

Supplementary Materials:

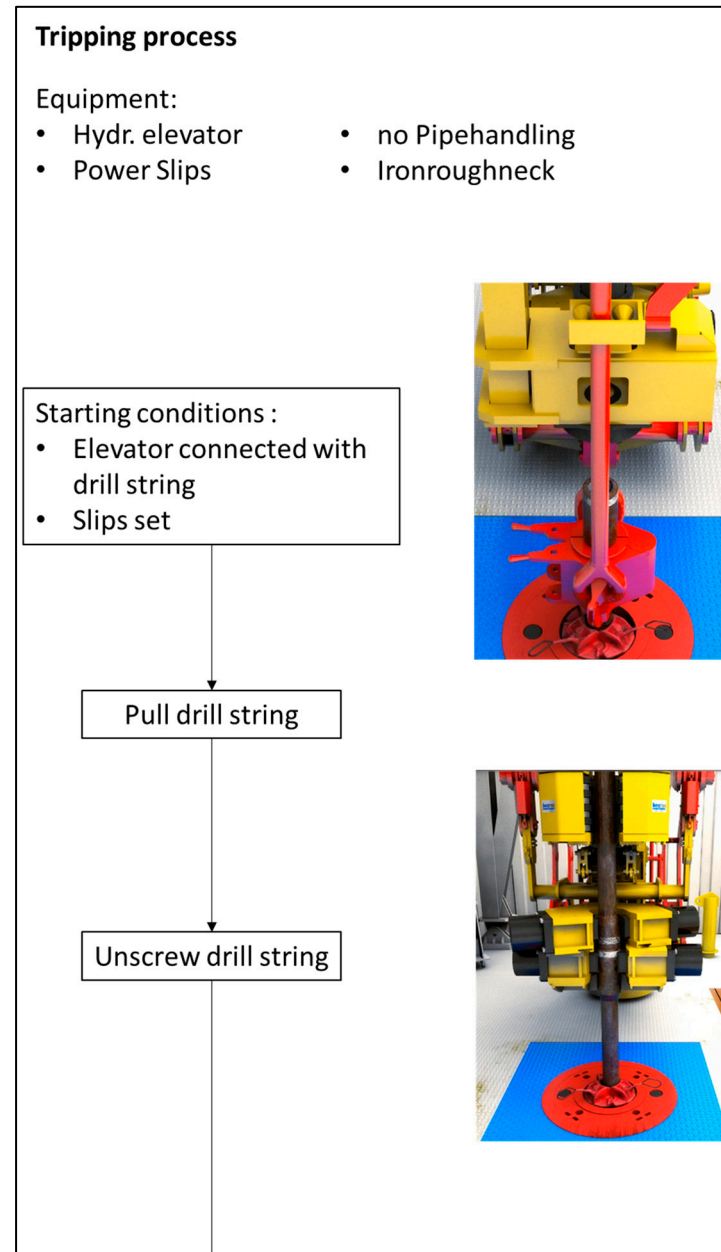


Figure S1. Description of the tripping process for the participants.

