and Demuynck (2015) also show in their Theorem 2 that this adapted criterion, in their formulation, is a necessary and sufficient condition for choice consistency with utility maximization.

expansion of consideration sets because the DM would not make worse choices by attending to additional options. Furthermore, it is equivalent for choices to be rationalized by the direct procedure with full consideration and by standard preference maximization.

The following remark summarizes the above discussion and will be useful later for formulating our hypothesis.

Remark 1. *Let c, $\tilde{c}$ be two direct choices, the following statements are true:*

(i) *c does not necessarily satisfy GARP.*

(ii) *The number of GARP violations in c is weakly greater than that in $\tilde{c}$ if c ($\tilde{c}$, respectively) is a direct choice with a preference relation $\succeq$ and a consideration set mapping γ ($\tilde{\gamma}$, respectively) such that $\gamma(A) \subseteq \tilde{\gamma}(A)$ for all $A \in \mathscr{X}$.*

(iii) *c satisfies GARP if and only if c is a direct choice with full consideration.*

2.2 Sequential Elimination

Remark 1 implies that the DM, under the direct procedure, may miss the best options by not giving menus full consideration, thus making choices inconsistent with preference maximization, especially when he considers only a small number of options. To address this problem, we propose sequential elimination, in which the DM eliminates options one by one until only one survives, i.e., the choice.

To illustrate sequential elimination, consider again that the DM faces the menu A. Under this procedure, he goes through two rounds of elimination to make a choice from A. In the first round, he eliminates $e_1(A) = y$, leaving the menu to be $A \backslash \{y\} = \{x, z\}$. In the second round, the DM confronts $\{x, z\}$ as a "new" menu, from which he eliminates $e_2(A) = x$, which reduces the menu to be $A \backslash \{y, x\} = \{z\}$—representing his choice.

Formally, an elimination function e assigns to every $A \in \mathscr{X}$ a sequence $e(A) = (e_1(A), \ldots, e_{|A|}(A)) \in X^{|A|}$ such that $\bigcup_{r=1}^{|A|} \{e_r(A)\} = A$. The sequence $e(A)$ fully describes the DM's elimination behavior when faced with a non-singleton menu A: he eliminates $e_1(A), \ldots, e_{|A|-1}(A)$ sequentially, and finally chooses $e_{|A|}(A)$ from A. For all $A \in \mathscr{X}$ and $r = 1, .., |A|$, let A_r denote the remaining menu before the rth round of elimination by $A_r = \bigcup_{s=r}^{|A|} \{e_s(A)\}$. We propose the following model of sequential elimination.

Definition 3. A choice function c is a *choice by sequential elimination* if there exist a preference relation $\succeq$, a consideration set mapping γ, and an elimination function e such that for all A and $r = 1, \ldots, |A|$,

(i) $e_r(A) \in \gamma(A_r)$;

(ii) $\{x \in \gamma(A_r) | x \succeq e_r(A), x \neq e_r(A)\} \neq \emptyset$ if $|A_r| \geq 2$;

(iii) $e_{|A|}(A) = c(A)$.

The first two conditions of Definition 3 state that the DM eliminates an option from his consideration set if he prefers another option in this set. In other words, despite limited attention, the DM compares at least two options according to his preferences in every elimination. The third condition relates an elimination data set to a choice data set by designating the last remaining option as the choice.

The following proposition formally establishes the consistency of individual choice behavior under sequential elimination. Proofs are in Appendix A.1.

Proposition 1. *Let c be a choice function. c satisfies GARP if and only if c is a choice by sequential elimination.*

Proposition 1 demonstrates that the DM always makes choices consistent with preference maximization under sequential elimination. Thanks to the minimum attention property, one of the best options in a menu survives in every elimination, based on one or the other of the following two cases. One is that the DM does not attend to this option, leaving it on the menu. The other is that he considers this option, which beats all the others in his consideration set. In essence, rather than choosing directly from an overwhelming menu, the DM systematically makes a series of elimination (sub)decisions, each within his attentional capacity.

2.3 Testable Implication

The most straightforward approach to validating our framework is to directly test choice consistency under the direct procedure and under sequential elimination, as outlined in Remark 1 and Proposition 1, respectively. Preserving the parsimony of our framework, however, we cannot rule out the possibility of other factors causing choice inconsistency, such as deliberate inconsistency (Kahneman, 2003; DellaVigna, 2009), (in)experience (List and Millimet, 2008), and socioeconomic background (e.g., Choi et al., 2014; Fisman et al., 2015; Echenique, Imai, and Saito, 2023). Therefore, we propose comparing the consistency of choices between sequential elimination and the direct procedure, assuming that other sources of inconsistency are parallel across the two procedures.

Considering individuals with limited attention represented by our DM, Remark 1 and Proposition 1 lead to the following hypothesis.[8]

Hypothesis 1. *Sequential elimination, as compared with the direct procedure, reveals a higher level of consistency in the choices of individuals with limited attention.*

Empirically, identifying individuals with limited attention from choice data remains a notable challenge. Nevertheless, cognitive ability can serve as a feasible and reliable proxy for drawing such inferences due to its decisive role in attentional capacity (Kahneman, 1973). Research from the cognitive sciences has consistently indicated that lower cognitive abilities are associated with more severe attentional constraints (e.g., Cowan et al., 2006; Unsworth, 2015).[9] Moreover, accumulating evidence in economics demonstrates a positive correlation between cognitive ability and economic rationality, consistent with limited attention models (Burks et al., 2009; Kim et al., 2018; Echenique, Imai, and Saito, 2023). Therefore, our test of Hypothesis 1 focuses on individuals with low cognitive ability in a general sample.

The hypothesis is falsifiable with two possible scenarios in a sample: either limited attention is not a significant issue, as verifiable by high levels of choice consistency and cognitive ability across both procedures; or other factors of inconsistency outweigh limited attention, as demonstrable by uniformly low levels of choice consistency.

[8] Remark 1 and Proposition 1 also imply that the underlying choice procedure remains unidentified when choices satisfy GARP. We do not delve into the identification of choice procedures in this context, given that our primary focus is on addressing choice inconsistency under limited attention.

[9] Further discussions on cognitive functions related to limited attention are provided in Section 3.1.3.

3 Experimental Design

Our experiment is structured as follows. Upon starting the experiment, subjects are randomly assigned to one of three treatments: Sequential Elimination, Direct Procedure, or Procedure Preference. They engage in economic decision-making under their assigned choice procedures, followed by cognitive ability tests. The experiment concludes with a survey on attitudes toward inconsistency and demographic information. The details of the experimental design are discussed below, accompanied by experimental instructions and screenshots available in Appendix B.1.

3.1 Main Design

3.1.1 Measuring Economic Rationality

Our experiment features twenty risky decision problems adapted from Kim et al. (2018) to assess economic rationality. Each problem consists of eleven distinct options presented in a randomized order. Every option, denoted as (x_1, x_2), yields either x_1 or x_2 tokens with equal probability.[10] Additionally, a comprehension check problem is included.[11] As guided by our framework, this design embodies a central challenge of limited attention, requiring subjects to consider all options within each problem, despite the simplicity of each option.

Our primary rationality measures comprise consistency, the number of GARP violations, and the HMI. Consistency is a binary variable that takes the value 1 if a subject's choices are consistent with preference maximization (i.e., no GARP violations occur) and 0 otherwise. The number of GARP violations quantifies deviations from economic rationality, as established in prior studies (e.g., Famulari, 1995; Harbaugh, Krause, and Berry, 2001; Andreoni and Miller, 2002). The HMI is defined as the minimum num-

[10]These problems are derived from unique budget lines, each characterized by a specific price-endowment combination. See Appendix B.1 for graphical representations of decision problems and a GARP violation in a two-dimensional space.

[11]The comprehension check problem contains nine options: (11, 11), (22, 22), (33, 33), (44, 44), (55, 55), (66, 66), (77, 77), (88, 88), and (99, 99). Selecting any option other than (99, 99) indicates a lack of comprehension. Subjects must also pass comprehension questions during the instructions before proceeding to the decision-making tasks.

ber of observations that must be removed to achieve consistency among the remaining choices. This index is commonly interpreted as capturing decision-making mistakes, such as how often a subject may overlook the best options—offering direct insights into how effectively limited attention is mitigated. Fewer GARP violations or a lower HMI indicate a higher level of economic rationality.

To test robustness, we introduce additional measures that extend the primary ones by incorporating FSD—a fundamental criterion in decision-making under risk: FSD-consistency, the number of FSD-GARP violations, and FSD-HMI. More precisely, FSD-GARP modifies GARP by imposing FSD, a stricter condition than monotonicity (see Appendix A.2 for formal details). FSD-consistency mirrors consistency but requires no violations of FSD-GARP instead of GARP. Similarly, the number of FSD-GARP violations and the FSD-HMI indicate deviations from economic rationality respecting FSD, with computation and interpretation analogous to their counterparts in the primary measures.[12]

3.1.2 Treatment Conditions

In each treatment, subjects choose an option from a vertical list of options on the screen's left side for every decision problem, with an initial practice trial for each procedure.[13] In *Sequential Elimination*, subjects make a choice by sequentially eliminating all other options, clicking each to discard it into a *trash* box on the screen's right side. To reduce errors from trembles or unfamiliarity, subjects can reinstate any eliminated option from the trash box into the decision problem list with a click.

The *Direct Procedure* provides comparable instructions and user interface to Sequential Elimination. We acknowledge that the interactive nature of Sequential Elimination, requiring multiple clicks, may increase engagement with each option compared

[12]As all subjects are evaluated with the same set of twenty problems, we define (FSD-)HMI as the minimum number of choice observations that must be removed, rather than as a proportion of total observations. This definition facilitates direct interpretation of results; for example, an HMI of 1 can indicate one choice mistake. Alternative rationality measures involve adjusting expenditures to achieve consistency of choices from linear budget sets, as proposed by Afriat (1973), Varian (1990), and Halevy, Persitz, and Zrill (2018). These measures are not directly applicable to our study, which focuses on finite choice sets without imposing budgets. See Apesteguia and Ballester (2015), Cosaert and Demuynck (2015), and Halevy, Persitz, and Zrill (2018) for detailed discussions.

[13]The Procedure Preference group receives a trial problem for each procedure in random order.

to treatments requiring only a single click to indicate a choice. Such interactions could account for observed treatment differences. However, this lies outside our study's scope and may obscure interpretations regarding mechanisms behind rationality differences. Thus, in the Direct Procedure, subjects make a choice after sequentially *examining* all options, clicking each to move it to a *choice list* box on the screen's right side.[14] Subjects finalize their selection from this box once it encompasses all available options.

This design offers two key advantages. First, the Direct Procedure ensures that subjects exert a minimum level of effort to engage with each option. Second, both treatments expose subjects to options similarly, differing only in procedural structure. By contrasting these treatments, we can evaluate how sequential elimination mitigates the impact of limited attention (as a constraint) precisely through the lens of our framework.

While Sequential Elimination steers subjects toward using the corresponding choice procedure, how this aligns with individual procedure preferences requires additional verification. The third treatment, Procedure Preference, addresses this by allowing subjects to choose between the Direct Procedure and Sequential Elimination. This setup helps identify factors influencing preferences for sequential elimination. Furthermore, comparing economic rationality across groups can cast light on whether the efficacy of Sequential Elimination varies when adopted by choice versus passively. Importantly, this analysis may shed light on potential non-coercive applications of the procedure.

3.1.3 Measuring Cognitive Ability

Cognitive ability is measured using IQ scores obtained through the ICAR test, which includes five matrix reasoning and five three-dimensional rotation tasks. This test provides a primary indicator of reasoning and problem-solving abilities, positioned as core components of rational decision-making (Stanovich, West, and Toplak, 2011).[15] Beyond IQ, we incorporate selective attention and working memory capacity as controls, which capture specific components of attentional processing. Selective attention

[14] To minimize potential treatment differences related to procedure names, we introduce the Direct Procedure to subjects as *Sequential Examination*.

[15] See Section 6 for a review of the evidence for the positive correlation of cognitive ability (measured using similar tasks) and economic rationality.

refers to the ability to focus on relevant information while filtering out distractions, critical when processing multiple stimuli simultaneously (Johnston and Dark, 1986). This is measured using the Stroop test (Stroop, 1935), wherein subjects identify the print color of incongruent words (e.g., the word "GREEN" printed in red), requiring inhibition of automatic responses to focus on task-relevant information. Working memory capacity, defined as the ability for "temporary storage and manipulation of information," is closely linked to cognitive constraints (Baddeley, 1992). It is assessed through the Sternberg test (Sternberg, 1966), which tasks subjects to remember and recognize sequences of numbers.[16]

3.2 Other Design Details

3.2.1 Measuring Attitude toward Inconsistency

Our estimation of sequential elimination's effect accounts exhaustively for deliberate choice inconsistency, along with demographic and cognitive factors, as informed by prior research (e.g., Kahneman, 2003; DellaVigna, 2009). We evaluate attitudes toward choice inconsistency via a decision-making scenario embodying the attraction effect, a well-documented example of choice inconsistency. (e.g., Huber, Payne, and Puto, 1982; Tversky and Simonson, 1993). Subjects are asked to rate how at ease they are with the inconsistency scenario on a 0 (least) to 10 (most at ease) scale, where higher scores reflect a less negative attitude.

3.2.2 Choice Revision

We incorporate a choice revision procedure into the experimental design to further validate the underlying mechanism of sequential elimination. This procedure offers subjects an opportunity to revise their choices, with recent studies showing that it enhances choice compliance with normative axioms in settings involving only a few

[16] In the Sternberg test, subjects see a sequence of numbers presented singly and are tasked with memorizing them. After the display of several numbers, there is a brief pause, followed by the presentation of a test number. Subjects are asked whether the test number was included in the previously displayed sequence. Each trial concluded with subjects recalling the sequence. The IQ scores, selective attention scores, and working memory scores are integers from 0 to 10, 0 to 20, and 0 to 10, respectively, reflecting the number of correct responses on their respective tests.

options. Choice revision may lead individuals to reconsider all options, yet their attentional capacity remains unchanged. If our experiment reveals an effect of sequential elimination but not of choice revision, it would reasonably indicate the persistence of limited attention, thereby better elucidating the role of sequential elimination pertinent to this issue.

Our choice revision design is as follows. In the economic decision-making task, subjects engage successively with two identical sets of the aforementioned decision problems, Blocks A and B. The order of decision problems within each block is randomized independently. Subjects are not informed of the two blocks' identical nature until they reach Block B. In Block B, each problem's corresponding Block A choice is highlighted. Subjects can restart their assigned choice procedure (by clicking on any option) or retain their Block A choices (via a shortcut button). The design ensures incentive compatibility across blocks by having subjects designate one block for payment, and a decision problem is randomly drawn from this block to determine their payoff.[17] Our design does not impart normative axioms to subjects to maintain comparability between choice revision and sequential elimination. Our primary analysis of sequential elimination is based on choices made in Block A. We examine choice revision by comparing economic rationality before and after modification, focusing on subjects who alter any choice in Block B and select Block B for payment.

3.3 Experimental Procedure

The experiment was conducted online on the Qualtrics platform between May 31 and June 1, 2020. Subjects were recruited from the Prolific subject pool and could withdraw from the experiment at any time with no need for justification. Upon completing the experiment, subjects received a participation fee of £3 and an additional payment of up to £14.6 contingent on their economic decisions and cognitive test performance. Payoffs based on earned tokens were distributed three days post-experiment through Prolific. The experiment averaged 42 minutes to complete, with a mean payout of £8.14.

