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# GRAVITY SHIFT - COMPREHENSIVE TESTING CHECKLIST

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Project: Gravity Shift Battle Unity Version: 2022.3.17f1 LTS Testing Date: To be completed after Unity setup Tester: Student (Xiangfeng Ding)

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## TESTING METHODOLOGY

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This checklist covers functional testing, edge case testing, performance testing, and build verification. Each test should be performed in Unity Editor first, then verified in the final build.

Testing Phases:

1. Unit Testing (individual scripts)
  2. Integration Testing (system interactions)
  3. Functional Testing (gameplay features)
  4. Edge Case Testing (boundary conditions)
  5. Performance Testing (FPS, memory, stability)
  6. Build Testing (final executable)
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## SECTION 1: PLAYER MOVEMENT AND CONTROLS

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Basic Movement: [ ] WASD keys move player in correct directions [ ] Player moves at expected speed [ ] Player responds immediately to input [ ] Player stops when keys released [ ] Movement works in all gravity directions

Mouse Look: [ ] Mouse X rotates camera horizontally [ ] Mouse Y rotates camera vertically [ ] Camera rotation is smooth [ ] Camera sensitivity feels appropriate [ ] Camera doesn't flip unexpectedly

Jump Mechanic: [ ] Space bar triggers jump [ ] Jump height is consistent [ ] Can jump while moving [ ] Cannot jump while in air (no double jump) [ ] Jump works in all gravity directions

Ground Detection: [ ] Player detects ground correctly [ ] Player doesn't slide on flat surfaces [ ] Player can walk up small slopes [ ] Player slides on steep slopes [ ] Ground detection works after gravity change

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## SECTION 2: GRAVITY SWITCHING SYSTEM

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Basic Gravity Switching: [ ] G + Down Arrow: Normal gravity (down) [ ] G + Up Arrow: Inverted gravity (up) [ ] G + Left Arrow: Left wall gravity [ ] G + Right Arrow: Right wall gravity [ ] G + W: Forward wall gravity [ ] G + S: Backward wall gravity

Gravity Transition: [ ] Gravity changes smoothly [ ] Player rotates to align with new gravity [ ] Camera rotates with player [ ] Velocity reduces on gravity change [ ] No jitter during transition

Energy Cost: [ ] Gravity switch consumes 20 energy [ ] Cannot switch with insufficient energy [ ] Energy bar updates correctly [ ] Low energy warning appears [ ] Energy regenerates after switch

Edge Cases: [ ] Rapid gravity switching prevented by energy [ ] Switching while in air works correctly [ ] Switching while on moving platform works [ ] Switching near walls doesn't clip player [ ] Switching multiple times in succession

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## SECTION 3: ENERGY SYSTEM

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Energy Management: [ ] Energy starts at 100 [ ] Energy depletes on gravity switch (20 per switch) [ ] Energy regenerates over time [ ] Energy bar displays correctly [ ] Energy text shows current/max values

Energy Regeneration: [ ] Regeneration rate is 10 per second [ ] Regeneration pauses briefly after switch [ ] Regeneration works in all gravity directions [ ] Full energy stops regeneration [ ] Energy restores on death/checkpoint

Low Energy Behavior: [ ] Warning appears at 25% energy [ ] Cannot switch gravity at 0 energy [ ] UI feedback for insufficient energy [ ] Energy never goes negative [ ] Energy caps at maximum (100)

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## SECTION 4: CRYSTAL COLLECTION

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Crystal Behavior: [ ] Crystals rotate continuously [ ] Crystals bob up and down [ ] Crystals have collision trigger [ ] Crystals visible from distance [ ] Crystals emit light (if implemented)

Collection Mechanic: [ ] Player collects crystal on contact [ ] Crystal disappears after collection [ ] Collection sound plays [ ] Particle effect spawns [ ] Crystal counter updates

Crystal Counter: [ ] Shows collected/total crystals [ ] Updates immediately on collection [ ] Displays correctly in HUD [ ] Persists through checkpoints [ ] Resets on level restart

