

ONLINE APPENDICES

Online Appendix A: Study 1 – Randomization Checks

We conducted randomization checks on participants’ design expertise, gender, GPA, School Year, their familiarity, and attitude toward GenAI. As shown in Table A1, no significant differences were observed across the four groups, indicating successful randomization.

Table A1. Randomization Checks

Variables	T1 (n = 48) Mean (SD)	T2 (n = 50) Mean (SD)	T3 (n = 48) Mean (SD)	T0 (n = 46) Mean (SD)	Differences (ANOVA) <i>F</i> -value (<i>p</i> -value)
Expertise (high vs. low)	44%	44%	46%	41%	$\chi^2(3) = 0.20$ <i>p</i> = 0.98
Female	77%	78%	75%	80%	$\chi^2(3) = 0.41$ <i>p</i> = 0.94
GPA	3.38 (1.47)	3.60 (1.54)	3.67 (1.68)	3.65 (1.14)	0.40 (0.75)
Familiarity with GenAI	2.79 (1.34)	2.68 (1.25)	2.56 (1.47)	2.70 (1.19)	0.24 (0.87)
Attitude toward GenAI	4.79 (0.95)	4.65 (0.96)	4.69 (1.18)	4.70 (0.98)	0.18 (0.91)
School Year	2.71 (1.33)	2.78 (1.07)	2.67 (1.26)	2.78 (1.15)	0.11 (0.96)

Online Appendix B: Study 1 – Visualizations of Creativity Measures: Relevance and Complexity