[17] This payment structure also underscores each problem's uniqueness, mitigating the possibility of deliberate choice variations in repetitive decision problems, as suggested by Agranov and Ortoleva (2017).

4 Experimental Results

4.1 Sample

Our sample comprises 223 subjects (50.2% female) with 73-75 observations per treatment condition.[18] Appendix C presents descriptive statistics of the sample and balance checks (Table C.1), along with histograms (Figures C.1 and C.2). By design, cognitive and demographic factors, as well as attitudes toward inconsistency are balanced across all three treatment groups. The mean age is approximately 23.731, with 75.3% of subjects aged 18 to 25. All participants have completed at least secondary education, with 57.0% engaged in undergraduate studies and 33.2% having attained at least an undergraduate degree. Thus, our sample is arguably younger and more educated than the general population.

Figure 1 shows a statistically significant, albeit modest, positive correlation between IQ, working memory, and selective attention scores. Among these measures, IQ emerges as the most consistently significant predictor of economic rationality, likely because the other two capture more specific cognitive processes rather than broader functions pertinent to limited attention. Our primary focus is thus on the effect of sequential elimination on low-IQ subjects as a proxy for individuals with limited attention. We also examine the implications of sequential elimination for high-IQ subjects and overall. Appendix Table C.2 displays the subject breakdown by treatment and IQ groups.[19] Moreover, working memory and selective attention are included in regression analyses to control for their potential influence.

4.2 Effect of Sequential Elimination

Figure 2 presents our central descriptive findings. As shown in Figure 2(a), the proportion of low-IQ subjects achieving choice consistency significantly increases by

[18] A total of 253 (53.0% female) subjects were recruited. Thirty subjects who failed the comprehension check were excluded from the analysis.

[19] The sample's IQ scores range from 0 to 10, with the first and third quartiles at 3 and 6, respectively. The mean IQ is approximately 4.74, with a median of 4 and a standard deviation of about 2.47. Thus, low-IQ (high-IQ, respectively) subjects are identically those with scores below (above, respectively) the sample mean.

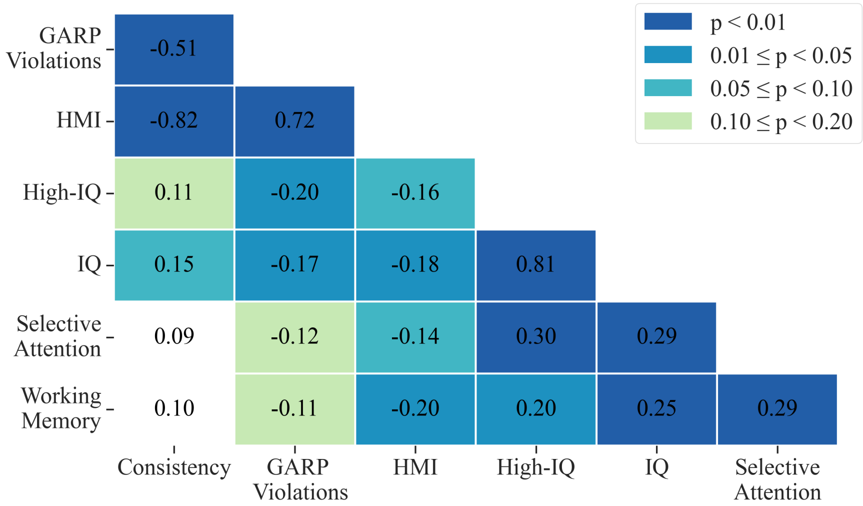
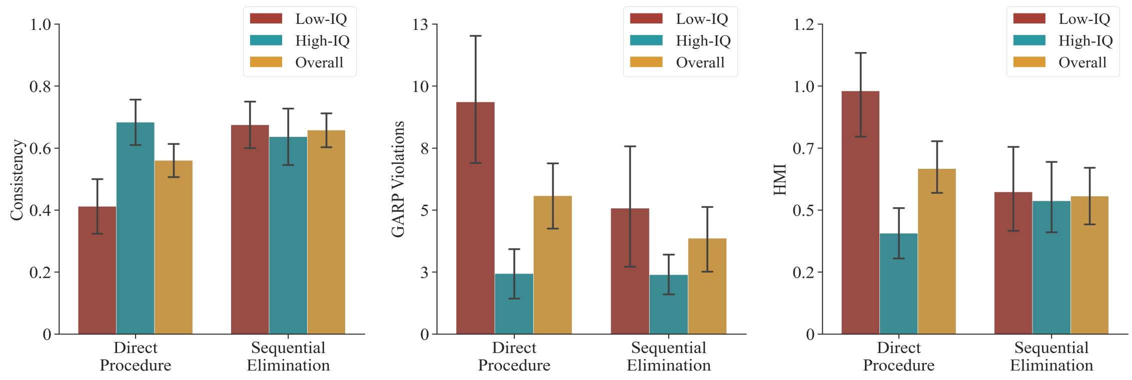


FIGURE 1. Heatmap of correlations among measures of economic rationality and cognitive ability. The variable high-IQ is binary, with a value of 1 assigned to individuals with IQ scores above the sample median and 0 otherwise. Pearson correlation coefficients are displayed in the lower triangular part of the matrix. Cells are color-coded based on p-values, with darker colors indicating higher levels of statistical significance and white representing non-significant correlations.

63.8% under Sequential Elimination as compared to to the proportion under the Direct Procedure (0.675 vs. 0.412; chi-square test, $p = 0.023$). Figures 2(b) and 2(c) further showcase that Sequential Elimination sharply reduces these subjects' GARP violations by 45.8% (5.275 vs. 9.735; Mann–Whitney U test, $p = 0.010$) and their HMI by 41.6% (0.550 vs. 0.941; Mann–Whitney U test, $p = 0.023$). Additionally, Appendix Figure D.2 contrasts the empirical cumulative distributions of the discrete metrics, delineating pronounced upward shifts from the Direct Procedure to Sequential Elimination among low-IQ subjects. These findings provide evidence for Hypothesis 1.

Among high-IQ subjects, differences in economic rationality between the two treatments are negligible across all measures. Appendix Table D.1 confirms that high-IQ subjects demonstrate a significantly higher level of economic rationality in the Direct Procedure than their low-IQ counterparts.[20] This finding aligns with prior studies (e.g., Burks et al., 2009; Cappelen et al., 2023; Echenique, Imai, and Saito, 2023), supporting

[20]This is except for FSD-consistency, possibly attributed to subjects' generally lower rates of FSD-consistency relative to their rates of consistency. See Appendix Table D.2 for the paired samples Wilcoxon test, which rejects the hypothesis that the distributions of FSD-consistency and consistency are equal.



(a) Consistency (b) GARP violations (c) HMI

FIGURE 2. Economic rationality across treatments. Mean values of rationality measures for low-IQ, high-IQ, and overall subjects in each treatment group are shown, with error bars representing standard errors.

the notion that individuals with lower cognitive abilities are more susceptible to limited attention.

Overall, subjects reveal a sizable 17.5% improvement in choice consistency under Sequential Elimination relative to the Direct Procedure, despite this difference not reaching statistical significance (0.658 vs. 0.560; chi-square test, $p = 0.224$). Sequential Elimination also leads to considerable reductions in GARP violations and the HMI, with margins of 30.8% (4.014 vs. 5.800; Mann–Whitney U test, $p = 0.125$) and 16.6% (0.534 vs. 0.640; Mann–Whitney U test, $p = 0.230$), respectively, with only the former approaching significance. Taken together, the results indicate that the effect of Sequential Elimination operates primarily among low-IQ subjects, consistent with our hypothesis.

We now present estimation results of Sequential Elimination's effect on economic rationality, incorporating the complete set of control variables. Columns 1 and 4 of Table 1 provide results from logistic regressions on the probability of achieving consistency and FSD-consistency, while the remaining columns report results for the other measures using negative binomial regressions.[21]

[21] Negative binomial regressions are particularly suitable for count data with skewed distributions (Cameron and Trivedi, 2013). The variance is specified as $\mathrm{Var}(y) = \mu + \alpha\mu^2$, where y is the dependent variable, μ is its mean, and α the dispersion parameter. This specification, known as the *NB2* model, is

The results consistently hold across all measures, further fortifying the support for our hypothesis. We begin by discussing the first three columns on the primary measures of economic rationality. As shown in Column 1, Sequential Elimination has a significant positive effect on consistency, indicated by a coefficient of 1.137 ($se = 0.516$). To aid interpretation, we compute average marginal effects, indicating that Sequential Elimination boosts the probability of choice consistency among low-IQ subjects by 25.9 percentage points ($se = 0.112$), a 61.8% improvement over the estimated baseline (0.419) under the Direct Procedure. In parallel, Columns 2 and 3 report substantial reductions in GARP violations by 10.439 ($se = 5.418$) and in the HMI by 0.400 ($se = 0.216$), respectively, due to Sequential Elimination. These magnitudes correspond to 70.9% and 43.3% of their baseline values (14.726 and 0.923) under the Direct Procedure.

The results also suggest heterogeneous effects of Sequential Elimination across IQ groups based on the primary measures. The interaction between Sequential Elimination and high-IQ is significant for consistency (coefficient of -1.345, $se = 0.724$), albeit marginally significant for GARP violations (coefficient of 1.114, $se = 0.687$) and the HMI (coefficient of 0.780, $se = 0.481$). Although we find no measurable impact of Sequential Elimination on the economic rationality of high-IQ subjects, there is marginally significant evidence that it reduces GARP violations by 4.514 ($se = 2.972$) at the aggregate level, echoing the descriptive results.

The last three columns examine economic rationality in compliance with FSD, once again demonstrating a pronounced effect of Sequential Elimination on low-IQ subjects, which qualitatively resembles the results for the primary measures.[22] Remarkably, this effect extends to high-IQ subjects, reducing their FSD-GARP violations by 13.963 ($se = 9.384$) and FSD-HMI by 0.625 ($se = 0.379$), with the former approaching significance and the latter attaining it. Further, the overall effect of Sequential Elimination emerges as a marked decrease in FSD-GARP violations by 27.430 ($se = 13.517$) and in FSD-HMI by 0.681 ($se = 0.294$), alongside a marginally significant increase in

preferred over the Poisson model as it accommodates deviations from the assumption of equal mean and variance. Dispersion parameters are reported in logarithmic form in corresponding tables.

[22] This is also showcased in the descriptive results with respect to FSD (Appendix Figures D.1 and D.2).

TABLE 1. Effect of Sequential Elimination on economic rationality.

	Consistency	GARP Violations	HMI	FSD-Consistency	FSD-GARP Violations	FSD-HMI
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Regression coefficients						
Sequential Elimination	1.137	-1.234	-0.567	0.934	-1.107	-0.477
	(0.516)	(0.515)	(0.323)	(0.549)	(0.494)	(0.272)
High-IQ	1.135	-1.776	-0.796	0.617	-0.852	-0.322
	(0.521)	(0.472)	(0.317)	(0.542)	(0.473)	(0.309)
Sequential Elimination × High-IQ	-1.345	1.114	0.780	-0.725	0.237	-0.118
	(0.724)	(0.687)	(0.481)	(0.729)	(0.680)	(0.408)
Panel B: Marginal effects of Sequential Elimination						
Low-IQ Subjects	0.259	-10.439	-0.400	0.201	-37.749	-0.729
	(0.112)	(5.418)	(0.216)	(0.112)	(20.913)	(0.424)
High-IQ Subjects	-0.045	-0.282	0.099	0.047	-13.963	-0.625
	(0.107)	(1.141)	(0.158)	(0.110)	(9.384)	(0.379)
Overall	0.106	-4.514	-0.161	0.121	-27.430	-0.681
	(0.077)	(2.972)	(0.132)	(0.078)	(13.517)	(0.294)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Log Alpha		1.714	-1.416		1.556	-0.407
		(0.160)	(0.809)		(0.129)	(0.327)
Log Likelihood	-91.469	-286.919	-143.694	-92.509	-486.503	-224.559
Observations	148	148	148	148	148	148

Note: This table estimates the effect of Sequential Elimination on various measures of economic rationality. Columns 1 and 4 present logistic regression results for consistency and FSD-consistency. Columns 2, 3, 5, and 6 display negative binomial regression results for GARP violations, HMI, FSD-GARP violations, and FSD-HMI. Panel A provides the regression coefficients. Panel B details the marginal effects of Sequential Elimination for different groups, showing the average change in the dependent variables when switching from the Direct Procedure to Sequential Elimination across observations. All models include a constant term. Control variables consist of cognitive functions (selective attention and working memory), demographic factors (age, gender, education), and attitude toward inconsistency. Robust standard errors are reported in parentheses.

FSD-consistency by 0.121 ($se = 0.078$). These findings imply the broader potential of the procedure to enhance rationality, prompting our next analysis of its specific effects across subjects with varying levels of cognitive abilities.

4.2.1 Alternative Specifications

We now delve into the effect of Sequential Elimination among subjects categorized based on their IQ scores across finer distribution tiers, first by terciles and then by quartiles, as detailed in Appendix Tables D.3 and D.4, respectively. The first three columns show that Sequential Elimination materially elevates rationality among subjects in the lowest IQ tiers, with magnitudes surpassing those identified among low-IQ subjects. Specifically, Column 1 of each table shows a virtually identical 31.5 percentage point improvement in consistency ($se = 0.139$) among subjects with IQ scores in the first tercile and those in the first quartile, respectively, corresponding to 76.8% and 77.2% of their baselines (0.410 and 0.408) in the Direct Procedure. Similar patterns are evident in GARP violations and the HMI in the subsequent two columns. These findings further corroborate the effectiveness of Sequential Elimination among individuals with limited attention.

Moreover, given that our sample primarily consists of young and educated individuals, the low-IQ subjects likely represent the upper end of the low-cognitive-ability population. Extrapolating from the more pronounced effects of sequential elimination among subjects with lower cognitive abilities suggests that the procedure could potentially benefit a broader low-cognitive-ability population—a considerable group particularly susceptible to limited attention.

The last three columns of the tables uncover a consistent pattern in the enhancement of rationality in compliance with FSD among subjects in the middle IQ tiers, attributed to Sequential Elimination. For instance, Column 4 of each table indicates significant FSD-consistency increases of 26.0 and 35.7 percentage points ($se = 0.107$ and $se = 0.157$) for subjects in the second tercile and those in the second quartile, respectively. Marked reductions in FSD-GARP violations and FSD-HMI are also observed among second-tercile, second-quartile, and third-quartile subjects, as shown in the final two columns. The absence of such effects at the lowest tiers aligns with the notion that compliance with stochastic dominance, in addition to choice consistency, is more demanding (Polisson, Quah, and Renou, 2020). Collectively, these findings suggest that deviations from stochastic dominance may stem from factors beyond limited attention, which can be mitigated by sequential elimination reinforced by adequate cognitive ability.

4.3 Preference for Sequential Elimination

Our analysis proceeds by investigating the factors driving individual preferences for sequential elimination. In the Procedure Preference treatment, 82.1% of low-IQ subjects opt for Sequential Elimination over the Direct Procedure, compared to 47.2% of high-IQ subjects (chi-square test, $p = 0.002$), suggesting a negative relationship be-

TABLE 2. Determinants of preference for Sequential Elimination.