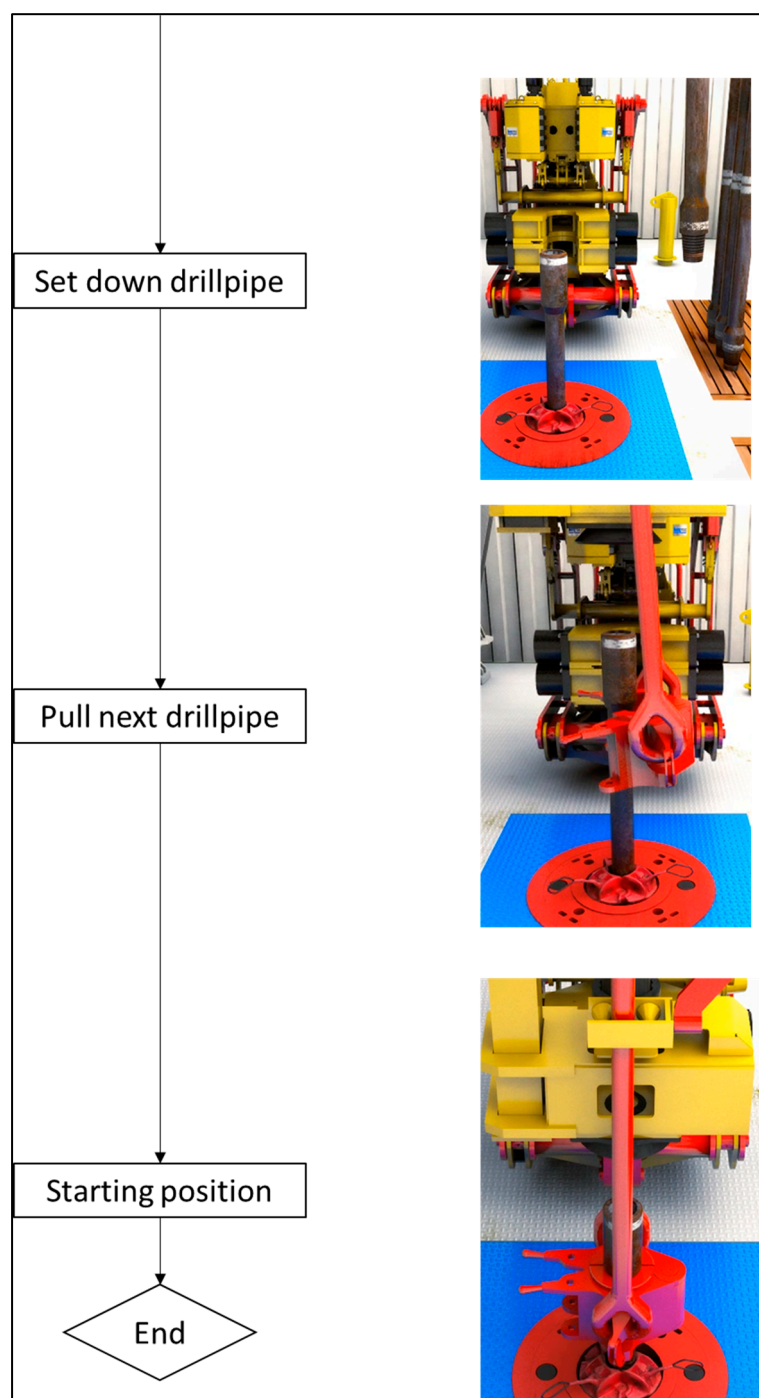


Figure S2. Description of the tripping process for the participants.

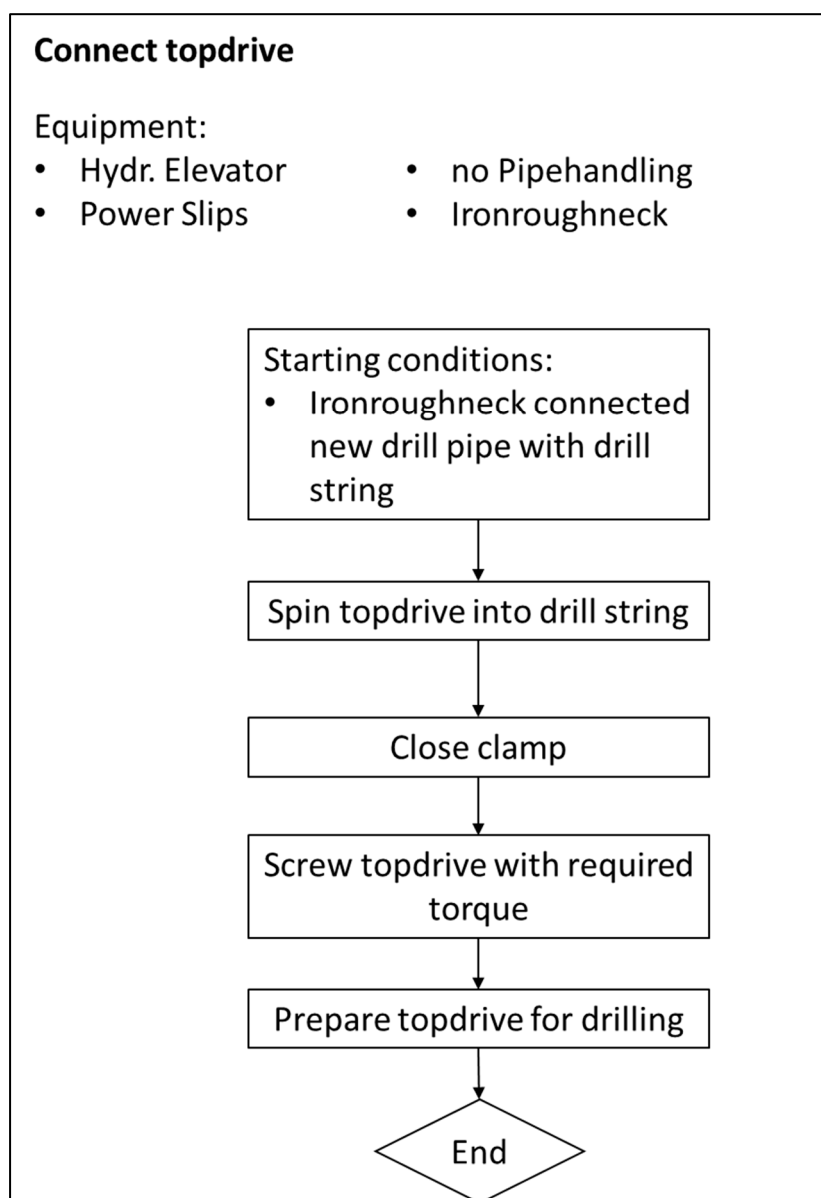


Figure S3. Description of the top drive connection process for the participants.