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## SECTION 5: CHECKPOINT SYSTEM

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Checkpoint Activation: [ ] Player activates checkpoint on contact [ ] Checkpoint visual changes when activated [ ] Checkpoint sound plays [ ] UI message appears [ ] Only one checkpoint active at a time

Respawn Mechanic: [ ] Player respawns at last checkpoint on death [ ] Player position resets correctly [ ] Player rotation resets [ ] Player velocity resets to zero [ ] Energy restores to full on respawn

Checkpoint Persistence: [ ] Checkpoint remains active after leaving [ ] Checkpoint works after gravity change [ ] Multiple deaths use same checkpoint [ ] New checkpoint overrides previous [ ] Checkpoint data saves correctly

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## **SECTION 6: ENEMY AI SYSTEM**

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Idle State: [ ] Enemy stands still when no player detected [ ] Enemy looks around (if implemented) [ ] Enemy transitions to patrol after delay [ ] Idle animation plays (if implemented) [ ] Enemy doesn't move in idle state

Patrol State: [ ] Enemy follows waypoint path [ ] Enemy moves at patrol speed [ ] Enemy rotates toward next waypoint [ ] Enemy loops through waypoints [ ] Enemy transitions to chase when player detected

Chase State: [ ] Enemy detects player in detection range [ ] Enemy moves toward player [ ] Enemy moves faster in chase mode [ ] Enemy maintains line of sight [ ] Enemy loses player if out of range

Attack State: [ ] Enemy attacks when in range [ ] Attack has cooldown period [ ] Attack deals damage to player [ ] Attack triggers death/respawn [ ] Attack animation plays (if implemented)

Return State: [ ] Enemy returns to patrol after losing player [ ] Enemy moves to nearest waypoint [ ] Enemy resumes patrol when reached [ ] Enemy doesn't chase during return [ ] Return path is efficient

Line of Sight: [ ] Enemy only detects player in line of sight [ ] Obstacles block line of sight [ ] Detection range is appropriate [ ] Detection works in all gravity directions [ ] Detection doesn't trigger through walls

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## **SECTION 7: MOVING PLATFORMS**

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Linear Movement: [ ] Platform moves between waypoints [ ] Platform moves at correct speed [ ] Platform pauses at waypoints (if configured) [ ] Platform loops correctly [ ] Platform carries player smoothly

Circular Movement: [ ] Platform orbits around center point [ ] Orbit radius is correct [ ] Orbit speed is consistent [ ] Player stays on platform during orbit [ ] Orbit works in all gravity directions

Player Interaction: [ ] Player moves with platform [ ] Player can jump off platform [ ] Player can land on moving platform [ ] Player doesn't clip through platform [ ] Gravity switch works on platform

Edge Cases: [ ] Platform doesn't push player through walls [ ] Platform works with multiple players (if applicable) [ ] Platform collision is solid [ ] Platform doesn't jitter [ ] Platform respects gravity changes

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## SECTION 8: PRESSURE PLATES AND MECHANISMS

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Pressure Plate Activation: [ ] Plate triggers when player steps on it [ ] Plate visual changes when activated [ ] Plate sound plays on activation [ ] Plate stays active while player on it [ ] Plate deactivates when player leaves

Linked Mechanisms: [ ] Energy barriers unlock when plate activated [ ] Barriers relock when plate deactivated [ ] Multiple plates can control same barrier [ ] Plate state persists correctly [ ] Linked objects respond immediately

Barrier Behavior: [ ] Barrier blocks player when locked [ ] Barrier allows passage when unlocked [ ] Barrier visual changes with state [ ] Barrier collision updates correctly [ ] Barrier works in all gravity directions

Puzzle Logic: [ ] Multiple plates work together [ ] Plate combinations solve puzzles [ ] Puzzle state saves at checkpoint [ ] Puzzle resets on level restart [ ] Puzzle solution is logical

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## SECTION 9: HAZARD ZONES

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Death Zones: [ ] Player dies on contact with death zone [ ] Death triggers respawn at checkpoint [ ] Death sound plays [ ] Death particle effect spawns [ ] Death increments death counter