	Preference for Sequential Elimination				
	(1)	(2)	(3)	(4)	(5)
High-IQ	-1.312			-1.060	
	(0.588)			(0.628)	
IQ		-0.286			-0.254
		(0.121)			(0.133)
Selective Attention	-0.107	-0.124		-0.130	-0.145
	(0.095)	(0.098)		(0.102)	(0.104)
Working Memory	-0.210	-0.194		-0.239	-0.228
	(0.112)	(0.112)		(0.134)	(0.130)
Education			0.567	0.627	0.663
			(0.285)	(0.278)	(0.279)
Age				-0.032	-0.024
				(0.044)	(0.043)
Female				0.668	0.684
				(0.585)	(0.587)
Attitude toward Inconsistency				0.038	0.020
				(0.123)	(0.123)
Log Likelihood	-41.147	-40.471	-45.901	-38.468	-37.630
Observations	75	75	75	75	75

Note: This table presents the regression coefficients from logistic regressions examining the determinants of individual preference for Sequential Elimination in the Procedure Preference treatment. The dependent variable is binary, with 1 indicating a choice for Sequential Elimination and 0 otherwise. All models include a constant term. Robust standard errors are reported in parentheses.

tween cognitive ability and preference for sequential elimination.

Logistic regressions, presented in Table 2, offer compelling evidence for this relationship. In Columns 1 and 2, the estimated coefficients for high-IQ (-1.312, $se = 0.588$) and IQ (-0.286, $se = 0.121$) are significantly negative, as are those for working memory (-0.210, $se = 0.112$ and -0.194, $se = 0.112$, respectively). These results remain robust in Columns 4 and 5 after controlling for demographics and attitude toward inconsistency. Apart from this, education emerges as the only significant predictor, with consistently positive coefficients across the last three columns (e.g., 0.663, $se = 0.279$ in Column 5). This underscores that education may influence procedure preferences, potentially fostering the adoption of Sequential Elimination.

4.3.1 Implications of Procedure Preference

We now explore the relationship between procedure preference and economic rationality. Table 3 highlights consistency measures for illustration, with similar results for other measures detailed in Appendix D.5. The first two columns compare subjects who select Sequential Elimination (in the Procedure Preference treatment) with those assigned to it, finding no significant effect of such a selection on either measure. This implies comparable levels of economic rationality among subjects who adopt Sequential Elimination, whether they do so preferentially or passively.

The middle two columns replicate this analysis in the Direct Procedure context. While preference for the Direct Procedure shows no clear effect on consistency (Column 3), it is associated with a significant 36.9 percentage point increase in FSD-consistency ($se = 0.187$) among low-IQ subjects as compared to those assigned to it (Column 4). Notably, 57.1% of low-IQ subjects who opt for the Direct Procedure make choices that satisfy GARP, with this group concurrently satisfying the more stringent FSD-GARP criterion, revealing a remarkable level of economic rationality. A possible interpretation—our preferred one—is that this preference among those individuals may reflect certain decision-making skills or experience beyond measured cognitive abilities.

The last two columns examine the collective impact of the Procedure Preference treatment, using those assigned to the Direct Procedure as the baseline. A significant effect on economic rationality is observed, with Procedure Preference improving consistency and FSD-consistency among low-IQ subjects by 28.6 and 21.0 percentage points ($se = 0.113$ and $se = 0.112$), respectively. Also notable are reductions in low-IQ subjects' FSD-GARP violations by 26.177 ($se = 12.937$) and HMI by 0.374 ($se = 0.227$) attributed to this treatment (Appendix Table D.5).[23] Importantly, these estimates parallel those obtained in our main results on the effect of Sequential Elimination in both magnitude and statistical significance.

In summary, the findings indicate a stronger preference for sequential elimination among individuals with lower cognitive abilities, leading to their improved rationality. This provides support for the effectiveness of implementing the procedure in a non-coercive manner, where individuals' procedural preferences are respected—a crucially advantageous feature in the design of policy and behavioral interventions.

[23]This is accompanied by the marginally significant reductions in low-IQ subjects' GARP violations by 6.683 ($se = 4.740$) and FSD-HMI by 0.647 ($se = 0.405$).

TABLE 3. Implications of Procedure Preference on economic rationality.

	Sequential Elimination Selected vs. Assigned		Direct Procedure Selected vs. Assigned		Procedure Preference vs. Direct Procedure	
	Consistency (1)	FSD-Consistency (2)	Consistency (3)	FSD-Consistency (4)	Consistency (5)	FSD-Consistency (6)
Panel A: Regression Coefficients						
Procedure Preference	0.213	-0.082	0.739	1.720	1.254	0.962
	(0.563)	(0.543)	(0.897)	(0.933)	(0.523)	(0.540)
High-IQ	-0.356	-0.385	1.195	0.900	1.100	0.637
	(0.556)	(0.542)	(0.538)	(0.584)	(0.524)	(0.533)
Procedure Preference × High-IQ	-0.274	0.434	-1.504	-1.534	-1.768	-0.552
	(0.831)	(0.830)	(1.059)	(1.090)	(0.719)	(0.727)
Panel B: Marginal Effects of Procedure Preference						
Low-IQ Subjects	0.040	-0.017	0.178	0.369	0.286	0.210
	(0.106)	(0.116)	(0.211)	(0.187)	(0.113)	(0.112)
High-IQ Subjects	-0.013	0.075	-0.176	0.042	-0.115	0.095
	(0.135)	(0.134)	(0.138)	(0.138)	(0.109)	(0.110)
Overall	0.019	0.022	-0.032	0.175	0.081	0.149
	(0.085)	(0.088)	(0.121)	(0.114)	(0.078)	(0.078)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-72.348	-75.144	-65.197	-61.397	-93.953	-94.235
Observations	122	122	101	101	150	150

Note: This table presents logistic regression results for the associations between Procedure Preference and economic rationality, focusing on consistency and FSD-consistency. The first two columns compare the economic rationality of subjects who select Sequential Elimination in the Procedure Preference treatment with those assigned to it. The middle two columns perform a similar analysis for subjects who select the Direct Procedure against those assigned to it. The last two columns compare the Procedure Preference treatment with the Direct Procedure treatment. Panel A provides the regression coefficients. Panel B details the marginal effects of Procedure Preference for different groups, showing the average change in the dependent variables when procedures switch from being assigned to being selected. All models include a constant term. Control variables consist of cognitive functions (selective attention and working memory), demographic factors (age, gender, education), and attitude toward inconsistency. Robust standard errors are reported in parentheses.

5 Further Discussion

This section extends our investigation in three directions to deepen our understanding of sequential elimination: the relationship between decision time and economic rationality, the deliberation during choice procedures, and the effect of choice revision under limited attention. We culminate in insights into the descriptive and normative roles of choice procedures.

5.1 Decision Time and Economic Rationality

We find that Sequential Elimination increases decision time as compared with the Direct Procedure, with average durations of 11.217 minutes vs. 7.474 minutes for the twenty decision problems. This pattern is similar among both low- and high-IQ subjects (see Appendix Table C.1). Regression results at the decision problem level, presented in Table 4, confirm this effect, with no significant interaction by IQ groups or decision problem order. This raises the key question of whether longer decision times are associated with economic rationality. While findings from the cognitive sciences typically indicate the role of increased time in reducing errors, this is yet to be established in conditions marked by limited attention.

Our results show that longer decision times correlate with fewer GARP violations and a lower HMI (see Appendix Table D.6). For instance, a one-standard-deviation increase in decision time reduces GARP violations by 2.789 ($se = 1.346$), an effect comparable to that of age, albeit considerably smaller than those of having high-IQ or of Sequential Elimination among low-IQ (Column 2).[24] This aligns with prior insights on the role of decision time. Of further relevance, our main findings on Sequential Elimination across the measures hold when controlling for decision time, although the

TABLE 4. Impact of Sequential Elimination on decision time.

	Decision Time			
	(1)	(2)	(3)	(4)
Sequential Elimination	0.182	0.189	0.202	0.159
	(0.049)	(0.049)	(0.080)	(0.077)
High-IQ	-0.049	0.001	0.013	0.001
	(0.049)	(0.043)	(0.056)	(0.043)
Decision Order	0.001	0.001	0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.001)
Sequential Elimination × High-IQ			-0.026	
			(0.089)	
Sequential Elimination × Decision Order				0.003
				(0.006)
Decision Problem Fixed Effects	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes
Observations	2960	2960	2960	2960

Note: This table presents GLS regression results examining the impact of Sequential Elimination on decision time (measured in minutes). Each observation corresponds to the time a subject spends on a specific decision problem. The decision order variable indicates the numerical position of the decision problem as presented to the subject. All models include a constant term. Control variables consist of cognitive functions (selective attention and working memory), demographic factors (age, gender, education), and attitude toward inconsistency. Standard errors, clustered at the individual level, are reported in parentheses.

[24] Our data reflect a positive relationship between age and rationality, in line with Dean and Martin (2016), but contrasts with Choi et al. (2014) and Echenique, Imai, and Saito (2023), potentially due to the younger sample, who are less prone to cognitive decline (Rönnlund et al., 2005).

effect on the HMI shows marginal significance.

We additionally incorporate a triple interaction between decision time, Sequential Elimination, and high-IQ to examine whether the effect of decision time varies across these conditions. As shown in Column 2 of Appendix Table D.7, this interaction significantly influences GARP violations (coefficient of 1.888, $se = 1.029$).[25] Figure 3 illustrates that the effect of decision time is most pronounced for low-IQ subjects under Sequential Elimination, where a one-standard-deviation increase reduces GARP violations by 3.046 ($se = 1.759$). In contrast, decision time has a negligible marginal effect on low-IQ subjects under the Direct Procedure. These findings imply that while additional time alone may not necessarily improve decision-making under limited attention, sequential elimination facilitates this effect by mitigating the impediment.

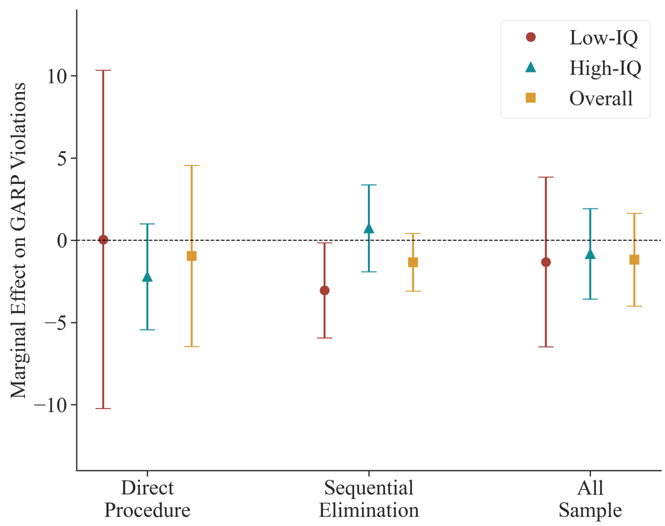


FIGURE 3. Marginal effects of decision time on GARP violations. This figure displays the average marginal effects of decision time on GARP violations, derived from a negative binomial regression that includes all control variables. Results are presented across treatments and IQ groups, with error bars indicating 90% confidence intervals.

[25]No significant effects of this interaction or others related to decision time are found for consistency or HMI, possibly due to the greater sensitivity of the number of GARP violations to marginal changes in decision time.

5.2 Deliberation during Sequential Elimination

We now probe elimination behavior in Sequential Elimination. To ensure comparability across analyses, we focus on the final elimination sequences at the decision problem level, represented by the options' presentation orders. These orders reflect subjects' ultimate decisions and are referred to as *elimination orders*.[26] By design, their counterparts in the Direct Procedure are the orders in which subjects examine options, referred to as *examination orders*. We assess how closely these elimination and examination orders align with the original presentation order using Spearman's correlation. Intuitively, a higher correlation indicates closer adherence to the presentation order.

In the Direct Procedure, the mean Spearman's correlation coefficient is noticeably high at 0.792 ($se = 0.013$), with 85.7% of observations exhibiting a strong correlation (coefficient > 0.5 and p-value < 0.05). This reveals a clear tendency to examine options in the order they are presented, which we interpret as illustrating how individuals typically attend to options in a conventional direct procedure (i.e., one without explicit examination instructions). Conversely, in Sequential Elimination, the mean correlation coefficient is close to zero (0.054, $se = 0.014$), with only 17.7% of observations showing a strong correlation, demonstrating a minimal tendency to eliminate options according to their presentation orders.

Columns 1 and 3 of Table 5 provide compelling evidence from the regression analyses that Sequential Elimination results in a decrease in both Spearman's correlation coefficient and the probability of exhibiting a strong correlation, respectively. Columns 2 and 4 further confirm that this effect is independent of the IQ groups. These findings augment our understanding of Sequential Elimination by indicating that subjects make elimination decisions based on their preferences, reflecting pronounced deliberation throughout the procedure, which is consistent with their observed economic rationality.

Next, we examine whether presentation orders affect final choices differently across the procedures. The mean positions of final choices relative to their presentation orders are 6.089 for the Direct Procedure and 6.099 for Sequential Elimination,

[26] For example, in an elimination sequence like [3,1,2,10,9,5,6,8,11,4,7], the subject eliminates the third option first, then the first option, and so on, in the order presented.

TABLE 5. Comparing choice behavior and choice positions across Sequential Elimination and the Direct Procedure.

	Spearman's Correlation Coefficient		Strong Correlation		Position of Choice	
	(1)	(2)	(3)	(4)	(5)	(6)
Sequential Elimination	-0.748	-0.729	-5.195	-5.207	0.005	-0.087
	(0.046)	(0.067)	(0.345)	(0.497)	(0.126)	(0.182)
High-IQ	-0.019	-0.001	-0.204	-0.215	-0.141	-0.228
	(0.052)	(0.075)	(0.383)	(0.602)	(0.136)	(0.173)
Decision Order	0.001	0.001	0.010	0.010	-0.003	-0.003
	(0.001)	(0.001)	(0.010)	(0.010)	(0.009)	(0.009)
Decision Time	-0.008	-0.008	-0.103	-0.103	-0.039	-0.039
	(0.007)	(0.007)	(0.141)	(0.141)	(0.043)	(0.043)
Sequential Elimination × High-IQ		-0.039		0.022		0.184
		(0.092)		(0.683)		(0.246)
Decision Problem Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Log Likelihood			-1014.815	-1014.815		
Observations	2960	2960	2960	2960	2960	2960

Note: This table examines the deliberation of elimination behavior under Sequential Elimination in comparison to the examination behavior under the Direct Procedure. Each observation corresponds to a subject's behavior on a single decision problem. Columns 1 and 2 present GLS regression results for Spearman's correlation coefficients between elimination/examination orders and presentation orders. Columns 3 and 4 display panel logistic regression results for a binary variable indicating a *strong correlation*, with 1 indicating a Spearman's correlation coefficient greater than 0.5 and statistically significant at $p < 0.05$ and 0 otherwise. Columns 5 and 6 provide GLS regression results for the positions of chosen options within their presentation orders. All models include a constant term. Control variables consist of cognitive functions (selective attention and working memory), demographic factors (age, gender, education), and attitude toward inconsistency. Standard errors, clustered at the individual level, are reported in parentheses.

both not significantly different from the midpoint of 6 (Wilcoxon signed-rank tests: Direct Procedure, $p = 0.300$; Sequential Elimination, $p = 0.239$). Meanwhile, the regression analyses in Table 5 show no notable differences in choice position between the procedures (Column 5), nor do they indicate any interaction effects associated with IQ groups (Column 6). In other words, the observed differences in economic rationality between the two procedures are not due to presentation order effects but rather to the inherent challenges of making final decisions in the Direct Procedure, where limited attention persists.