Stage 1 - Ideation

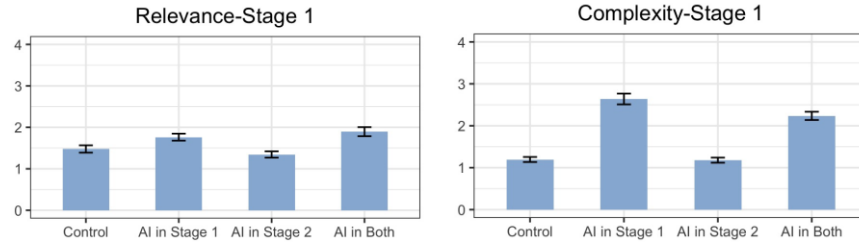


Figure B1. Creativity Measures – Relevance and Complexity in Stage 1 – ATE

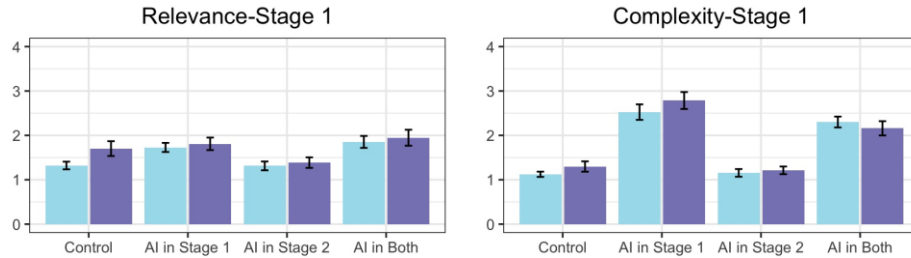


Figure B2. Creativity Measures – Relevance and Complexity in Stage 1 – HTE

Stage 2 – Implementation

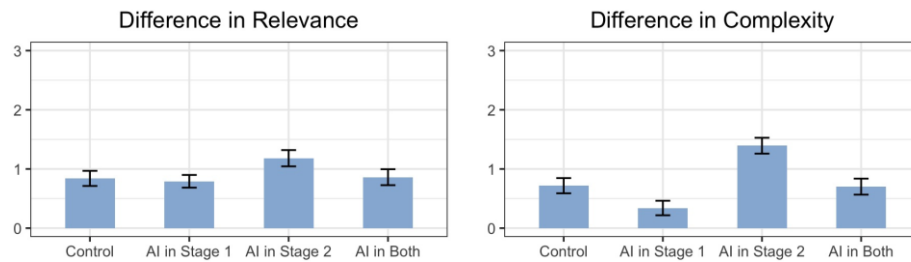


Figure B3. Creativity Measures – Relevance and Complexity in Stage 2 – ATE

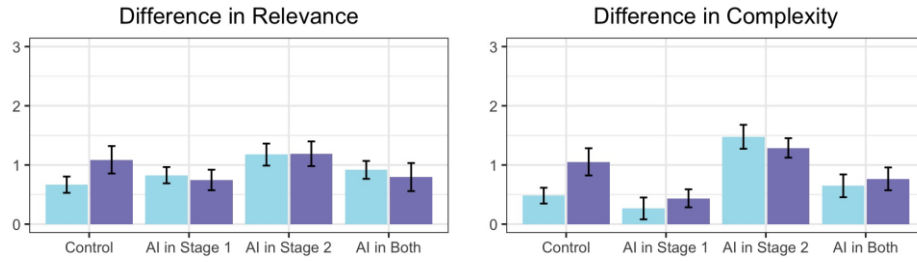


Figure B4. Creativity Measures – Relevance and Complexity in Stage 2 – HTE

Online Appendix C: Study 1 – Additional Analyses

Perceived Ease-of-Effort. To further examine our theorized mechanism on expertise fixation, we measured participants’ perceived ease-of-effort in each stage of the design task using three items on a 7-point scale ($\alpha_{stage 1} = .80$, $\alpha_{stage 2} = .86$), adapted from Kankanhalli et al. (2015). As shown in Table C1, in the ideation stage, perceived ease-of-effort was significantly higher (i.e., less effort) among participants who used GenAI (T1 and T3) than those who did not (T0 and T2), irrespective of their expertise level. However, in the implementation, only low-expertise designers who used GenAI reported significantly higher perceived ease-of-effort (i.e., less effort). High-expertise designers in T2 reported significantly lower perceived ease-of-effort (i.e., more effort) compared to their counterparts who did not use GenAI. These findings lend strong support to our theorized mechanism: In the ideation stage, both high- and low-expertise designers perceive the task as easier, thanks to GenAI’s capability to foster divergent thinking. In contrast, in the implementation stage, it seems more challenging for expert designers to utilize GenAI, as indicated by their increased perceived effort to converge on their final design.

Table C1. Perceived Ease-of-Effort in the Two Stages

	Stage 1		Stage 2	
T1	0.516** (0.235)	0.590 [†] (0.307)	0.131 (0.262)	0.163 (0.340)
T2	0.346 (0.228)	0.491 (0.302)	0.411 (0.254)	0.867** (0.334)
T3	0.592** (0.231)	0.968*** (0.308)	0.720*** (0.257)	0.996*** (0.341)
T1 * Expertise		-0.166 (0.468)		-0.114 (0.519)
T2 * Expertise		-0.348 (0.464)		-1.058** (0.514)
T3 * Expertise		-0.850 [†] (0.467)		-0.646 (0.517)
Controls	Included	Included	Included	Included
N	192	192	192	192
Adjusted R ²	0.019	0.023	0.098	0.110

Note: Standard errors are in parentheses. [†] $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Perceived Confidence. The observed results support our theorized mechanism that GenAI affects creative work through the mitigation (or lack thereof) of cognitive fixation. However, one may argue that the impacts were due to a boost in confidence among participants, as having access to GenAI might instill

a sense of empowerment. Meanwhile, designers with less expertise might feel especially empowered by GenAI due to their initial lack of confidence in their capabilities to handle the design task. To examine this alternative explanation, we measured participant self-report confidence adapted from Dahl and Moreau (2007). The results in Table C2 revealed that having GenAI only marginally increased designers' confidence, with no statistically significant difference between high- vs. low-expertise designers. This did not align with our main findings. Thus, the data cast doubt on confidence as an alternative mechanism for the observed results.

