

# An Open-Source Virtual Reality System for the Measurement of Spatial Learning in Head-Restrained Mice

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jove.com/video/64863

## Materials

Name	Company	Catalog Number	Comments
1/4 " diam aluminum rod	McMaster-Carr	9062K26	3" in length for wheel axle
1/4"-20 cap screws, 3/4" long (x2)	Amazon.com	B09ZNMR41V	for affixing head post holders to optical posts
2"x7" T-slotted aluminum bar (x2)	8020.net	1020	wheel/animal mounting frame
6" diam, 3" wide acrylic cylinder (1/8" thick)	Canal Plastics	33210090702	Running wheel (custom width cut at canalplastics.com)
8-32 x 1/2" socket head screws	McMaster-Carr	92196A194	fastening head post holder to optical post
Adjustable arm (14")	Amazon.com	B087BZGKSL	to hold/adjust lick spout
Analysis code (MATLAB)		custom written	file at github.com/GergelyTuri/HallPassVR/software/Analysis code
Axle mounting flange, 1/4" ID	Pololu	1993	for mounting wheel to axle
Ball bearing (5/8" OD, 1/4" ID, x2)	McMaster-Carr	57155K324	for mounting wheel axle to frame
Behavior ESP32 code		custom written	file at github.com/GergelyTuri/HallPassVR/software/Arduino code/Behavior board
Black opaque matte acrylic sheets (1/4" thick)	Canal Plastics	32918353422	laser cut file at github.com/GergelyTuri/HallPassVR/hardware/VR screen assembly
Clear acrylic sheet (1/4" thick)	Canal Plastics	32920770574	laser cut file at github.com/GergelyTuri/HallPassVR/hardware/VR wheel assembly
ESP32 devKitC v4 (x2)	Amazon.com	B086YS4Z3F	microcontroller for behavior and rotary encoder
ESP32 shield	OpenMaze.org	OMwSmall	description at www.openmaze.org (https://claylacefield.wixsite.com/openmazehome/copy-of-om2shield). ZIP gerber files at: https://github.com/claylacefield/OpenMaze/tree/master/OM_PCBs
Fasteners and brackets	8020.net	4138, 3382,3280	for wheel frame mounts
goniometers	Edmund Optics	66-526, 66-527	optional for behavior. Fine tuning head for imaging

HallPassVR python code		custom written	file at <a href="https://github.com/GergelyTuri/HallPassVR/software/HallPassVR">github.com/GergelyTuri/HallPassVR/software/HallPassVR</a>
Head post holder		custom design	3D design file at <a href="https://github.com/GergelyTuri/HallPassVR/hardware/VR_head_mount/Headpost_Clamp">github.com/GergelyTuri/HallPassVR/hardware/VR head mount/Headpost Clamp</a>
LED projector	Texas Instruments	DLPDLCR230NPEVM	or other small LED projector
Lick spout	VWR	20068-638	(or ~16 G metal hypodermic tubing)
M 2.5 x 6 set screws	McMaster-Carr	92015A097	securing head post
Matte white diffusion paper	Amazon.com		screen material
Metal headposts		custom design	3D design file at <a href="https://github.com/GergelyTuri/HallPassVR/hardware/VR_head_mount/head_post_designs">github.com/GergelyTuri/HallPassVR/hardware/VR head mount/head post designs</a>
Miscellaneous tubing and tubing adapters (1/16" ID)			for constructing the water line
Optical breadboard	Thorlabs	as per user's requirements	
Optical posts, 1/2" diam (2x)	Thorlabs	TR4	for head fixation setup
Processing code		custom written	file at <a href="https://github.com/GergelyTuri/HallPassVR/software/Processing_code">github.com/GergelyTuri/HallPassVR/software/Processing code</a>
Raspberry Pi 4B	<a href="https://raspberrypi.com">raspberrypi.com</a> , <a href="https://adafruit.com">adafruit.com</a>		Single-board computer for rendering of HallPassVR envir.
Right angle clamp	Thorlabs	RA90	for head fixation setup
Rotary encoder (quadrature, 256 step)	DigiKey	ENS1J-B28-L00256L	to measure wheel rotation
Rotary encoder ESP32 code		custom written	file at <a href="https://github.com/GergelyTuri/HallPassVR/software/Arduino_code/Rotary_encoder">github.com/GergelyTuri/HallPassVR/software/Arduino code/Rotary encoder</a>
SCIGRIP 10315 acrylic cement	Amazon.com		
Shaft coupler	McMaster-Carr	9861T426	to couple rotary encoder shaft with axle
Silver mirror acrylic sheets	Canal Plastics	32913817934	laser cut file at <a href="https://github.com/GergelyTuri/HallPassVR/hardware/VR_screen_assembly">github.com/GergelyTuri/HallPassVR/hardware/VR screen assembly</a>
Solenoid valve	Parker	003-0137-900	to administer water rewards