5.3 Choice Revision under Limited Attention

To comprehensively understand choice revision under limited attention, we examine its effect through the triple interaction with Sequential Elimination and high-IQ, accounting for their potential interplay. As detailed in Appendix Table D.8, the results contribute preliminary evidence of revisions enhancing rationality in compliance with FSD under limited attention, a pattern aligning with prior research.

Specifically, significant interaction coefficients between revision and high-IQ are observed for FSD-consistency (1.139, $se = 0.619$) and FSD-HMI (-0.500, $se = 0.276$), as shown in Columns 4 and 6. The estimates in these columns further indicate that, for high-IQ subjects, choice revision corresponds to a marginally significant increase in FSD-consistency of 0.101 ($se = 0.066$) and a significant reduction in FSD-HMI by 0.380 ($se = 0.205$). One sensible interpretation is that while FSD-related deviations may stem from factors beyond limited attention, cognitively adept individuals can leverage revisions to refine their choices, consequently reducing these deviations.

For low-IQ subjects in the Direct Procedure, who are most affected by limited attention, we find no evidence of improvement in their primary measures attributable to choice revision, with only a suggestive increase in FSD-consistency of 0.101 ($se = 0.068$). These results point to the persistence of limited attention as a key barrier to economic rationality, indirectly reinforcing the significance of the observed effect of sequential elimination.

5.4 Descriptive and Normative Roles

Our findings are central to the fundamental discussion in economics on reconciling choice inconsistencies with preference maximization. While prior research has primarily explored how choice procedures *describe* these inconsistencies (e.g., Manzini and Mariotti, 2007; Masatlioglu and Nakajima, 2007; Masatlioglu, Nakajima, and Ozbay, 2012), we take an alternative approach by examining how such procedures can *shape* economic rationality. In doing so, we show that those choice inconsistencies and corresponding procedures are not entrenched characteristics of individual behavior.

It can be argued that the normative appeal of choice procedures enhances their descriptive roles. The Procedure Preference treatment indicates that subjects who select Sequential Elimination tend to benefit the most, *as if* such selections are rationalized by the benefits. Our findings thus complement existing descriptive theories by providing new insights into when procedures can effectively describe choice behavior. By raising public awareness of their benefits, choice procedures may gain wider adoption and develop to better support decision-making. This fortifies the pivotal role of economic research in elucidating how choice procedures work and advancing their applications to improve welfare.

6 Related Literature

This paper builds upon the growing literature on limited attention models, where DMs are typically assumed to choose directly from their consideration sets (e.g., Masatlioglu, Nakajima, and Ozbay, 2012; Dean, Özgür Kıbrıs, and Masatlioglu, 2017; Lleras et al., 2017). For instance, Eliaz and Spiegler (2011) examine the role of consideration sets in market competition. Models by Manzini and Mariotti (2014), Caplin, Dean, and Leahy (2018), and Cattaneo et al. (2020) propose that consideration sets arise stochastically. More closely related to our work, Dardanoni et al. (2020) attribute variation in consideration set sizes to cognitive heterogeneity. Leveraging these insights, we introduce the minimum attention property to formalize limited attention and thus uncover how it can be mitigated through choice procedures.

Our research also relates to models of elimination-based choice models. Masatlioglu and Nakajima (2007) propose a model where a DM selects all the remaining alternatives after eliminating those dominated by others, according to certain comparison criteria (which depend on the menu). Alternative models describe elimination behaviors based on multiple acyclic relations (Manzini and Mariotti, 2007), a checklist of desirable properties (Mandler, Manzini, and Mariotti, 2012), or a specific order of binary comparisons (Apesteguia and Ballester, 2013). While these approaches diverge from the standard premise of preference maximization to accommodate choice inconsistencies, our framework stems from a distinct aim—improving economic rationality by mitigating cognitive limitations.

This work also benefits from research in marketing and psychology, which indicates that elimination-based approaches prompt participants to consider more options in judgment tasks than direct or inclusion-based ones (Yaniv and Schul, 1997; Sokolova and Krishna, 2016). In the field of economics, Besedeš et al. (2015) show that a *sequen-*

tial tournament procedure—where subjects first select from smaller sets of four options across four rounds, followed by a final round with the previously chosen options—leads to more optimal choices (those with the highest reward probabilities) than when choosing directly from larger sets of sixteen options. Their finding can be reconciled within our framework under the stronger assumption that the DM can simultaneously compare at least four options. Furthermore, our theoretical argument for sequential elimination extends to a specific sequential tournament involving only rounds of binary choices. However, this may require prior ordering or randomization, which could be more costly or introduce context effects. In contrast, sequential elimination offers a more parsimonious approach, granting individuals autonomy over the process.

A considerable body of research has explored the determinants of economic rationality, demonstrating the roles of education (Harbaugh, Krause, and Berry, 2001), market experience (List and Millimet, 2008), and cognitive ability (Burks et al., 2009). Large-scale population studies find that levels of rationality tend to be lower among socioeconomically disadvantaged or older households (Echenique, Lee, and Shum, 2011; Choi et al., 2014), while elite law students (Fisman et al., 2015) and retirement-age households (Dean and Martin, 2016) reveal higher levels. Recent findings by Echenique, Imai, and Saito (2023) strengthen evidence of a positive association between rationality and cognitive ability, alongside negative associations with age and unemployment. Additionally, Cappelen et al. (2023) document a pronounced rationality gap between elite students from developed and developing economies.

Finally, our research contributes to a relatively underexplored area of research on improving economic rationality, despite its central importance. Notably, Kim et al. (2018) provides causal evidence from a field experiment in Malawi, demonstrating the role of education in such improvements, partly by enhancing cognitive ability. Banks, Carvalho, and Perez-Arce (2019), however, find no significant impact of a policy change in compulsory schooling in England on rationality among the affected groups. More recently, Halevy and Mayraz (2022) observe a strong preference for rule-based over case-by-case investment decisions, particularly when simpler rules are involved. Compared to these studies, this paper leverages a consistent theoretical and experimental framework, offering a choice-theoretical model that yields testable implications for both experimental and applied settings.

7 Concluding Remarks

This paper presents a theoretical foundation and experimental validation for the efficacy of sequential elimination—an appealingly simple choice procedure grounded in economics and the cognitive sciences—in improving economic rationality under limited attention. We develop a choice-theoretical framework that elucidates the instrumental role of sequential elimination in establishing choice consistency with preference maximization. Causal evidence for a sequential elimination effect is obtained for subjects engaged in a randomized controlled experiment involving risky decision-making, with significant economic implications for individuals facing cognitive limitations.

Our research provides actionable insights for policymakers. Sequential elimination stands out for its intuitive mechanism and relatively low implementation costs, making it adaptable across domains where decisions have welfare consequences, such as financial or healthcare choices. These features are especially valuable for socioeconomically disadvantaged groups. Expanding individuals' procedural options to include sequential elimination arguably imposes little or no harm, as the ultimate choice to employ it hinges on their preferences. While the procedure is remarkably accessible to those with limited cognitive abilities, more cognitively adept individuals may enhance efficiency by eliminating multiple alternatives at once. Future research could explore variations of the procedure to maximize its efficiency.

In addition to decision-making under risk, examining the robustness of sequential elimination across various choice domains—such as consumer goods, intertemporal choices, and altruistic choices—would be valuable. Field studies into sequential elimination also present a promising research avenue. Perhaps more importantly, these lines of research may inspire new choice procedures that yield economically meaningful improvements, particularly for individuals contending with challenges beyond limited attention.

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Supplemental Appendix

A Theoretical Details

A.1 Proof of Proposition 1

Let c be a choice function. Consider the following conditions:

[1] c satisfies GARP.

[2] There exists a preference relation $\succeq$ on X such that for all $A \in \mathscr{X}$, $c(A) \in \{x \in A | x \succeq y \ \forall y \in A\}$.

[3] c is a choice by sequential elimination.

By Theorem 1 of Nishimura, Ok, and Quah (2017), [1] holds if and only if [2] holds. Therefore, we will show that [3] holds if and only if [2].

[3] implies [2]. Suppose that [3] is true. Define $\gamma(A) = A$ for all $A \in \mathscr{X}$. Given c, construct an elimination function e such that for all $A \in \mathscr{X}$: if $|A| \geq 2$, then $e(A) = (e_1(A), ..., e_{|A|-1}(A), c(A))$ with $\bigcup_{r=1}^{|A|}\{A_r\} = A$; if $|A| = 1$, then $e_1(A) = c(A)$. For all A and $r = 1, ..., |A|$, we have $e_r(A) \in \gamma(A_r)$ (Definition 3 (i)); $\{x \in \gamma(A_r) | x \succeq e_r(A), x \neq e_r(A)\} \neq \emptyset$ if $|A_r| \geq 2$ (Definition 3 (ii)); and $e_{|A|}(A) = c(A)$ (Definition 3 (iii)). Thus, c is a choice by sequential elimination.

[2] implies [3]. Suppose that [2] is true. Let $\succeq$, γ, and e be the preference relation, consideration set mapping, and elimination function that satisfy the conditions in Definition 3. Suppose by contradiction that there exists some A such that $c(A) = e_{|A|} \notin \{x \in A | x \succeq y \ \forall y \in A\}$. Since $\succeq$ is complete and transitive, $\{x \in A | x \succeq y \ \forall y \in A\} \neq \emptyset$. Then there must exist some $r \in \{1, ..., |A-1|\}$ such that $e_r(A) \in \{x \in A | x \succeq y \ \forall y \in A\}$. Consequently, $\{x \in A_r | x \succeq e_r(A), x \neq e_r(A)\} = \emptyset$, which implies that $\{x \in \gamma(A_r) | x \succeq e_r(A), x \neq e_r(A)\} = \emptyset$, leading to a contradiction to Definition 3 (ii). Therefore, we have that for all $A \in \mathscr{X}$, $c(A) \in \{x \in A | x \succeq y \ \forall y \in A\}$.

A.2 Choice Consistency Respecting FSD

Given that the choice options in our experiment involve only two states of equal probabilities, we focus on $X \in \mathbb{R}^2_+$ and let $\mathscr{X}$ be a nonempty set of nonempty subsets of X. For any two options $x, y \in X$ defined by $x = (x_1, x_2)$ and $y = (y_1, y_2)$, we denote $x \geq_F y$ if $(x_1, x_2) \geq (y_1, y_2)$ or $(x_2, x_1) \geq (y_1, y_2)$; and $x >_F y$ if $x \geq_F y$ but the two options are distinct.

A preference relation $\succeq$ is said to be first-order stochastically monotone if $x \geq_F y$ implies $x \succeq y$ and $x >_F y$ implies $x \succeq y$ but not $y \succeq x$. For any x, y, we denote that xR^D_F (R^S_F, respectively) y if there exist some $A, B \in \mathscr{X}$ and $z \in A$ such that $c(A) = x$, $c(B) = y$, and $z \geq_F$ ($>_F$, respectively) y. We define R_F to be the transitive closure of R^D_F. The FSD-GARP criterion is formally defined as follows.

Definition 4 (FSD-GARP)**.** A choice function c is said to satisfy FSD-GARP if, for any $x, y \in X$, $xR_F y$ implies that $yR^S_F x$ does not hold.

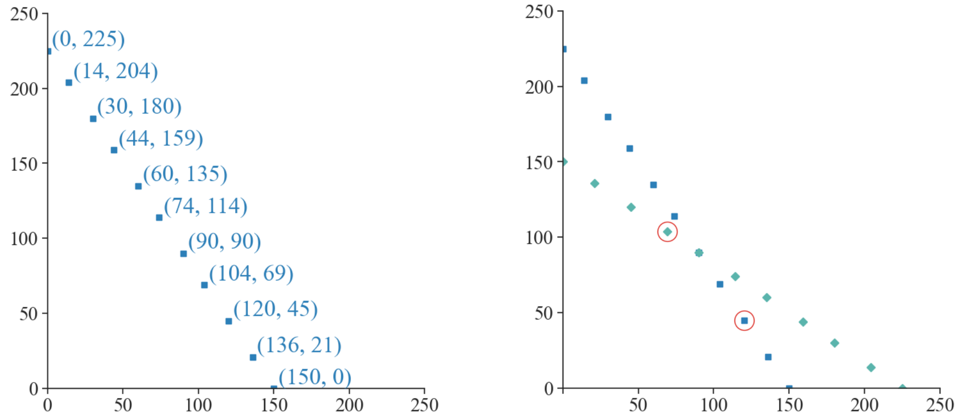
Any first-order stochastically monotone preference relation $\succeq$ on X and any choice function c on $\mathscr{X}$ fall within the primitives of Nishimura, Ok, and Quah (2017). By applying their Theorem 1, a choice function c satisfies FSD-GARP if and only if there exists a first-order stochastically monotone preference relation $\succeq$ on X such that for all $A \in \mathscr{X}$, $c(A) \in \{x \in A | x \succeq y \ \forall y \in A\}$. Moreover, we say that an ordered pair (x, y) constitutes a violation of FSD-GARP if $xR_F y$ and $yR^S_F x$. Note that, by the same logic as in the proofs of Proposition 1 in Appendix A.1, a choice function c satisfies FSD-GARP if and only if c is a choice by sequential elimination with a first-order stochastically monotone preference relation.

B Experimental Design Details

B.1 Decision Problems

TABLE B.1. List of options in decision problems.