Table C2. Impact of GenAI on Confidence

DV: Confidence	(1)	(2)
T1	-0.020 (0.304)	-0.202 (0.400)
T2	0.579 [†] (0.295)	0.689 [†] (0.393)
T3	0.541 [†] (0.298)	0.506 (0.401)
T1 * Expertise		0.408 (0.610)
T2 * Expertise		-0.240 (0.604)
T3 * Expertise		0.085 (0.608)
Controls	Included	Included
N	192	192
Adjusted R^2	0.111	0.102

Note: Standard errors are in parentheses. [†] $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Overall impact on creative work. As supplementary analyses, we also evaluate the overall impact of GenAI use on the final creative work product at the conclusion of the entire design process. We measure final work creativity using the score at the end of Stage 2 (e.g., using *Novelty2* to measure the final novelty of the design work), and measure the overall work efficiency using the total time spent across both stages. We first present model-free evidence in Figure C1 and Figure C2. In addition, as a baseline check, without GenAI (control groups), high-expertise designers outperformed low-expertise designers with significantly more novel and complex design work (Figure C2).

Next, we quantify the impact of GenAI on the final creative work. Specifically, we define three dummy variables: 1) AI_S1, equal to 1 if AI was used at Stage 1, captures the effect of AI at Stage 1; 2)

AI_S2, equal to 1 if AI was used at Stage 2, captures the effect of AI at Stage 2 only; 3) AI_both, equal to 1 if AI was used at both stages, captures the incremental effect of AI at Stage 2, conditional on the use of AI at Stage 1. As shown in Table C3 below, using AI at both Stage 1 and Stage 2 significantly improved final creativity, specifically in terms of novelty and complexity. However, using AI at Stage 2 also led to an increase in the total time spent. Additionally, we conducted separate analyses for designers with high and low levels of expertise. Results in Table C4a show that using AI at Stage 1 significantly enhances the final creativity (novelty and complexity) of high-expertise designers. In contrast, using AI only at Stage 2 does not improve their creativity and negatively impacts their efficiency. Moreover, when AI is already used at Stage 1, providing additional AI support at Stage 2 does not yield further creativity benefits for high-expertise designers. Hence, for high-expertise designers, AI should be used primarily in the early stages of the creative process to facilitate divergent thinking. Introducing AI support at the convergent thinking stage can be counterproductive and hinder performance. For low-expertise designers (Table C4b), using AI at both Stage 1 and Stage 2 can benefit their final creativity without compromising efficiency. This suggests that low-expertise designers may benefit from continuous AI support throughout the entire design process, as it can compensate for skill gaps and guide them effectively across stages.