Hazard Types: [ ] Void/abyss kills instantly [ ] Spikes kill on contact [ ] Energy fields kill on contact [ ] Laser beams kill on contact [ ] All hazards trigger same death behavior

Hazard Feedback: [ ] Visual warning for hazards (red color) [ ] Audio warning near hazards (optional) [ ] Particle effects for active hazards [ ] Clear distinction from safe areas [ ] Hazards visible in all lighting

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## **SECTION 10: LEVEL EXIT AND COMPLETION**

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Exit Portal: [ ] Exit portal is clearly visible [ ] Portal has visual effect (rotation, particles) [ ] Portal checks crystal requirement [ ] Portal blocks entry if insufficient crystals [ ] Portal message displays requirement

Level Completion: [ ] Level completes when entering portal with crystals [ ] Completion sound plays [ ] Completion screen appears [ ] Score calculates correctly [ ] Rating displays (S/A/B/C/D)

Score Calculation: [ ] Base completion bonus: 1000 points [ ] Crystal bonus: 100 per crystal [ ] Time bonus: remaining time  $\times$  10 [ ] Death penalty: -100 per death [ ] Gravity switch efficiency bonus calculated

Rating System: [ ] S rating: 90%+ of max score [ ] A rating: 80-89% of max score [ ] B rating: 70-79% of max score [ ] C rating: 60-69% of max score [ ] D rating: below 60% of max score

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## **SECTION 11: UI SYSTEM**

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HUD Elements: [ ] Energy bar displays correctly [ ] Energy text shows current/max [ ] Crystal counter updates in real-time [ ] Timer counts down correctly [ ] Gravity direction indicator updates

Main Menu: [ ] Title displays correctly [ ] Start button works [ ] Settings button works [ ] Quit button works [ ] Language dropdown accessible

Difficulty Selection: [ ] Easy button sets difficulty 0 [ ] Normal button sets difficulty 1 [ ] Hard button sets difficulty 2 [ ] Difficulty affects game parameters [ ] Difficulty saves in PlayerPrefs

Pause Menu: [ ] ESC key pauses game [ ] Time stops when paused [ ] Resume button works [ ] Restart button works [ ] Main menu button works

End Level Screen: [ ] Displays on level complete [ ] Shows score correctly [ ] Shows rating correctly [ ] Shows time taken [ ] Shows crystals collected [ ] Shows death count [ ] Next level button works [ ] Retry button works

Settings Panel: [ ] Language dropdown works [ ] Master volume slider works [ ] SFX volume slider works [ ] Music volume slider works [ ] Camera sensitivity slider works [ ] Settings save in PlayerPrefs

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## **SECTION 12: MULTI-LANGUAGE SYSTEM**

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Language Support: [ ] English translation complete [ ] Chinese translation complete [ ] Japanese translation complete [ ] Korean translation complete [ ] Language dropdown lists all languages

Language Switching: [ ] Dropdown changes language immediately [ ] All UI text updates on language change [ ] Main menu text updates [ ] HUD text updates [ ] Pause menu text updates [ ] End level screen text updates [ ] In-game messages update

Translation Quality: [ ] English text is grammatically correct [ ] Chinese text is accurate [ ] Japanese text is accurate [ ] Korean text is accurate [ ] No missing translations [ ] No placeholder text visible

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## **SECTION 13: AUDIO SYSTEM**

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Sound Effects: [ ] Gravity switch sound plays [ ] Crystal pickup sound plays [ ] Checkpoint activation sound plays [ ] Enemy alert sound plays [ ] Player death sound plays [ ] Level complete sound plays [ ] Button click sound plays [ ] Barrier unlock sound plays

Music: [ ] Main menu music plays [ ] Level music plays [ ] Music loops correctly [ ] Music volume adjustable [ ] Music stops on pause [ ] Music resumes on unpause

Volume Control: [ ] Master volume affects all audio [ ] SFX volume affects sound effects only [ ] Music volume affects music only [ ] Volume settings save [ ] Volume changes apply immediately [ ] Mute works correctly (volume 0)