Problem	Options
1	[0, 84], [16, 76], [34, 67], [56, 56], [68, 50], [84, 42], [100, 34], [118, 25], [134, 17], [152, 8], [168, 0]
2	[0, 54], [20, 49], [44, 43], [68, 37], [88, 32], [108, 27], [132, 21], [152, 16], [172, 11], [196, 5], [216, 0]
3	[0, 225], [14, 204], [30, 180], [44, 159], [60, 135], [74, 114], [90, 90], [104, 69], [120, 45], [136, 21], [150, 0]
4	[0, 97], [18, 88], [36, 79], [50, 72], [64, 65], [92, 51], [112, 41], [134, 30], [154, 20], [176, 9], [194, 0]
5	[0, 108], [15, 96], [30, 84], [45, 72], [60, 60], [70, 52], [80, 44], [95, 32], [105, 24], [120, 12], [135, 0]
6	[0, 270], [6, 243], [12, 216], [18, 189], [24, 162], [30, 135], [36, 108], [42, 81], [48, 54], [54, 27], [60, 0]
7	[0, 150], [21, 136], [45, 120], [69, 104], [90, 90], [114, 74], [135, 60], [159, 44], [180, 30], [204, 14], [225, 0]
8	[0, 165], [17, 148], [33, 132], [50, 115], [66, 99], [83, 82], [100, 65], [116, 49], [133, 32], [149, 16], [165, 0]
9	[0, 102], [25, 92], [50, 82], [70, 74], [105, 60], [130, 50], [150, 42], [175, 32], [205, 20], [230, 10], [255, 0]
10	[0, 168], [8, 152], [17, 134], [25, 118], [34, 100], [42, 84], [50, 68], [56, 56], [67, 34], [76, 16], [84, 0]
11	[0, 216], [5, 196], [11, 172], [16, 152], [21, 132], [27, 108], [32, 88], [37, 68], [43, 44], [49, 20], [54, 0]
12	[0, 255], [10, 230], [20, 205], [32, 175], [42, 150], [50, 130], [60, 105], [74, 70], [82, 50], [92, 25], [102, 0]
13	[0, 90], [33, 79], [66, 68], [90, 60], [111, 53], [135, 45], [162, 36], [189, 27], [216, 18], [243, 9], [270, 0]
14	[0, 270], [9, 243], [18, 216], [27, 189], [36, 162], [45, 135], [53, 111], [60, 90], [68, 66], [79, 33], [90, 0]
15	[0, 60], [27, 54], [54, 48], [81, 42], [108, 36], [135, 30], [162, 24], [189, 18], [216, 12], [243, 6], [270, 0]
16	[0, 194], [9, 176], [20, 154], [30, 134], [41, 112], [51, 92], [65, 64], [72, 50], [79, 36], [88, 18], [97, 0]
17	[0, 135], [12, 120], [24, 105], [32, 95], [44, 80], [52, 70], [60, 60], [72, 45], [84, 30], [96, 15], [108, 0]
18	[0, 58], [25, 53], [45, 49], [80, 42], [115, 35], [145, 29], [175, 23], [205, 17], [230, 12], [260, 6], [290, 0]
19	[0, 290], [6, 260], [12, 230], [17, 205], [23, 175], [29, 145], [35, 115], [42, 80], [49, 45], [53, 25], [58, 0]
20	[0, 195], [20, 175], [39, 156], [59, 136], [78, 117], [96, 99], [118, 77], [137, 58], [157, 38], [176, 19], [195, 0]



(a) Decision problem

(b) GARP violation

FIGURE B.1. Graphical illustrations of a decision problem and a GARP violation. In panel (a), the squares represent a menu of options in a two-dimensional space, randomly ordered during the experiment. In panel (b), the squares and diamonds depict the two distinct menus, with the circles indicating a pair of choices that violate consistency with preference maximization, or equivalently, a GARP violation.

B.2 Experimental Instructions

B.2.1 Introduction

Welcome to our study on decision-making.

The study consists of three sections. In Section 1, you will make a series of economic decisions. In Section 2, you will participate in some cognitive tasks. In Section 3, you will be asked to imagine yourself in some hypothetical scenarios and answer a few questions related to those scenarios. Detailed instructions will be provided at the beginning of each section.

You will receive £3 as a participation fee for completing the study. You will also earn an additional payment of up to £14.6 depending partly on your decisions and partly on chance. You will be paid within 3 working days after completing the study.

Please pay careful attention to the instructions. During the study, we will speak in terms of experimental tokens instead of pounds. The sum of tokens you earn in the experiment will be converted to pounds at the following rate:

25 tokens= £1

Important: Once you have moved on to the next question, you **cannot** go back and change your choice. Do not close the web browser at any time!

B.2.2 Experimental Section 1

Section 1 consists of two blocks, Blocks A and B. Each block consists of 21 decision problems that share a common format. An example of the decision problem will be provided at the beginning of each block.

In each decision problem, you will be asked to choose **one** option out of multiple options. An option [X, Y] indicates that you will earn either X tokens or Y tokens with **the same** probability. For instance, the option [24, 32] indicates that you will earn 24 tokens with probability 50% and 32 tokens with probability 50%.

In each decision problem, you are encouraged to examine all options and should choose only one option that you prefer. There is no right and wrong answer to each decision problem. We are interested in studying your preferences.

We use the following method to determine your payment in Section 1: At the end of Section 1, you will be asked to make a choice between Blocks A and B for your payment. At the end of the experiment, one of the 21 problems from the block you choose will be drawn at random. Each problem has **the same** probability of being drawn. You will earn tokens according to your choice in this randomly drawn problem.

You will earn real money, depending on your decisions. Please make careful decisions. Please answer the following questions to confirm that you have understood the instructions.

1. For an option [X, Y], which one of the following statements is correct? [*I will earn X tokens and Y tokens at the same time*, *I will earn X tokens and Y tokens with the same probability*, or *I will be more likely to earn X tokens than to earn Y tokens*].

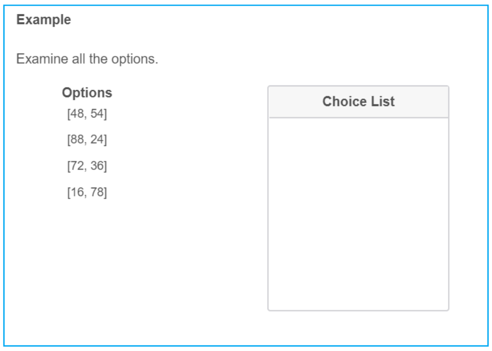
2. Which block will determine your payment in Section 1? [*Both Blocks A and B*, *Only Block A*, or *Only the block that I choose*].

3. Which one of the following statements is not correct? [*I will choose the decision problem for payment by myself*, *Only one decision problem will be drawn for payment*, or *The decision problem for payment will be randomly drawn by the computer*].

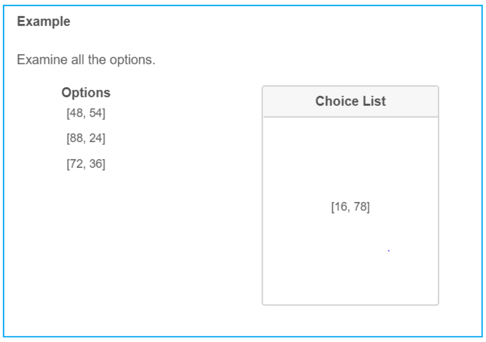
If you are ready, please click on ”Next” to proceed to the Block A of Section 1.

B.2.2.1 Direct Procedure (Block A)

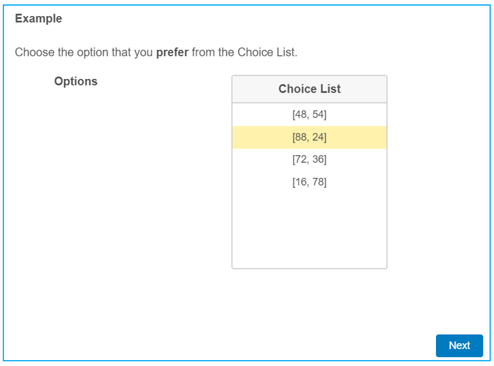
In this block, you will participate in 21 decision problems. You will make decisions by a procedure called “**sequential examination**.” You will be asked to sequentially examine, one by one, options by clicking on them. Then you will be asked to choose only **one** option that you **prefer**. Below, you can see an example of sequential examination:



For instance, if you have examined the option [16, 78], you can click on it. It will then be moved to the “**Choice List**.”



You should examine all the options by clicking on them. Then you can choose the option that you prefer from the “**Choice List**” by clicking on it. Your final choice will be highlighted in yellow. For instance, in the screen below, your choice is [88, 24].



You should click on “Next” to confirm your choice and proceed to the next problem.

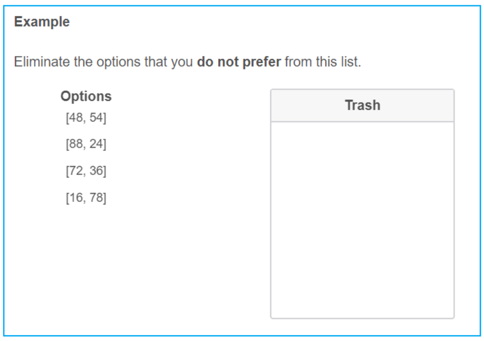
Regarding payment, suppose that you choose [88, 24] by sequential examination. If you are paid according to this choice, you would receive 88 tokens with 50% probability and 24 tokens with 50% probability.

To familiarize you with the decision problems, you will have a practice problem. It will not affect your payment. Then you will be asked to complete all the problems.

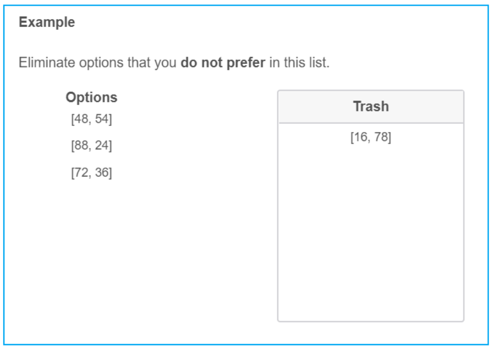
B.2.2.2 Sequential Elimination (Block A)

In this block, you will participate in 21 decision problems. You will make decisions by a procedure called “**sequential elimination**.” You will be asked to sequentially eliminate, one by one, the options that you do not prefer by clicking on them, until only **one** option remains. The **last remaining option** is your **choice** in the decision problem.

Below, you can see an example of sequential elimination:

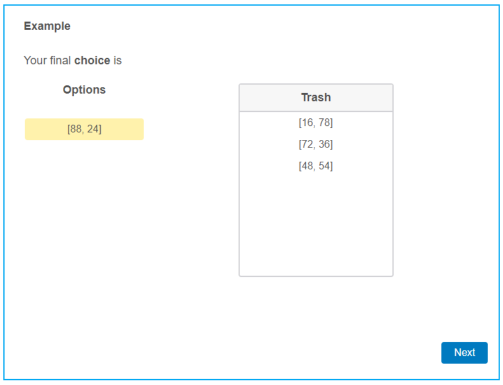


For instance, if you eliminate [16, 78] by clicking on it, it will be moved to the “**Trash**.”



Note that you can **recover** the options in the Trash by clicking on them. For example, if you click on [16, 78] in the Trash, it will be moved back to the “Options.”

Regarding your choice, you should eliminate options until only **one** option remains. For instance, in the screen below, suppose that you have eliminated [16, 78], [72, 36], and [48, 54]. As a result, the **last remaining** [88, 24] is your final **choice** in this problem. Your final choice is highlighted in yellow.



You should click on “Next” to confirm your choice and proceed to the next problem.

Regarding payment, suppose that you choose [88, 24] by sequential elimination. If you are paid according to this choice, you would receive 88 tokens with 50% probability and 24 tokens with 50% probability.

To familiarize you with the decision problems, you will have a practice problem. It will not affect your payment. Then you will be asked to complete all the problems.

B.2.2.3 Procedure Preference (Block A)

First, you have to make a choice between two choice procedures: sequential examination and sequential elimination. The two procedures will be explained below with examples. Then you will participate in 21 decision problems using the procedure chosen by you.

1) **Sequential Examination**: You will be asked to sequentially examine, one by one, options by clicking on them. Then you will be asked to choose only **one** option that you **prefer**. [*Detailed instructions are same as in Section B.2.2.1*].

2) **Sequential Elimination**: You will be asked to sequentially eliminate, one by one, the options that you do **not prefer** by clicking on them, until only one option remains. The **last remaining option** is your **choice** in the decision problem. [*Detailed instructions are same as in Section B.2.2.2*].

To familiarize you with the decision problems, you will have a practice problem for each procedure. It will not affect your payment. Then you will be asked to choose a procedure and complete all the problems.

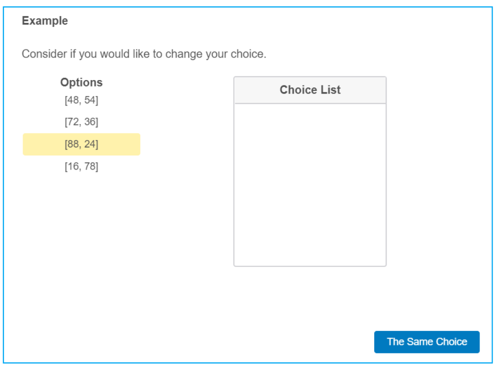
B.2.2.4 Procedure Preference (Procedure Selection)

Please indicate which procedure you would like to use in Section 1. [*Sequential Examination* or *Sequential Elimination*].

B.2.2.5 Choice Revision (Block B)

In this block, you will confront the **same** 21 decision problems as those in Block A. You will see your choice from the corresponding problem in Block A highlighted in yellow. You will be asked to consider if you would like to change your choice.

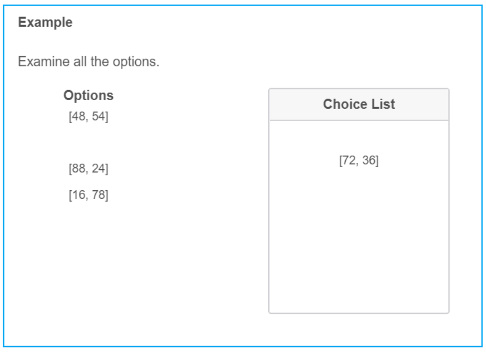
Below, you can see an example of Block B problem:



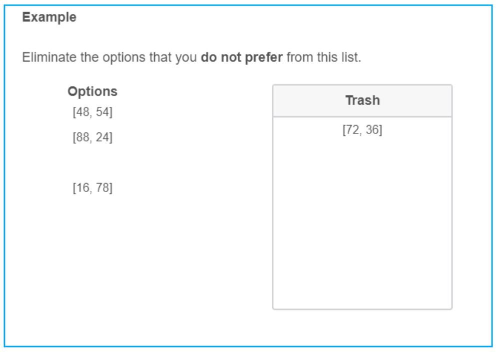
You can choose the same option as you chose in the corresponding problem in

Block A by clicking on "The Same Choice." For instance, if you click on "The Same Choice" in this problem, your choice is [88, 24] and you will proceed to the next problem directly.

If you want to change your choice, you can click on **any** option on the list. Then you can start again the [sequential examination (the Direct Procedure) / sequential elimination (Sequential Elimination)]. For instance, if you click on [72, 36], you will see the screen below [Figure B.2(a) (the Direct Procedure) / Figure B.2(b) (Sequential Elimination)].



(a) Choice revision in the Direct Procedure



(b) Choice revision in Sequential Elimination

FIGURE B.2. Screenshots for choice revision instructions.

Regarding payment, suppose that this time you choose [48, 54]. If you are paid according to this choice, you would receive 48 tokens with 50% probability and 54 tokens with 50% probability.

To familiarize you with the decision problems, you will have a practice problem. It will not affect your payment. Then you will be asked to complete all the problems. **Remember** that we will ask you to choose between Blocks A and B for payment at the end of Section 1.

B.2.2.6 Payment Block Selection

Please indicate which block you would like to choose for your payment in Section 1. [*Block A* or *Block B*].

B.2.3 Experimental Section 2

This section has three cognitive tasks. Your payment in this section will depend on your performance in the three tasks. Each task has a different number of questions. At the end of the experiment, the computer will randomly draw three questions from all the tasks with equal probability. For each correct answer to the random three questions, you will receive 25 tokens.

B.2.4 Experimental Section 3

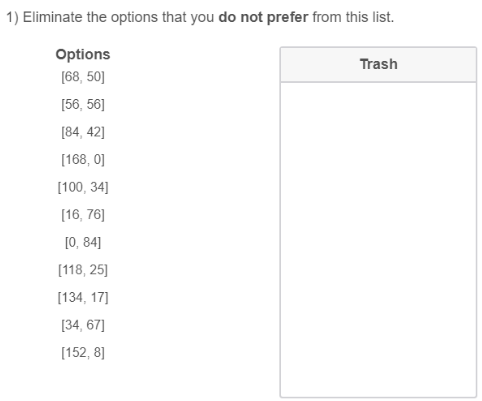
Question 1 (attitude toward inconsistency). Imagine that you are at a cinema and wish to buy some popcorn. The cinema sells small tubs of popcorn for £3 and large ones for £7. Suppose that you choose the small one. Now consider a different situation. The cinema sells small tubs for £3, medium ones for £6.50, and large ones for £7. This time you choose the large one.