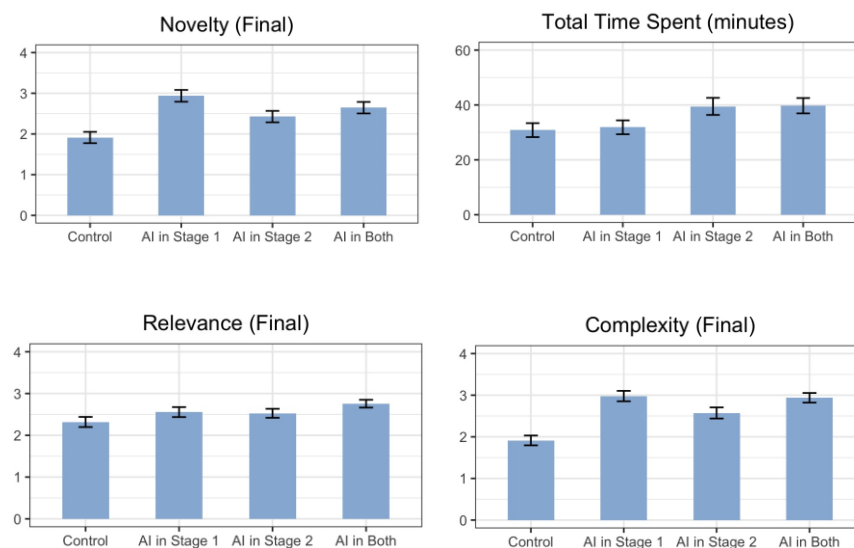


Figure C1. Overall Effects of GenAI on Creativity and Efficiency Measures – ATE

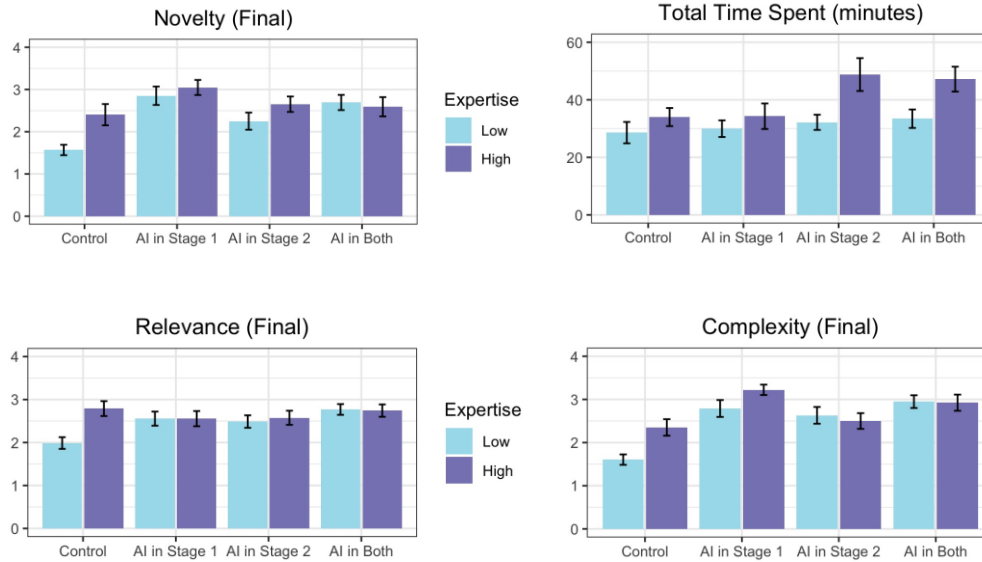


Figure C2. Overall Effects of GenAI on Creativity and Efficiency Measures – HTE

Table C3. Average Treatment Effect on Final Outcomes

DV	Novelty	Relevance	Complexity	Total Time Spent
AI_S1	0.999*** (0.200)	0.261 (0.163)	1.082*** (0.179)	1.774 (3.950)
AI_S2	0.496** (0.194)	0.192 (0.158)	0.639*** (0.172)	8.547** (3.814)
AI_both	-0.237 (0.197)	0.190 (0.160)	-0.026 (0.175)	6.613 [†] (3.876)
Controls	Included	Included	Included	Included
N	192	192	192	192
Adjusted R ²	0.176	0.016	0.215	0.084

Note: Standard errors are in parentheses. [†] $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table C4a. Study 1 –Treatment Effect on Final Outcomes – High Expertise

DV	Novelty	Relevance	Complexity	Total Time Spent
AI_S1	0.570 [†] (0.320)	-0.244 (0.254)	0.0843*** (0.267)	0.981 (7.106)
AI_S2	0.204 (0.307)	-0.261 (0.244)	0.132 (0.256)	16.283** (0.02)
AI_both	-0.327 (0.315)	0.198 (0.250)	-0.237 (0.263)	10.802 (7.007)
Controls	Included	Included	Included	Included
N	84	84	84	84
Adjusted R ²	0.016	-0.055	0.095	0.026

Note: Standard errors are in parentheses. [†] $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table C4b. Study 1 – Treatment Effect on Final Outcomes – Low Expertise

DV	Novelty	Relevance	Complexity	Total Time Spent
AI_S1	1.339*** (0.263)	0.580*** (0.204)	1.201*** (0.242)	3.145 (4.483)
AI_S2	0.709*** (0.255)	0.489** (0.198)	1.061*** (0.235)	3.224 (4.349)
AI_both	-0.242 (0.264)	0.214 (0.205)	0.138 (0.243)	1.629 (4.501)
Controls	Included	Included	Included	Included
N	108	108	108	108
Adjusted R ²	0.239	0.160	0.275	0.028

*Note: Standard errors are in parentheses. † $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$*