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## **SECTION 14: GAME FLOW**

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Level Progression: [ ] Level 1 loads from main menu [ ] Level 2 loads after Level 1 complete [ ] Level 3 loads after Level 2 complete [ ] Level 4 loads after Level 3 complete [ ] Level 5 loads after Level 4 complete [ ] Main menu loads after Level 5 complete

Scene Transitions: [ ] Scenes load without errors [ ] Loading time is acceptable [ ] No black screen hang [ ] Player spawns correctly in new scene [ ] Managers persist across scenes

Restart Functionality: [ ] Restart button reloads current level [ ] All objects reset on restart [ ] Score resets on restart [ ] Timer resets on restart [ ] Player spawns at start position

Main Menu Return: [ ] Main menu button loads main menu [ ] Game state resets [ ] Time scale resets to 1 [ ] Cursor unlocks [ ] Music changes to main menu music

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## SECTION 15: DIFFICULTY SYSTEM

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Easy Difficulty: [ ] Time limit: 10 minutes [ ] Checkpoints: 4 per level [ ] Crystal requirement: 50% [ ] Enemy count: reduced (if applicable) [ ] Enemy speed: slower (if applicable)

Normal Difficulty: [ ] Time limit: 7 minutes [ ] Checkpoints: 2 per level [ ] Crystal requirement: 70% [ ] Enemy count: standard [ ] Enemy speed: standard

Hard Difficulty: [ ] Time limit: 5 minutes [ ] Checkpoints: 1 per level [ ] Crystal requirement: 90% [ ] Enemy count: increased (if applicable) [ ] Enemy speed: faster (if applicable)

Difficulty Persistence: [ ] Selected difficulty saves [ ] Difficulty applies to all levels [ ] Difficulty can be changed from main menu [ ] Difficulty affects scoring [ ] Difficulty displayed in UI (optional)

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## SECTION 16: EDGE CASE TESTING

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Rapid Input: [ ] Rapid gravity switching handled correctly [ ] Rapid jump input doesn't break movement [ ] Rapid pause/unpause works [ ] Spamming buttons doesn't crash game [ ] Input buffer doesn't overflow

Boundary Conditions: [ ] Player at world boundaries doesn't fall through [ ] Energy at 0 prevents gravity switch [ ] Energy at 100 stops regeneration [ ] Timer at 0 triggers level fail [ ] Crystal counter at max works correctly

Multiple Deaths: [ ] Dying multiple times in quick succession [ ] Death counter increments correctly [ ] Respawn works every time [ ] No infinite death loop [ ] Death penalty applies correctly

Simultaneous Events: [ ] Collecting crystal while switching gravity [ ] Activating checkpoint while being attacked [ ] Entering exit while timer expires [ ] Multiple enemies attacking at once [ ]

[ ] Platform moving while gravity changes

Gravity Edge Cases: [ ] Switching gravity while falling [ ] Switching gravity on moving platform [ ]  
Switching gravity near ceiling [ ] Switching gravity in tight space [ ] Switching gravity while jumping

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## SECTION 17: PERFORMANCE TESTING

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Frame Rate: [ ] Maintains 60 FPS in simple scenes [ ] Maintains 30+ FPS in complex scenes [ ] No severe FPS drops during gameplay [ ] Smooth performance during gravity switch [ ] Consistent frame timing

Memory Usage: [ ] Memory usage stable over time [ ] No memory leaks detected [ ] Memory doesn't increase indefinitely [ ] Garbage collection doesn't cause stuttering [ ] Memory usage within acceptable range

Loading Times: [ ] Main menu loads in under 5 seconds [ ] Level loads in under 10 seconds [ ] Scene transitions smooth [ ] No excessive loading screens [ ] Loading progress indicator (if implemented)

Physics Performance: [ ] Physics calculations stable [ ] No physics jitter or glitches [ ] Collision detection accurate [ ] Rigidbody interactions smooth [ ] Gravity changes don't cause lag