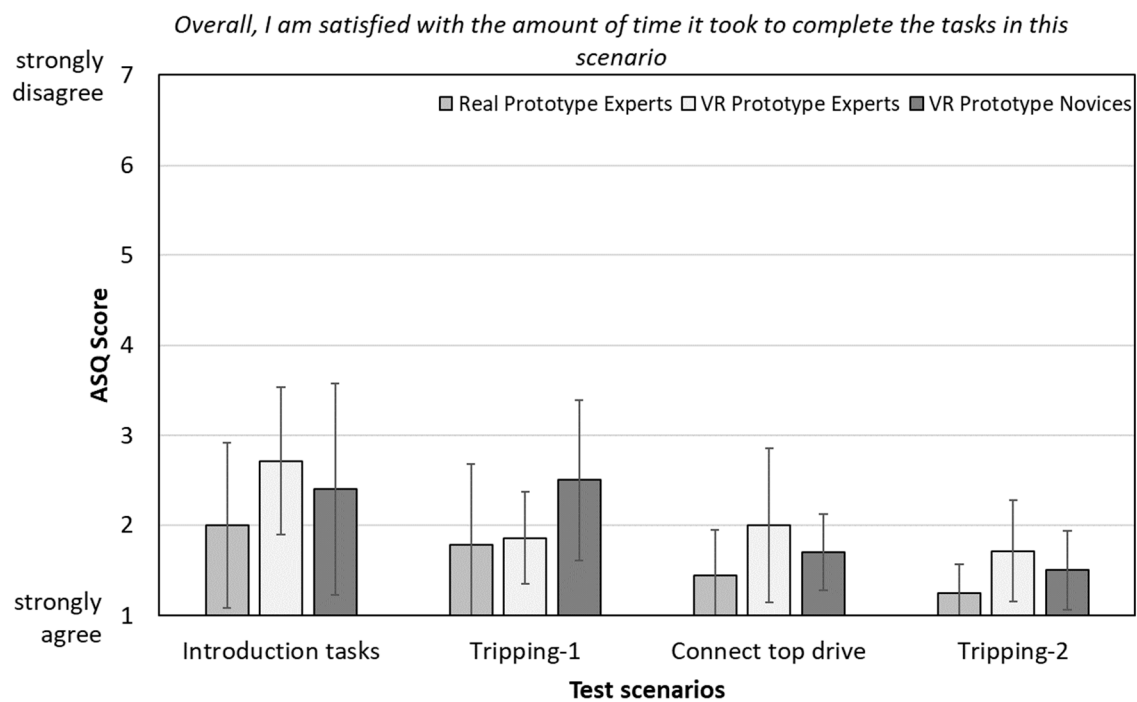


Figure S4. Mean ASQ scores for the statement “Overall, I am satisfied with the amount of time it took to complete the tasks in this scenario.”.

Tasks		Wizard of Oz	VR Drilling Experts	VR Drilling Novices
1	Log in	94%	93%	100%
2	Select Tripping	94%	100%	95%
3	Link Tilt teach	75%	71%	70%
5	Open IBOP	63%	57%	35%
6	Change TD rotation direction	75%	86%	95%
7	Open camera monkeyboard	100%	93%	100%
8	Change TD mode	81%	86%	100%
9	Select "Set" key	81%	93%	80%
10	Operate rotary-push actuator	69%	64%	70%
11	Confirm setting	94%	71%	95%
12	Open PRW Slips	81%	71%	65%
13	Extend Link Tilt	100%	100%	95%
14	Activate active float	100%	79%	80%
15	Open elevator	100%	100%	90%
16	Determine hook position	81%	100%	100%
17	Determine hook load	81%	93%	90%
18	Determine SPP	100%	100%	100%
19	Determine elevator status	100%	100%	100%
20	Determine Trip-Tank Volume	100%	100%	95%
Total:		88%	87%	87%

Figure S5. Comparison of success rates for performing the introductory tasks.




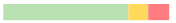

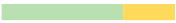
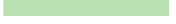
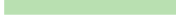
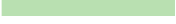









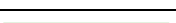
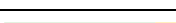
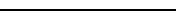







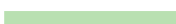
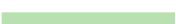
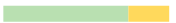
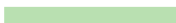

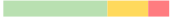
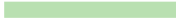



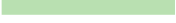






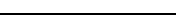
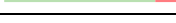




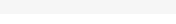
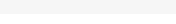
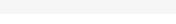
Tasks		Real Prototype Experts		VR Prototype Experts		VR Prototype Novices	
1	Pull drill string out of PWR slips		88%		79%		60%
2	Open PWR slips		81%		100%		85%
3	Pull up drill string		100%		100%		100%
4	Close PWR slips		88%		100%		85%
5	Place drill string into PWR slips		100%		100%		55%
6	Call up IR menu		100%		86%		85%
7	Extend IR		94%		100%		100%
8	Set IR height		100%		93%		85%
9	Close button clamp		100%		100%		100%
10	Unscrewing drill string		100%		100%		100%
11	Extend Link Tilt		100%		100%		100%
12	Lower Elevator		88%		100%		75%
13	Open Elevator		75%		100%		85%
14	Activate active float		94%		100%		100%
15	Lower topdrive to rig floor		100%		100%		90%
16	Extend and retract Link Tilt		81%		71%		85%
17	Close Elevator		100%		86%		100%
Total:			93%		95%		88%

Figure S6. Comparison of the success rates in the simulation of the second tripping process.