Online Appendix D: Study 2 – Randomization Checks and Summary Statistics

Table D1. Study 2 – Randomization Checks

Variables	T1 (n = 30) Mean (SD)	T2 (n = 30) Mean (SD)	T3 (n = 30) Mean (SD)	T0 (n = 30) Mean (SD)	Differences (ANOVA) <i>F</i> -value (<i>p</i> -value)
Female	0.73	0.67	0.70	0.73	$\chi^2(3) = 0.44$ <i>p</i> = 0.93
Design Ability	5.33 (1.13)	5.37 (1.05)	5.38 (1.02)	5.28 (1.06)	0.05 (0.99)
Familiarity with GenAI	4.17 (1.82)	4.40 (2.13)	4.17 (2.00)	4.43 (1.79)	0.17 (0.92)
Attitude toward GenAI	4.70 (1.15)	4.73 (1.03)	4.60 (1.03)	4.72 (1.13)	0.09 (0.96)

Table D2. Study 2 – Variables and Summary Statistics

Variables	Mean	Std Dev	Min	Max
Outcomes in the Ideation Stage (Stage 1)				
Novelty1	3.911	1.935	1.000	6.667
Relevance1	4.261	1.885	1.000	6.667
Complexity1	3.811	1.870	1.000	6.667
TimeSpent1	21.039	13.216	1.817	77.200
Outcomes in the Implementation Stage (Stage 2)				
Novelty2	0.997	1.576	-3.333	4.667
Relevance2	1.167	1.632	-1.333	5.667
Complexity2	1.153	1.446	-2.333	4.667
TimeSpent2	37.026	17.935	1.000	83.467
Controls				
Female	0.708	0.456	0	1
Design Ability	5.342	1.053	2	7
Familiarity with GenAI	4.292	1.920	1	7
Attitude toward GenAI	4.689	1.075	1	7

Online Appendix E: Study 2 – Visualizations of Creativity and Efficiency Measures