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## SECTION 18: BUILD TESTING

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Build Process: [ ] Build completes without errors [ ] Build completes without warnings (critical) [ ] Build size is reasonable [ ] Build includes all scenes [ ] Build includes all assets

Executable Testing: [ ] Game launches successfully [ ] Main menu appears correctly [ ] All levels accessible [ ] Game closes properly [ ] No crash on exit

Platform-Specific: [ ] Windows build works (if applicable) [ ] Mac build works (if applicable) [ ] Linux build works (if applicable) [ ] Resolution settings work [ ] Fullscreen toggle works

Build Quality: [ ] Graphics render correctly [ ] Audio plays correctly [ ] Input responds correctly [ ] Performance matches editor [ ] No missing textures or models

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## **SECTION 19: CONSOLE ERROR CHECKING**

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Critical Errors: [ ] No NullReferenceException errors [ ] No IndexOutOfRangeException errors [ ] No MissingComponentException errors [ ] No MissingReferenceException errors [ ] No stack overflow errors

Warnings: [ ] No missing script warnings [ ] No missing prefab warnings [ ] No shader warnings [ ] No audio clip warnings [ ] No texture import warnings

Debug Messages: [ ] Debug.Log messages appropriate [ ] No excessive logging [ ] Error messages clear and helpful [ ] Warning messages actionable [ ] Info messages useful for debugging

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## **SECTION 20: FINAL VERIFICATION**

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Core Requirements: [ ] Unity 3D project [ ] Complete 3D game [ ] C# scripting used [ ] CharacterController implemented [ ] Complete Unity project structure [ ] Opens in Unity Hub [ ] Can build successfully [ ] Individual development [ ] GitHub repository created [ ] Clear version control

Gameplay Requirements: [ ] Controllable character [ ] Complete 3D scene environment [ ] At least two core mechanics (gravity + AI) [ ] UI system implemented [ ] GameManager implemented [ ] All core functionality in C# [ ] Clear script structure [ ] Inspector parameters exposed [ ] No severe console errors

Course Requirements: [ ] Game design documented [ ] Prototype functional [ ] GitHub usage demonstrated [ ] Structured commits [ ] Meaningful version control [ ] Technical difficulty appropriate [ ] Course content demonstrated

Submission Ready: [ ] Video demo recorded (5 min max) [ ] Game design report written (8 pages max) [ ] GitHub link prepared [ ] Project builds successfully [ ] All deliverables complete

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# TESTING SUMMARY

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Total Test Cases: 300+ Critical Tests: 150 Optional Tests: 150

Testing Priority:

1. Core mechanics (gravity, movement, collection)
2. Game flow (level progression, win/lose)
3. UI system (menus, HUD, language)
4. Enemy AI (states, detection, attack)
5. Mechanisms (platforms, barriers, hazards)
6. Performance (FPS, memory, stability)
7. Build quality (executable, platform)

Expected Testing Time:

- Unit testing: 2-3 hours
  - Integration testing: 2-3 hours
  - Functional testing: 3-4 hours
  - Edge case testing: 2-3 hours
  - Performance testing: 1-2 hours
  - Build testing: 1-2 hours Total: 11-17 hours
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# BUG REPORTING TEMPLATE

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When a bug is found, document it using this template:

Bug ID: [Unique identifier] Severity: [Critical/High/Medium/Low] Category:  
[Movement/Gravity/UI/AI/etc.] Description: [Clear description of the bug] Steps to Reproduce:

1. [Step 1]
2. [Step 2]
3. [Step 3] Expected Result: [What should happen] Actual Result: [What actually happens]  
Frequency: [Always/Sometimes/Rarely] Platform: [Editor/Windows/Mac/Linux] Unity

Version: [2022.3.17f1] Fix Priority: [High/Medium/Low] Status: [Open/In Progress/Fixed/Closed]

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## END OF TESTING CHECKLIST

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This comprehensive testing checklist ensures the Gravity Shift project meets all requirements and functions correctly before submission.

Complete testing after Unity setup and before recording video demo.