In the first case, you prefer the small size to the large. In the second case, your choice suggests the opposite. How at ease do you feel with your choices? Please rate how at ease you feel on the scale provided. A rating of 0 means that you are not at all at ease with one or more of your choices and would really like to make changes. A rating of 10 means that you could not be more at ease and have no wish to change anything.

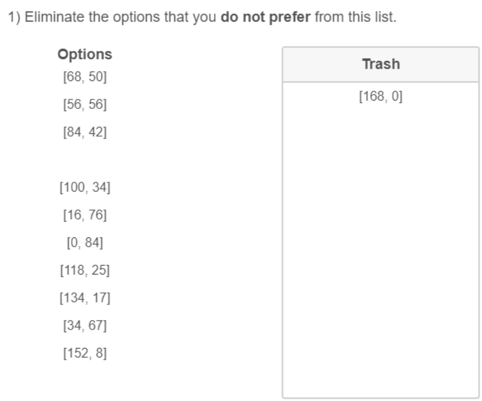
Question 2 (sunk cost fallacy). Imagine that you have spent £50 on a ticket for concert A and £100 on a ticket for concert B. You really prefer A to B, but you have discovered that the two concerts are to take place exactly at the same time on the same day. You cannot obtain a refund or sell the tickets. Which concert would you go to? [*Concert A* or *Concert B*].

Question 3 (consequentialism). Imagine two trips you may make this summer. You plan Trip 1 by yourself. Someone plans Trip 2 for you. The plans for both trips are the same. You will visit the same places, take the same photos, and enjoy the same foods. In other words, you will enjoy the same experiences on both trips. Which trip do you prefer to go to? [*Trip 1*, *Trip 2*, or *I am indifferent between the two trips*].

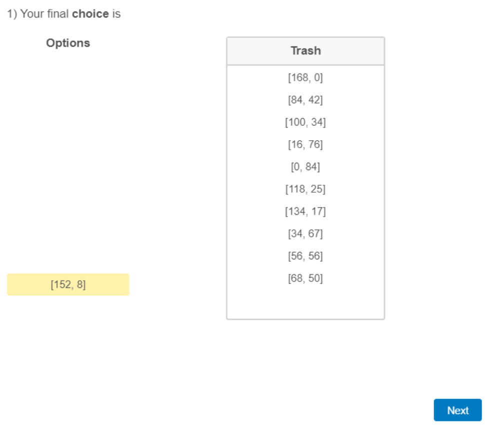
B.3 Screenshots



(a) Initial screen



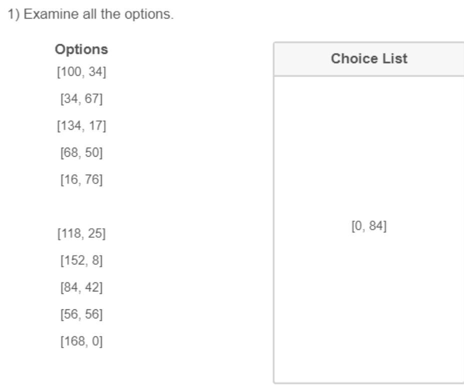
(b) An option is eliminated



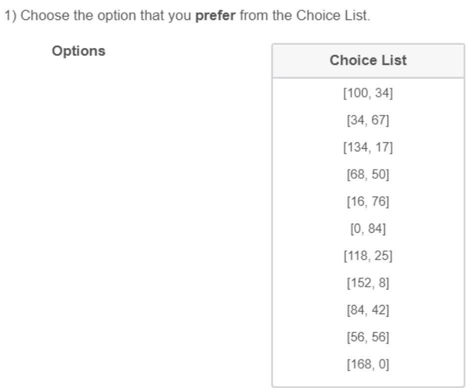
(c) Making a choice

FIGURE B.3. Screenshots of Sequential Elimination.

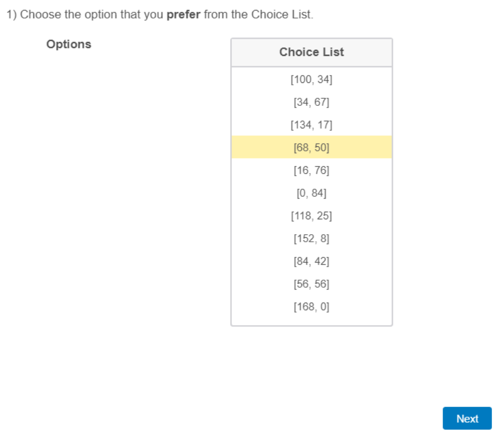
(a) Initial screen



(b) An option is examined



(c) All options are examined



(d) Making a choice

FIGURE B.4. Screenshots of the Direct Procedure.

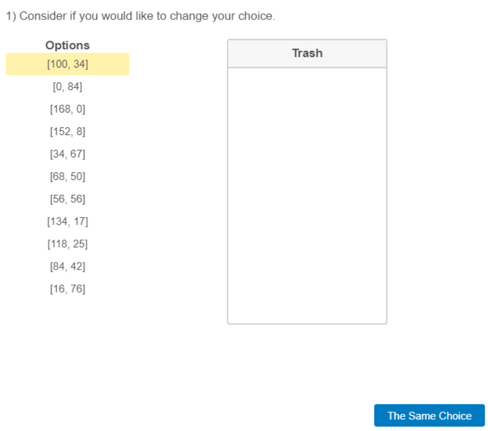
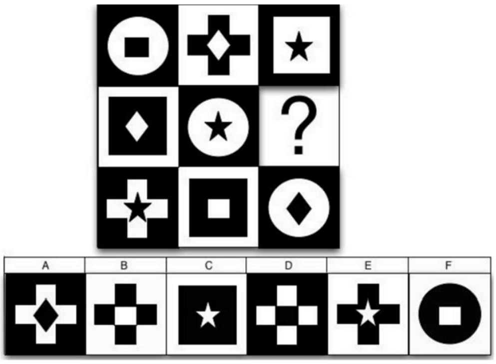
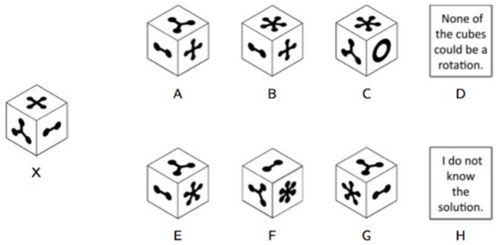


FIGURE B.5. Screenshot of choice revision.

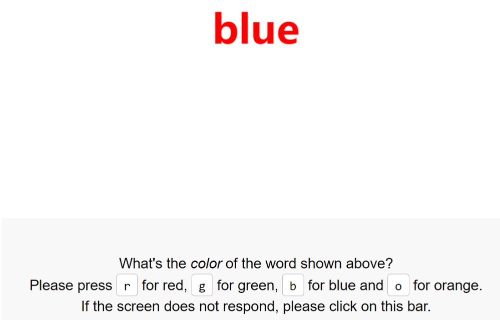


(a) Matrix reasoning problem



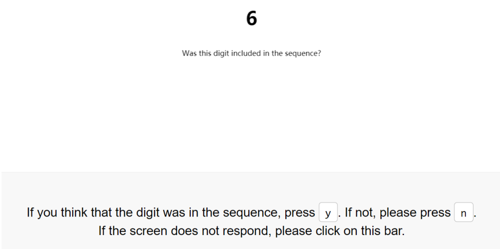
(b) Three-dimensional rotation problem

FIGURE B.6. Screenshots of ICAR test.

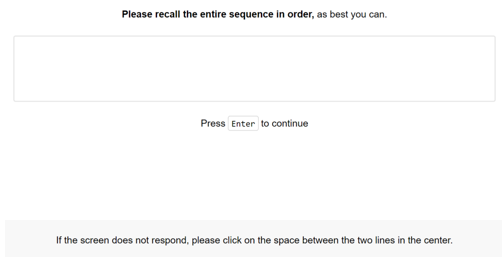


(a) Stroop test

(b) Sternberg test (memorization)



(c) Sternberg test (recall 1)



(d) Sternberg test (recall 2)

FIGURE B.7. Screenshots of cognitive function tests.

C Sample Details

C.1 Descriptive Statistics

TABLE C.1. Sample descriptive statistics.

Variable	Sequential Elimination (SE)	Direct Procedure (DP)	Procedure Preference (PP)	SE vs. DP	SE vs. PP	PP vs. DP
Age	24.712	23.147	23.360	1.566	1.352	0.213
	(0.967)	(0.587)	(0.726)	(1.131)	(1.209)	(0.933)
Female	0.507	0.520	0.480	-0.013	0.027	-0.040
	(0.059)	(0.058)	(0.058)	(0.083)	(0.083)	(0.082)
Education	2.603	2.453	2.240	0.149	0.363	-0.213
	(0.184)	(0.186)	(0.175)	(0.262)	(0.254)	(0.255)
Attitude toward Inconsistency	5.329	5.800	5.240	-0.471	0.089	-0.560
	(0.341)	(0.335)	(0.289)	(0.478)	(0.447)	(0.442)
IQ	4.562	4.907	4.747	-0.345	-0.185	-0.160
	(0.3)	(0.265)	(0.296)	(0.4)	(0.421)	(0.397)
Selective Attention	16.616	17.173	17.680	-0.557	-1.064	0.507
	(0.491)	(0.394)	(0.357)	(0.629)	(0.607)	(0.531)
Working Memory	6.096	6.213	6.547	-0.117	-0.451	0.333
	(0.273)	(0.25)	(0.28)	(0.37)	(0.391)	(0.375)
Decision Time (Overall)	11.217	7.474	8.86	3.743	2.357	1.386
	(0.945)	(0.402)	(0.622)	(1.026)	(1.131)	(0.741)
Decision Time (Low-IQ Subjects)	11.867	7.777	7.888	4.09	3.979	0.111
	(1.599)	(0.713)	(0.561)	(1.751)	(1.695)	(0.907)
Decision Time (High-IQ Subjects)	10.430	7.224	9.914	3.206	0.516	2.691
	(0.792)	(0.443)	(1.129)	(0.907)	(1.379)	(1.213)
Observations	73	75	75	148	148	150

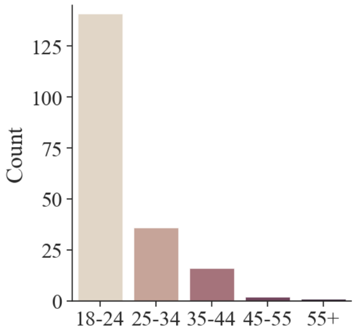
Note: This table summarizes the means of key variables and their differences across treatments. The variable *education* is coded numerically based on the highest level of education attained: 1="High school diploma/A-levels/Secondary education", 2="Technical/community college", 3="Undergraduate degree", 4="Graduate degree", 5="Doctorate degree." Decision time is measured in minutes. Standard errors are reported in parentheses.

TABLE C.2. Breakdown of observations.

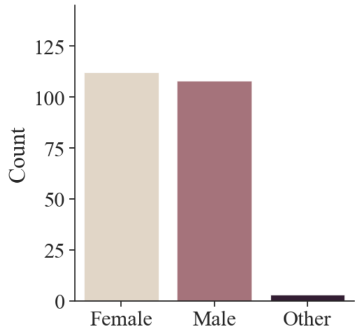
	Sequential Elimination (SE)	Direct Procedure (DP)	Procedure Preference (PP)	SE Selected in PP	DP Selected in PP
Low-IQ	40 (55%)	34 (45%)	39 (52%)	32 (65%)	7 (27%)
High-IQ	33 (45%)	41 (55%)	36 (48%)	17 (35%)	19 (73%)
Total	73 (100%)	75 (100%)	75 (100%)	49 (100%)	26 (100%)

Note: The table presents the number of observations by treatment and IQ groups, with percentages of subjects in each IQ group within each treatment reported in parentheses.

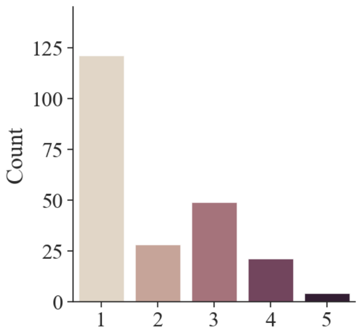
C.2 Histograms



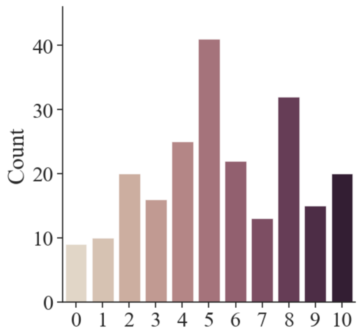
(a) Age



(b) Gender

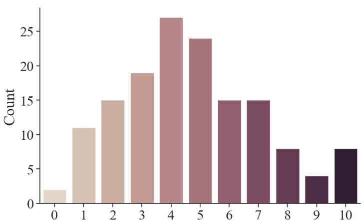


(c) Education

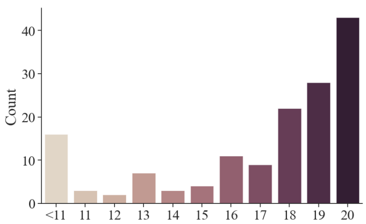


(d) Attitude toward inconsistency

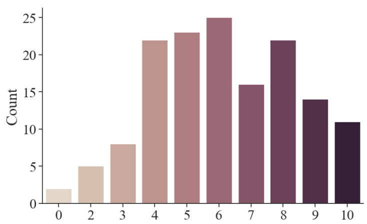
FIGURE C.1. Histograms of individual characteristics. The variable *education* is coded numerically based on the highest level of education attained: 1=“High school diploma/A-levels/Secondary education”, 2=“Technical/community college”, 3=“Undergraduate degree”, 4=“Graduate degree”, 5=“Doctorate degree.”



(a) IQ



(b) Selective attention



(c) Working memory

FIGURE C.2. Histograms of cognitive ability measures.

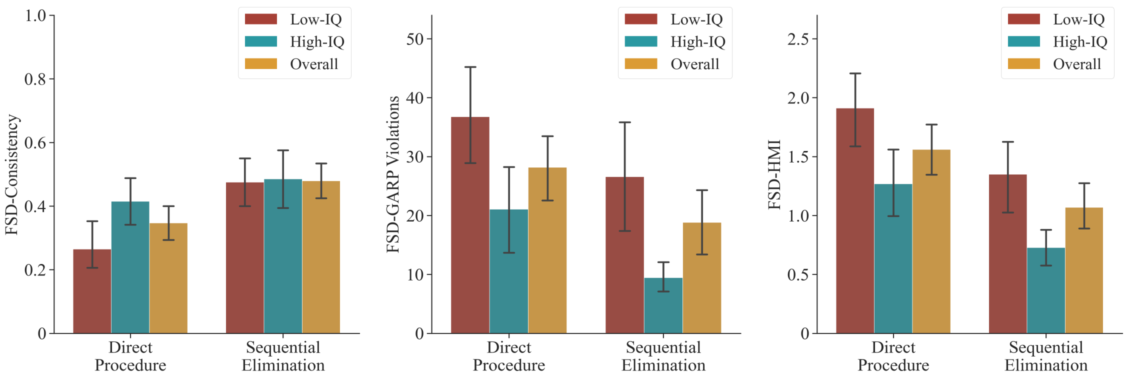
D Supplementary Experimental Results

D.1 Effect of Sequential Elimination

TABLE D.1. Economic rationality by IQ groups in the Direct Procedure.