Stage 1 – Ideation

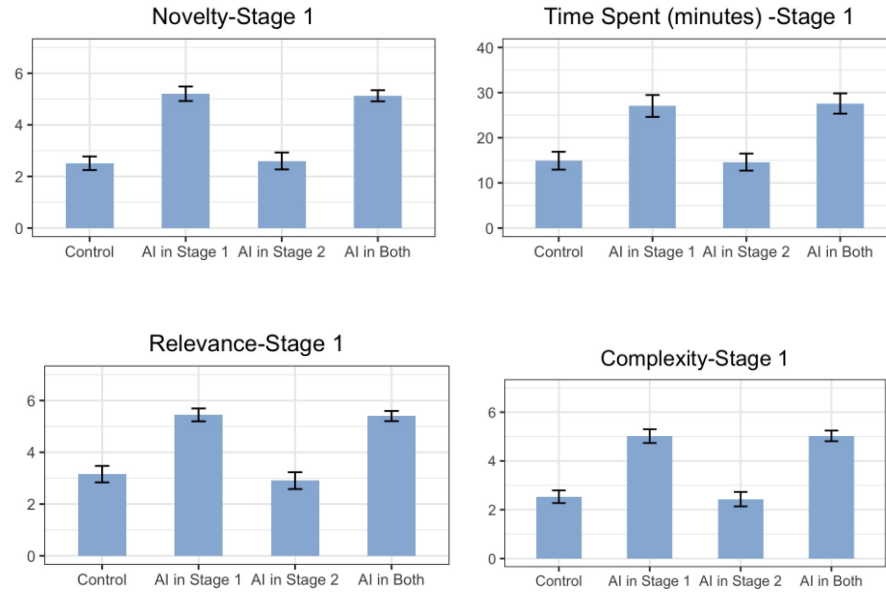


Figure E1. Creativity and Efficiency Measures in Stage 1 – ATE

Stage 2 – Implementation

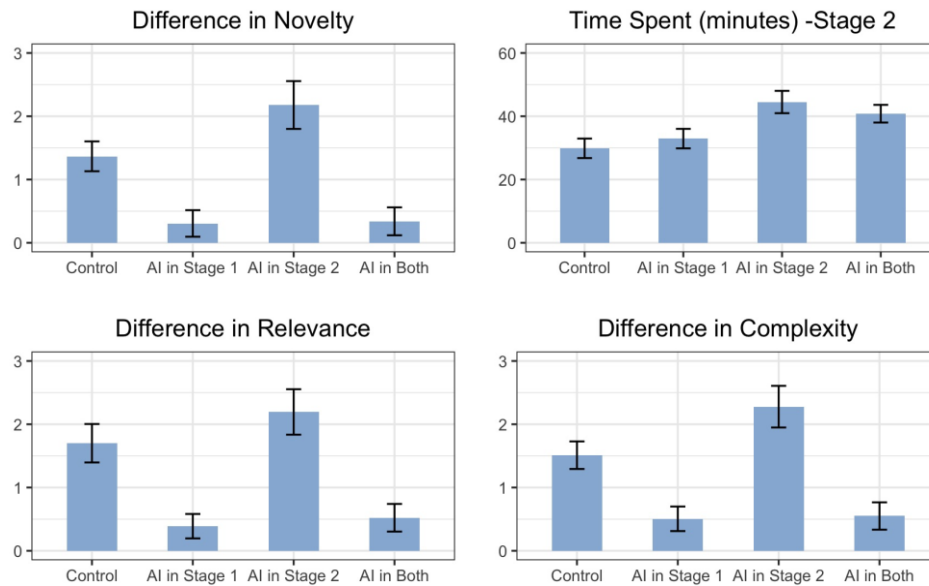


Figure E2. Creativity and Efficiency Measures in Stage 2 – ATE

Overall Impact on Creative Work

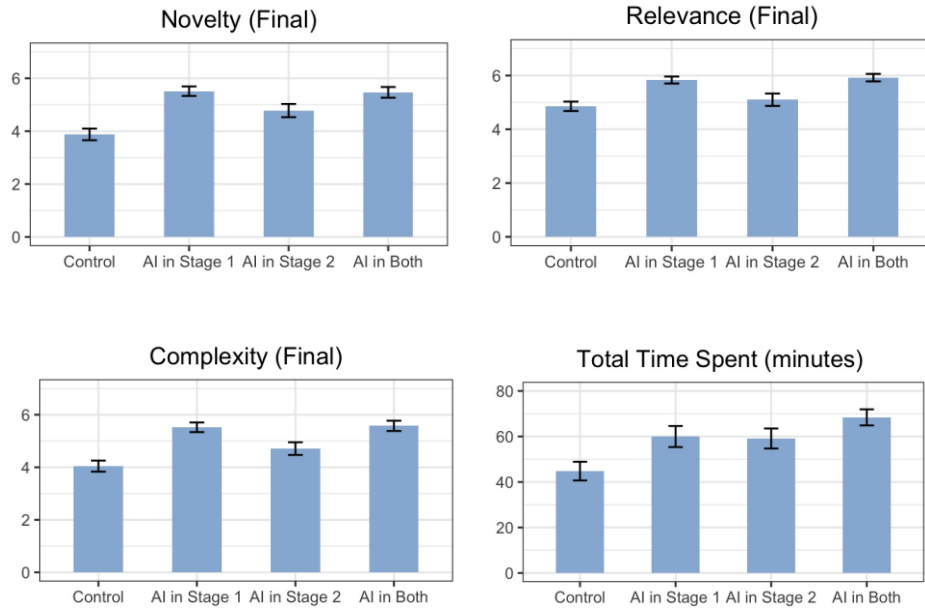


Figure E3. Overall Effects of GenAI on Creativity and Efficiency Measures

Online Appendix F – Study 1 Questionnaires

Q1 – Pre-test Questionnaire in Study 1

1. Self-report design expertise (Haerem & Rau, 2007; 1 = extremely disagree; 7 = extremely agree)
 - I am good at such design tasks.
 - I know how to do well on such design tasks.
2. Familiarity with GenAI tools (Yang et al., 2023; 1 = not at all familiar; 7 = extremely familiar)
 - How familiar are you with GenAI tools?
3. Attitude towards GenAI tools (Bruner, 2013)
 - What is your overall attitude toward GenAI tools? (1-7)
 - Unfavorable/favorable
 - Bad/good
 - Negative/positive

Q2 – End of Stage 1 Questionnaire in Study 1

1. Attention Check
 - Did you use the GenAI tool in the ideation stage (i.e., the stage that you just experienced)?
2. Perceived Ease-of-Effort (Kankanhalli et al., 2015; 1 = extremely disagree; 7 = extremely agree)
 - It was very easy for me to perform the creative design task during the ideation stage.
 - I spent a lot of effort in the ideation stage. (Reversed)
 - Completing the ideation stage was an easy task for me.

Q3 – End of Stage 2 Questionnaire in Study 1

1. Attention Check
 - Did you use the GenAI tool in the implementation stage (i.e., the stage that you just experienced)?
2. Perceived Ease-of-Effort
 - It was very easy for me to perform the creative design task during the implementation stage.
 - I spent a lot of effort in the implementation stage. (Reversed)
 - Completing the implementation stage was an easy task for me.
3. Confidence (Dahl & Moreau, 2007; 1 = extremely disagree; 7 = extremely agree)
 - I felt confident while performing the task.
4. Mood (Yang et al., 2023; 1 = very negative, 7 = very positive)
 - How would you describe your mood during the design task?
5. How did you feel about your involvement in the creative design process?
 - I was not involved at all. (1) / I was very involved. (7)
6. How playful did you find the creative design process?
 - The design process was not playful at all. (1) / The design process was very playful. (7)

Online Appendix G – Study 2 Questionnaires

Q1 – Pre-test Questionnaire in Study 2

1. Self-report design expertise (Haerem & Rau, 2007; 1 = extremely disagree; 7 = extremely agree)
 - I am good at such design tasks.
 - I know how to do well on such design tasks.
2. Familiarity with GenAI tools
 - How familiar are you with GenAI tools? (1 = not at all familiar; 7 = extremely familiar)
 - What's your experience with Midjourney? (1 =no experience et al; 7 =extremely experienced)
3. Attitude towards GenAI tools
 - What is your overall attitude toward GenAI tools? (1-7)
 - Unfavorable/favorable
 - Unreliable/reliable
 - Untrustworthy/trustworthy

Q2 – End of Stage 1 Questionnaire in Study 2

1. Did you use the GenAI tool in the ideation stage (i.e., the stage that you just experienced) (Yes/No)?
2. Perceived Ease-of-Effort (Kankanhalli et al., 2015; 1 = extremely disagree; 7 = extremely agree)
 - It was very easy for me to perform the creative design task during the ideation stage.
 - I spent a lot of effort in the ideation stage. (Reversed)
 - Completing the ideation stage was an easy task for me.
3. Cognitive Stimulation (Hofstetter et al., 2021; 1 = extremely disagree; 7 = extremely agree)
 - In this process, I feel I was being inspired with lots of design ideas.
 - In this process, I believe that there are a lot of different design styles in my brain.
 - In this process, I think I am fully aware of the many different design styles.
4. Choice Overload (Iyengar & Lepper, 2000; 1= strongly disagree; 7= strongly agree)
 - I find it difficult to make a choice when I have many options available.
 - Having too many options confuses me and makes it harder to decide.
 - I am less satisfied with my choice when there are many options to choose from.
 - Evaluating many options requires a lot of effort and energy.

Q3 – End of Stage 2 Questionnaire in Study 2

1. Did you use the GenAI tool in the implementation stage (i.e., the stage that you just experienced) (Yes/No)?
2. Perceived Ease-of-Effort (Kankanhalli et al., 2015; 1 = extremely disagree; 7 = extremely agree)
 - It was very easy for me to perform the creative design task during the implementation stage.
 - I spent a lot of effort in the implementation stage. (Reversed)
 - Completing the implementation stage was an easy task for me.
3. Work Routinization (Choi et al., 2009; 1 = extremely disagree; 7 = extremely agree)
How do you feel about this design work?
 - This design work aligns very well with the repetitive routine that I usually follow.
 - For this design work, there is something different from what I do daily. (Reversed)

- The procedure of this design work is the same as that of my routine work.

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