	Overall Mean	Low-IQ Mean	High-IQ Mean	Low-IQ vs. High-IQ Mean Difference	Low-IQ vs. High-IQ *p*-value
	(1)	(2)	(3)	(4)	(5)
Consistency	0.560	0.412	0.683	-0.271	0.019
	(0.058)	(0.086)	(0.074)	(0.113)	
GARP Violations	5.800	9.735	2.537	7.199	0.005
	(1.369)	(2.602)	(1.059)	(2.81)	
HMI	0.640	0.941	0.390	0.551	0.008
	(0.098)	(0.169)	(0.098)	(0.195)	
FSD-Consistency	0.347	0.265	0.415	-0.150	0.174
	(0.055)	(0.077)	(0.078)	(0.109)	
FSD-GARP Violations	28.187	36.765	21.073	15.692	0.015
	(5.701)	(8.619)	(7.508)	(11.43)	
FSD-HMI	1.560	1.912	1.268	0.643	0.033
	(0.22)	(0.323)	(0.296)	(0.438)	
Observations	75	34	41		

Note: This table compares economic rationality between low-IQ and high-IQ subjects in the Direct Procedure across various measures. Column 1 presents the overall mean values, Columns 2 and 3 display group-specific means, and Column 4 shows the differences between these means. Column 5 provides p-values from chi-square tests for consistency and FSD-consistency, as well as from Mann–Whitney U tests for other measures. Standard errors are reported in parentheses.



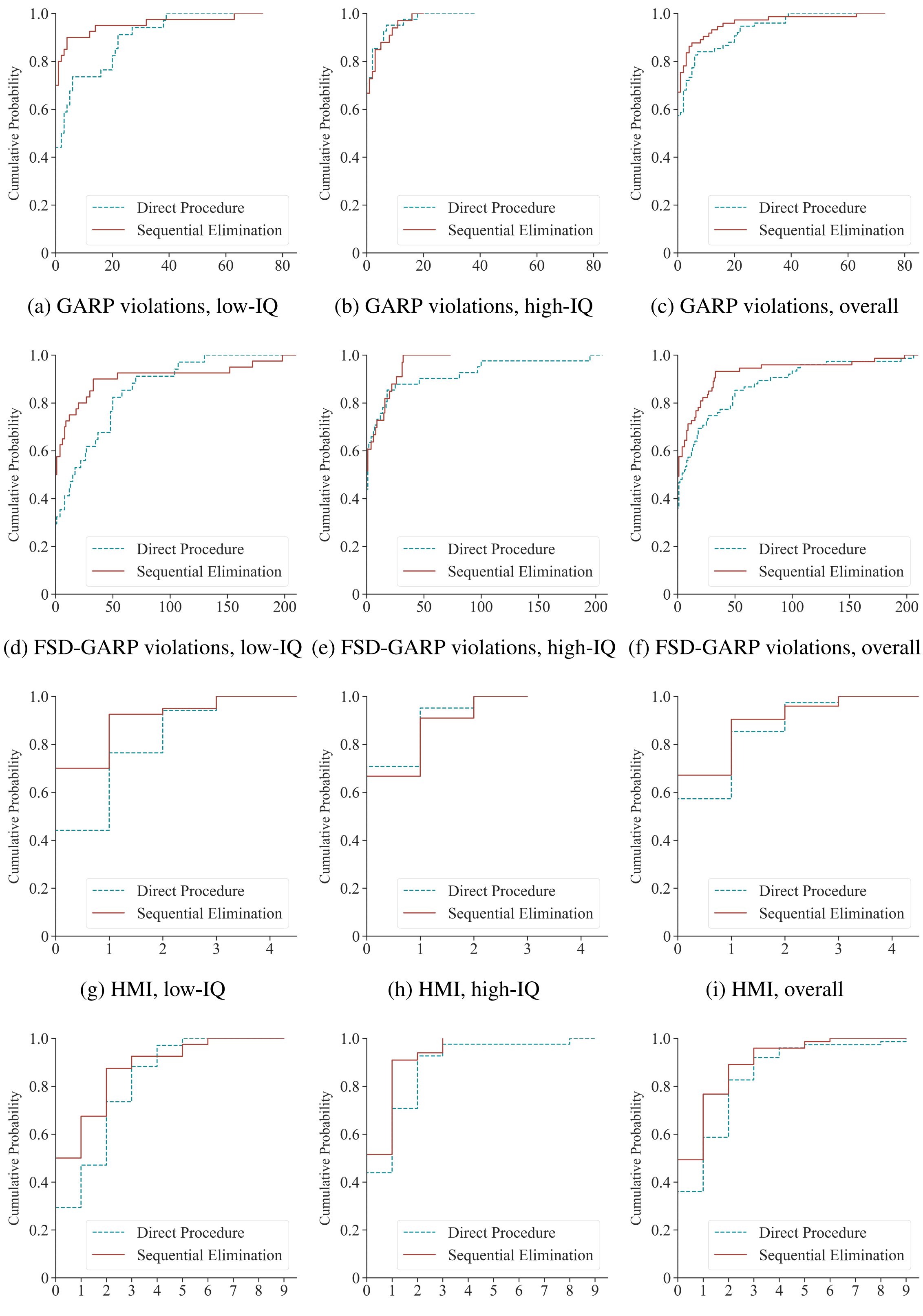
(a) FSD-Consistency (b) FSD-GARP violations (c) FSD-HMI

FIGURE D.1. Economic rationality in compliance with FSD across treatments. Mean values of rationality measures respecting FSD for low-IQ, high-IQ, and overall subjects in each treatment group are shown, with error bars representing the standard errors.

TABLE D.2. Comparison of FSD-consistency and consistency across groups.

	FSD-Consistency vs. Consistency					
	Overall		Sequential Elimination		Direct Procedure	
	Mean Diff.	*p*-value	Mean Diff.	*p*-value	Mean Diff.	*p*-value
	(1)	(2)	(3)	(4)	(5)	(6)
Low-IQ Subjects	-0.176	< 0.001	-0.200	0.005	-0.147	0.025
	(0.081)		(0.110)		(0.115)	
High-IQ Subjects	-0.216	< 0.001	-0.152	0.025	-0.268	0.001
	(0.080)		(0.123)		(0.107)	
Overall	-0.196	< 0.001	-0.178	< 0.001	-0.213	< 0.001
	(0.057)		(0.081)		(0.080)	

Note: The table compares FSD-consistency and consistency across different treatments and IQ groups. Odd-numbered columns show mean differences, while even-numbered columns present p-values from paired-sample Wilcoxon tests for distributional differences. Standard errors are reported in parentheses.



(a) GARP violations, low-IQ (b) GARP violations, high-IQ (c) GARP violations, overall

(d) FSD-GARP violations, low-IQ (e) FSD-GARP violations, high-IQ (f) FSD-GARP violations, overall

(g) HMI, low-IQ (h) HMI, high-IQ (i) HMI, overall

(j) FSD-HMI, low-IQ (k) FSD-HMI, high-IQ (l) FSD-HMI, overall

FIGURE D.2. Empirical cumulative distributions of rationality measures across treatments and IQ groups.

TABLE D.3. Effect of Sequential Elimination on economic rationality by tercile IQ groups.

	Consistency	GARP Violations	HMI	FSD-Consistency	FSD-GARP Violations	FSD-HMI
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Regression coefficients						
Sequential Elimination	1.409	-1.587	-0.910	0.420	-0.351	-0.199
	(0.665)	(0.675)	(0.410)	(0.667)	(0.599)	(0.327)
2nd-Tercile-IQ	0.481	-0.288	-0.286	-0.765	0.756	0.387
	(0.601)	(0.518)	(0.324)	(0.650)	(0.434)	(0.299)
3rd-Tercile-IQ	1.963	-2.735	-1.517	0.929	-2.153	-0.825
	(0.850)	(0.826)	(0.616)	(0.718)	(0.631)	(0.432)
Sequential Elimination	-1.124	1.096	0.993	0.839	-1.141	-0.597
$\times$ 2nd-Tercile-IQ	(0.844)	(0.862)	(0.521)	(0.850)	(0.751)	(0.450)
Sequential Elimination	-2.277	2.608	1.625	-1.043	1.780	0.326
$\times$ 3rd-Tercile-IQ	(1.069)	(1.162)	(0.762)	(0.994)	(0.968)	(0.571)
Panel B: Marginal effects of Sequential Elimination						
1st-Tercile-IQ Subjects	0.315	-8.541	-0.549	0.095	-8.205	-0.266
	(0.139)	(4.693)	(0.251)	(0.148)	(13.964)	(0.437)
2nd-Tercile-IQ Subjectss	0.066	-3.124	0.060	0.260	-45.740	-1.194
	(0.118)	(3.297)	(0.230)	(0.107)	(19.068)	(0.498)
3rd-Tercile-IQ Subjectss	-0.156	1.238	0.210	-0.144	10.200	0.088
	(0.143)	(1.124)	(0.174)	(0.166)	(7.611)	(0.325)
Overall	0.093	-3.876	-0.117	0.110	-20.295	-0.594
	(0.076)	(2.244)	(0.136)	(0.078)	(9.666)	(0.270)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Log Alpha		1.709	-1.914		1.473	-0.543
		(0.165)	(1.120)		(0.130)	(0.307)
Log Likelihood	-89.957	-286.748	-141.201	-89.540	-481.450	-220.533
Observations	148	148	148	148	148	148

Note: This table estimates the effect of Sequential Elimination on economic rationality among subjects categorized by IQ score terciles. Columns 1 and 4 present logistic regression results for consistency and FSD-consistency. Columns 2, 3, 5, and 6 display negative binomial regression results for GARP violations, HMI, FSD-GARP violations, and FSD-HMI. Panel A provides the regression coefficients. Panel B details the marginal effects of Sequential Elimination for different groups, showing the average change in the dependent variables when switching from the Direct Procedure to Sequential Elimination across observations. All models include a constant term. Control variables consist of cognitive functions (selective attention and working memory), demographic factors (age, gender, education), and attitude toward inconsistency. Robust standard errors are reported in parentheses.

TABLE D.4. Effect of Sequential Elimination on economic rationality by quartile IQ groups.

	Consistency	GARP Violations	HMI	FSD-Consistency	FSD-GARP Violations	FSD-HMI
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Regression coefficients						
Sequential Elimination	1.412	-1.634	-0.911	0.422	-0.329	-0.200
	(0.666)	(0.638)	(0.409)	(0.667)	(0.590)	(0.325)
2nd-Quartile-IQ	0.097	0.471	-0.022	-1.242	1.269	0.534
	(0.750)	(0.583)	(0.379)	(0.949)	(0.582)	(0.354)
3rd-Quartile-IQ	0.733	-1.148	-0.524	-0.524	0.353	0.264
	(0.666)	(0.546)	(0.370)	(0.717)	(0.486)	(0.362)
4th-Quartile-IQ	1.974	-2.785	-1.535	0.928	-2.190	-0.836
	(0.854)	(0.815)	(0.615)	(0.719)	(0.629)	(0.431)
Sequential Elimination	-0.812	0.981	0.905	1.433	-1.251	-0.589
× 2nd-Quartile-IQ	(1.061)	(0.984)	(0.653)	(1.149)	(0.960)	(0.568)
Sequential Elimination	-1.313	1.218	1.061	0.507	-1.191	-0.638
× 3rd-Quartile-IQ	(0.942)	(0.860)	(0.571)	(0.940)	(0.774)	(0.490)
Sequential Elimination	-2.266	2.685	1.618	-1.039	1.717	0.313
× 4th-Quartile-IQ	(1.070)	(1.129)	(0.761)	(0.995)	(0.946)	(0.568)
Panel B: Marginal effects of Sequential Elimination						
1st-Quartile-IQ Subjects	0.315	-8.963	-0.555	0.095	-7.652	-0.269
	(0.139)	(4.553)	(0.253)	(0.148)	(13.465)	(0.436)
2nd-Quartile-IQ Subjectss	0.140	-8.559	-0.005	0.357	-77.018	-1.384
	(0.189)	(10.203)	(0.457)	(0.157)	(51.965)	(0.837)
3rd-Quartile-IQ Subjectss	0.023	-1.201	0.089	0.197	-30.327	-1.099
	(0.151)	(1.728)	(0.239)	(0.140)	(15.165)	(0.573)
4th-Quartile-IQ Subjectss	-0.154	1.279	0.205	-0.142	9.173	0.077
	(0.143)	(1.128)	(0.172)	(0.167)	(6.564)	(0.320)
Overall	0.095	-4.259	-0.121	0.111	-22.053	-0.609
	(0.076)	(2.485)	(0.136)	(0.077)	(11.383)	(0.270)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Log Alpha		1.629	-2.104		1.453	-0.560
		(0.168)	(1.303)		(0.130)	(0.314)
Log Likelihood	-89.538	-283.808	-140.240	-89.176	-480.224	-220.058
Observations	148	148	148	148	148	148

Note: This table estimates the effect of Sequential Elimination on economic rationality among subjects categorized by IQ score quantiles. Columns 1 and 4 present logistic regression results for consistency and FSD-consistency. Columns 2, 3, 5, and 6 display negative binomial regression results for GARP violations, HMI, FSD-GARP violations, and FSD-HMI. Panel A provides the regression coefficients. Panel B details the marginal effects of Sequential Elimination for different groups, showing the average change in the dependent variables when switching from the Direct Procedure to Sequential Elimination across observations. All models include a constant term. Control variables consist of cognitive functions (selective attention and working memory), demographic factors (age, gender, education), and attitude toward inconsistency. Robust standard errors are reported in parentheses.

D.2 Implications of Procedure Preference

TABLE D.5. Effects of Procedure Preference on economic rationality (robustness checks).

	Sequential Elimination Selected vs. Assigned				Direct Procedure Selected vs. Assigned				Procedure Preference vs. Direct Procedure			
	GARP Violations (1)	HMI (2)	FSD-GARP Violations (3)	FSD-HMI (4)	GARP Violations (5)	HMI (6) (7)	FSD-GARP Violations (8)	FSD-HMI (9)	GARP Violations (10)	HMI (11)	FSD-GARP Violations (12)	FSD-HMI
Panel A: Regression Coefficients												
Procedure Preference	0.470	0.064	0.124	0.133	-0.746	-0.410	-0.760	-0.613	-0.684	-0.517	-0.940	-0.419
	(0.546)	(0.428)	(0.490)	(0.286)	(0.732)	(0.551)	(0.765)	(0.482)	(0.447)	(0.323)	(0.402)	(0.257)
High-IQ	-0.173	0.078	-0.261	-0.350	-1.730	-0.888	-0.709	-0.456	-1.628	-0.809	-0.659	-0.346
	(0.526)	(0.359)	(0.483)	(0.276)	(0.443)	(0.319)	(0.466)	(0.301)	(0.464)	(0.322)	(0.447)	(0.297)
Procedure Preference × High-IQ	-0.815	0.052	-0.409	0.061	1.583	1.184	0.700	0.463	1.119	1.022	0.548	0.093
	(0.823)	(0.610)	(0.726)	(0.501)	(0.891)	(0.646)	(0.856)	(0.608)	(0.691)	(0.456)	(0.615)	(0.411)
Panel B: Marginal Effects of Procedure Preference												
Low-IQ Subjects	2.803	0.034	2.894	0.169	-7.421	-0.312	-22.422	-0.894	-6.683	-0.374	-26.177	-0.647
	(3.668)	(0.232)	(11.701)	(0.366)	(6.934)	(0.369)	(20.557)	(0.593)	(4.740)	(0.227)	(12.937)	(0.405)
High-IQ Subjects	-1.148	0.070	-4.169	0.179	3.277	0.446	-1.204	-0.172	1.445	0.271	-7.204	-0.372
	(1.905)	(0.260)	(7.868)	(0.402)	(2.756)	(0.239)	(9.808)	(0.423)	(1.824)	(0.176)	(8.925)	(0.379)
Overall	1.819	0.046	1.102	0.172	-0.870	0.139	-9.418	-0.463	-2.754	-0.064	-17.122	-0.515
	(2.802)	(0.175)	(8.989)	(0.278)	(3.144)	(0.209)	(10.298)	(0.345)	(2.596)	(0.145)	(8.059)	(0.280)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log Alpha	1.911	-0.310	1.659	-0.529	1.546	-14.493	1.552	-0.423	1.801	-0.989	1.652	-0.220
	(0.191)	(0.547)	(0.149)	(0.365)	(0.191)	(3.095)	(0.158)	(0.399)	(0.159)	(0.573)	(0.130)	(0.280)
Log Likelihood	-201.984	-113.189	-342.126	-163.873	-226.103	-103.784	-355.558	-162.401	-312.436	-154.821	-490.260	-234.592
Observations	122	122	122	122	101	101	101	101	150	150	150	150

Note: The table presents negative binomial regression results for the associations between procedure preference and economic rationality, measured by the number of GARP and FSD-GARP violations, as well as the HMI and FSD-HMI. The first four columns compare the economic rationality of subjects who select Sequential Elimination in the Procedure Preference treatment with those assigned to it. The middle four columns perform a similar analysis for subjects who select the Direct Procedure against those assigned to it. The last four columns compare the Procedure Preference treatment with the Direct Procedure treatment. Panel A provides the regression coefficients. Panel B details the marginal effects of Procedure Preference for different groups, showing the average change in the dependent variables when procedures switch from being assigned to being selected. All models include a constant term. Control variables consist of cognitive functions (selective attention and working memory), demographic factors (age, gender, education), and attitude toward inconsistency. Robust standard errors are reported in parentheses.

D.3 Decision Time and Economic Rationality

TABLE D.6. Determinants of economic rationality.

	Consistency	GARP Violations	HMI	FSD-Consistency	FSD-GARP Violations	FSD-HMI
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Regression coefficients						
Decision Time	0.182	-0.462	-0.211	-0.087	0.078	0.020
	(0.176)	(0.164)	(0.123)	(0.167)	(0.145)	(0.105)
Sequential Elimination	1.025	-1.119	-0.439	0.976	-1.192	-0.495
	(0.526)	(0.521)	(0.323)	(0.550)	(0.489)	(0.269)
High-IQ	1.131	-1.803	-0.772	0.614	-0.886	-0.325
	(0.520)	(0.461)	(0.320)	(0.542)	(0.473)	(0.309)
Sequential Elimination × High-IQ	-1.338	1.331	0.770	-0.718	0.263	-0.113
	(0.731)	(0.674)	(0.475)	(0.727)	(0.670)	(0.406)
Selective Attention	0.099	-0.165	-0.072	0.269	-0.262	-0.134
	(0.205)	(0.197)	(0.122)	(0.255)	(0.178)	(0.110)
Working Memory	0.166	-0.122	-0.259	0.084	-0.135	-0.154
	(0.205)	(0.175)	(0.158)	(0.180)	(0.161)	(0.113)
Age	0.353	-0.479	-0.378	0.436	-0.386	-0.250
	(0.233)	(0.252)	(0.171)	(0.215)	(0.237)	(0.121)
Female	0.549	0.143	-0.183	0.176	-0.383	-0.101
	(0.364)	(0.335)	(0.231)	(0.360)	(0.309)	(0.197)
Education	-0.003	-0.198	0.059	-0.006	0.086	0.062
	(0.210)	(0.219)	(0.137)	(0.207)	(0.219)	(0.117)
Attitude toward Inconsistency	0.122	-0.364	-0.123	-0.027	-0.286	-0.026
	(0.181)	(0.168)	(0.110)	(0.165)	(0.168)	(0.092)
Panel B: Marginal effects						
Decision Time	0.039	-2.789	-0.124	-0.019	2.165	0.026
	(0.037)	(1.346)	(0.075)	(0.036)	(4.109)	(0.140)
Sequential Elimination among Low-IQ	0.233	-9.229	-0.305	0.210	-41.422	-0.756
	(0.116)	(5.121)	(0.216)	(0.113)	(22.495)	(0.425)
Sequential Elimination among High-IQ	-0.067	0.533	0.156	0.059	-14.832	-0.638
	(0.109)	(1.253)	(0.165)	(0.113)	(9.661)	(0.385)
Sequential Elimination	0.081	-4.514	-0.085	0.131	-29.909	-0.702
	(0.080)	(2.972)	(0.137)	(0.081)	(14.753)	(0.298)
High-IQ	0.110	-7.018	-0.246	0.055	-20.893	-0.478
	(0.083)	(2.802)	(0.140)	(0.085)	(10.315)	(0.286)
Selective Attention	0.021	-0.993	-0.042	0.059	-7.286	-0.178
	(0.044)	(1.322)	(0.072)	(0.054)	(5.843)	(0.153)
Working Memory	0.035	-0.738	-0.153	0.018	-3.754	-0.206
	(0.043)	(1.099)	(0.097)	(0.039)	(4.697)	(0.155)
Age	0.075	-2.891	-0.223	0.095	-10.717	-0.334
	(0.048)	(1.619)	(0.106)	(0.045)	(7.027)	(0.163)
Female	0.117	0.865	-0.108	0.038	-10.652	-0.135
	(0.076)	(2.073)	(0.135)	(0.078)	(8.968)	(0.261)
Education	-0.001	-1.192	0.035	-0.001	2.390	0.083
	(0.045)	(1.444)	(0.081)	(0.045)	(6.166)	(0.159)
Attitude toward Inconsistency	0.026	-2.194	-0.073	-0.006	-7.944	-0.034
	(0.038)	(1.368)	(0.066)	(0.036)	(5.535)	(0.123)
Log Alpha		1.678	-1.625		1.554	-0.410
		(0.160)	(0.911)		(0.128)	(0.325)
Log Likelihood	-90.966	-285.583	-142.350	-92.411	-486.392	-224.534
Observations	148	148	148	148	148	148

Note: This table examines the determinants of economic rationality. All non-binary independent variables are standardized to have a mean of zero and a variance of one. Columns 1 and 4 present logistic regression results for consistency and FSD-consistency. Columns 2, 3, 5, and 6 display negative binomial regression results for GARP violations, HMI, FSD-GARP violations, and FSD-HMI. Panel A provides the regression coefficients, while Panel B details the marginal effects of each independent variable. All models include a constant term. Robust standard errors are reported in parentheses.

TABLE D.7. Impacts of decision time on economic rationality in choice procedures.

	Consistency	GARP Violations	HMI	FSD-Consistency	FSD-GARP Violations	FSD-HMI
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Regression coefficients						
Decision Time	0.402	0.004	-0.215	-0.072	-0.454	-0.283
	(0.551)	(0.457)	(0.275)	(0.577)	(0.443)	(0.237)
Sequential Elimination	0.977	-1.216	-0.435	1.005	-1.047	-0.424
	(0.543)	(0.521)	(0.329)	(0.559)	(0.486)	(0.264)
High-IQ	1.143	-2.040	-0.800	0.828	-0.806	-0.482
	(0.586)	(0.526)	(0.379)	(0.605)	(0.492)	(0.354)
Decision Time × Sequential Elimination	-0.202	-0.644	-0.064	-0.163	0.594	0.379
	(0.613)	(0.513)	(0.333)	(0.625)	(0.481)	(0.271)
Decision Time × High-IQ	-0.089	-0.939	-0.092	0.664	0.411	-0.283
	(0.923)	(0.807)	(0.607)	(0.951)	(0.673)	(0.661)
Sequential Elimination × High-IQ	-1.253	1.397	0.752	-0.982	0.198	0.054
	(0.784)	(0.737)	(0.519)	(0.783)	(0.703)	(0.458)
Decision Time × Sequential Elimination	-0.327	1.888	0.476	-0.357	-0.676	0.186
× High-IQ	(1.067)	(1.029)	(0.701)	(1.095)	(0.912)	(0.723)
Panel B: Marginal effects of decision time						
Sequential Elimination among Low-IQ	0.042	-3.046	-0.156	-0.054	2.556	0.112
	(0.046)	(1.759)	(0.113)	(0.049)	(3.134)	(0.133)
Sequential Elimination among High-IQ	-0.047	0.719	0.056	0.016	-1.210	-0.000
	(0.095)	(1.607)	(0.151)	(0.109)	(5.053)	(0.182)
Sequential Elimination	-0.003	-1.344	-0.056	-0.018	0.892	0.060
	(0.054)	(1.065)	(0.092)	(0.062)	(2.805)	(0.115)
Direct Procedure among Low-IQ	0.090	0.048	-0.184	-0.014	-24.851	-0.509
	(0.117)	(6.250)	(0.227)	(0.108)	(29.207)	(0.446)
Direct Procedure among High-IQ	0.062	-2.225	-0.120	0.129	-0.952	-0.679
	(0.139)	(1.960)	(0.211)	(0.146)	(10.503)	(0.732)
Direct Procedure	0.075	-0.958	-0.154	0.061	-13.992	-0.588
	(0.091)	(3.350)	(0.156)	(0.095)	(16.762)	(0.393)
Low-IQ Subjects	0.066	-1.329	-0.170	-0.033	-12.116	-0.219
	(0.064)	(3.137)	(0.133)	(0.059)	(16.453)	(0.260)
High-IQ Subjects	0.010	-0.839	-0.036	0.075	-1.065	-0.384
	(0.090)	(1.672)	(0.145)	(0.095)	(5.711)	(0.440)
Overall	0.039	-1.186	-0.110	0.025	-6.516	-0.297
	(0.057)	(1.714)	(0.097)	(0.058)	(8.993)	(0.249)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Log Alpha		1.653	-1.706		1.549	-0.496
		(0.162)	(0.985)		(0.127)	(0.316)
Log Likelihood	-90.554	-284.654	-141.847	-91.734	-486.039	-222.753
Observations	148	148	148	148	148	148

Note: This table estimates the impacts of decision time on economic rationality, including interactions with Sequential Elimination and high-IQ. All non-binary independent variables are standardized to have a mean of zero and a variance of one. Columns 1 and 4 present logistic regression results for consistency and FSD-consistency. Columns 2, 3, 5, and 6 display negative binomial regression results for GARP violations, HMI, FSD-GARP violations, and FSD-HMI. Panel A provides the regression coefficients, while Panel B details the marginal effects of decision time for different groups. All models include a constant term. Control variables consist of cognitive functions (selective attention and working memory), demographic factors (age, gender, education), and attitude toward inconsistency. Robust standard errors are reported in parentheses.

D.4 Choice Revision under Limited Attention

TABLE D.8. Effect of choice revision on economic rationality.

	Consistency	GARP Violations	HMI	FSD-Consistency	FSD-GARP Violations	FSD-HMI
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Regression coefficients						
Revision	-0.220	-0.480	-0.053	-0.669	-0.447	0.070
	(0.493)	(0.302)	(0.250)	(0.462)	(0.157)	(0.148)
Sequential Elimination	1.356	-1.683	-0.830	1.644	-1.869	-0.798
	(0.696)	(0.768)	(0.452)	(0.760)	(0.666)	(0.356)
High-IQ	1.056	-1.877	-0.996	0.605	-0.620	-0.075
	(0.675)	(0.621)	(0.422)	(0.744)	(0.572)	(0.371)
Revision × Sequential Elimination	-0.216	0.869	0.270	0.469	0.728	0.013
	(0.654)	(0.449)	(0.378)	(0.579)	(0.350)	(0.203)
Revision × High-IQ	0.411	0.739	0.168	1.139	0.057	-0.500
	(0.708)	(0.594)	(0.440)	(0.619)	(0.309)	(0.276)
Sequential Elimination × High-IQ	-1.841	1.349	1.359	-1.090	0.528	0.054
	(0.932)	(0.899)	(0.641)	(0.964)	(0.800)	(0.520)
Revision × Sequential Elimination	0.491	-1.128	-0.740	-0.508	-0.657	0.155
× High-IQ	(0.885)	(0.698)	(0.571)	(0.828)	(0.512)	(0.369)
Panel B: Marginal effects of revision						
Sequential Elimination among Low-IQ	0.036	0.934	0.045	0.105	-12.381	-0.572
	(0.097)	(1.973)	(0.144)	(0.090)	(10.767)	(0.378)
Sequential Elimination among High-IQ	0.099	-0.000	-0.188	0.097	-2.744	-0.179
	(0.066)	(0.333)	(0.118)	(0.096)	(2.405)	(0.136)
Sequential Elimination	0.011	1.090	-0.036	0.031	0.712	-0.057
	(0.052)	(1.033)	(0.086)	(0.062)	(2.491)	(0.088)
Direct Procedure among Low-IQ	-0.050	-7.864	-0.052	-0.101	-25.692	0.127
	(0.112)	(7.617)	(0.245)	(0.068)	(18.879)	(0.270)
Direct Procedure among High-IQ	-0.083	1.824	0.106	-0.044	3.574	0.069
	(0.081)	(1.601)	(0.132)	(0.076)	(4.107)	(0.111)
Direct Procedure	-0.005	-4.324	-0.005	0.009	-19.662	-0.228
	(0.072)	(5.095)	(0.144)	(0.059)	(13.071)	(0.236)
Low-IQ Subjects	-0.066	-3.063	0.027	-0.072	-10.960	0.098
	(0.070)	(4.016)	(0.140)	(0.050)	(9.590)	(0.148)
High-IQ Subjects	0.066	0.471	-0.071	0.101	-7.530	-0.380
	(0.059)	(1.003)	(0.093)	(0.066)	(5.646)	(0.205)
Overall	-0.000	-1.770	-0.009	0.022	-9.287	-0.155
	(0.046)	(2.923)	(0.082)	(0.043)	(6.699)	(0.132)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Log Alpha		1.816	-0.904		1.621	-0.414
		(0.180)	(0.670)		(0.145)	(0.340)
Log Likelihood	-108.617	-327.791	-175.725	-109.503	-558.984	-257.200
Observations	184	184	184	184	184	184

Note: This table estimates the effect of choice revision for subjects in the Direct Procedure and Sequential Elimination, comparing economic rationality before and after revisions. Columns 1 and 4 present logistic regression results for consistency and FSD-consistency. Columns 2, 3, 5, and 6 display negative binomial regression results for GARP violations, HMI, FSD-GARP violations, and FSD-HMI. Panel A provides the regression coefficients. Panel B details the marginal effects of choice revision for different groups, showing the average change in the dependent variables upon switching from initial to revised choices across observations. All models include a constant term. Control variables consist of cognitive functions (selective attention and working memory), demographic factors (age, gender, education), and attitude toward inconsistency. Standard errors, clustered at the individual level, are reported in parentheses.