Attack Systems PRD

Combat Foundations

The current combat lacks depth, timing, and impact. Attacks happen without clear intention, feedback, or commitment, making combat feel empty and ungrounded. Players cannot judge spacing, threat, or risk because attacks lack structure, readable wind-ups, and meaningful consequences.

Goals

Design a grounded 1v1 melee combat system where attacks are responsive, readable, and skill-expressive. The system should reward timing, spacing, and aggression, while maintaining clarity and fairness. Combat must feel tactile and impactful, with clear differences between fast, safe options and slower, high-reward strikes.

Combat Philosophy

Combat is fast and aggressive, but grounded in realistic movement and stylized physicality. Attacks have clear startup, contact, and recovery phases that communicate intent and risk to the player. Wind-ups are readable, movement remains weighty, and players are encouraged to apply pressure while respecting counterplay opportunities.

V1 Attack Set Overview

- **Light Punch:** Fast startup, low commitment, safe on whiff, low damage. Ideal for pressure and interrupting enemy attacks.
- **Heavy Punch:** Slower startup with a clear telegraph, high damage, punishing recovery. Used for big reads and punish windows.
- **Front Kick:** Medium speed with extended range. Helps control distance and create space; moderate damage and moderate risk.

Attack Timing Structure

1 Startup Phase

- Light attacks have fast but readable startup (0.10–0.18 seconds).
- Heavy attacks have medium startup (0.28–0.35 seconds).
- Heavy attacks include slight auto-rotation toward target (up to 15°) to prevent close-range whiffs.
- During startup, movement stops, but rotation smoothing still applies for allowed direction correction.
- Startup frames communicate risk clearly through anticipatory animation.

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2 Contact Phase

- Hitbox activates during a defined contact window (2–5 frames).
- Light attacks apply light hit reactions (small flinch).
- Heavy attacks apply medium hit reactions (stagger, slight pushback).
- Contact frame triggers optional camera shake, SFX, hit flash, and hitstop (2–4 frames).
- If the attack misses, no reaction occurs and recovery proceeds normally.

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3 Recovery Phase

- Light attacks: short recovery (0.12–0.18 seconds).
- Heavy attacks: medium recovery (0.25–0.35 seconds).
- Recovery duration determines punish windows and combat pacing.
- Recovery can be interrupted only by block/dodge (cancel rules below).

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4 Cancel Rules

- Player cannot cancel startup frames.
- Player can cancel recovery frames into **block or dodge** only.

- Successful hit reduces recovery time slightly (hit advantage).
- Whiffed attacks maintain full recovery (punishable).

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5 Sliding Rules

- All V1 attacks are rooted unless animation includes natural forward body movement.
- Light Punch → No sliding.
- Heavy Punch → Rooted, except natural lean.
- Kick → Rooted unless animation naturally extends weight forward.
- This ensures grounded, realistic footwork.

Gameplay Rules

- Player cannot move during attacks.
- Light attacks do not rotate the player.
- Heavy attacks rotate slightly to face target.
- Attack direction is defined at button press.
- Hitstop applied for impact clarity (2–4 frames).
- Attacks must be readable and telegraphed enough to allow counterplay.

Animation Requirements

- Attacks must follow clear anticipation → contact → recovery structure.
- Animation events must trigger:
  - hitbox on/off
  - SFX
  - VFX
  - camera shake

- Contact animations must have visible weight transfer.
- Heavy attacks use more exaggerated anticipation.
- Light attacks use sharp, snappy motions.

Hit Reaction Requirements

Light Punch

- Small upper-body flinch
- Minimal displacement
- Fast recovery

Heavy Punch

- Medium stagger
- Slight displacement backward
- Longer recovery

Kick Reaction

- Moderate stagger; more displacement than punches

Hit reactions must always match:

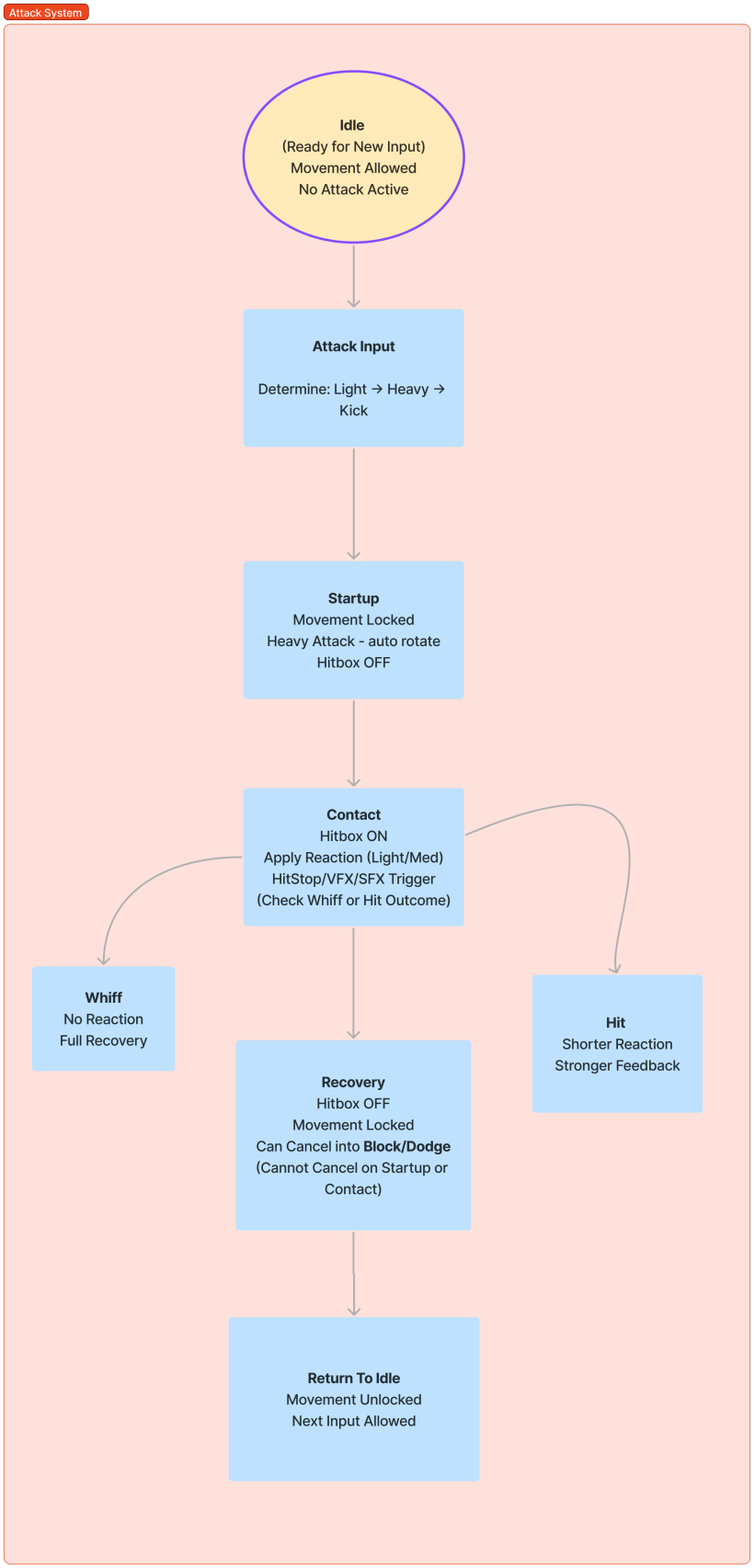
- attack intensity
- attack direction
- player expectation

Acceptance Criteria

- 90%+ of test players can distinguish light vs heavy attacks.
- Attacks feel responsive (<80ms input-to-action).
- Heavy attacks feel powerful and fair (readable startup).

- No animation sliding unless intentional.
- Recovery timing feels predictable.
- Attacks do not whiff at close range unless player mis-aims.
- Cancels into block/dodge feel smooth and intuitive.

Attack Flow Diagram


Attack System
Idle
(Ready for New Input)
Movement Allowed
No Attack Active
Attack Input
Determine: Light → Heavy → Kick
Startup
Movement Locked
Heavy Attack - auto rotate
Hitbox OFF
Contact
Hitbox ON
Apply Reaction (Light/Med)
HitStop/VFX/SFX Trigger
(Check Whiff or Hit Outcome)
Whiff
No Reaction
Full Recovery
Hit
Shorter Reaction
Stronger Feedback
Recovery
Hitbox OFF
Movement Locked
Can Cancel into Block/Dodge
(Cannot Cancel on Startup or Contact)
Return To Idle
Movement Unlocked
Next Input Allowed

Functional Requirements

This section defines *exact technical + gameplay rules* the attack system must follow.

1. Input Handling Requirements

1: Attack Input Detection

- System must detect tap/hold input and map it to Light, Heavy, or Kick.
- Input priority: **Block/Dodge > Heavy > Kick > Light**.
- Attacks must trigger within **<80ms** of button press.

2: Input Buffering

- During Recovery, system buffers attack inputs for **0.1–0.15s**.
- Buffered inputs execute immediately when recovery ends.
- Startup phase cannot be canceled except by block/dodge.

3: Input Lock Conditions

- During Startup → Contact → Early Recovery:
  - **Movement is locked**
  - **Rotation limited (Heavy auto-rotate only)**
  - No attack overrides allowed.

2. Animation Requirements

1: Attack Animation Phases

Every attack MUST contain:

- **Anticipation (Startup)**
- **Strike (Contact)**
- **Recover (Return)**

2: Animation Events

Each animation must contain precise events for:

- Hitbox ON
- Hitbox OFF
- SFX Trigger
- VFX Trigger
- Camera Shake Trigger
- Hitstop

3: Animation Rooting

- All attacks are **rooted** unless animation has natural forward motion.
- No foot sliding allowed unless explicitly defined.

4: Heavy Attack Auto-Rotate

- Heavy attack startup frames rotate character toward opponent by **up to 15°**.
- Light and Kick attacks do **not** auto-rotate.

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3. Hitbox Requirements

1: Hitbox Activation

- Hitbox must activate only during Contact frame window.
- Hitboxes must be placed on punch/kick bones, not body collider.

2: Directional Accuracy

- Hitbox direction must follow animation forward vector.
- No backward or sideways hits allowed.

3: Hitbox Rules Per Attack

- Light Punch → Small hitbox, short active window
- Heavy Punch → Larger hitbox, medium active window
- Kick → Medium hitbox, extended forward reach

4. Hit Reaction Requirements

1: Reaction Intensity

- Light → Light flinch
- Heavy → Medium stagger
- Kick → Medium stagger with slight push

2: Reaction Timing

- Reaction must start **immediately** (<60ms after contact event).

3: Reaction Lock

- Opponent cannot attack during stagger frames.

5. Movement Lock / Unlock Requirements

1: Movement Restrictions

- No movement allowed during Startup/Contact.
- Light attacks unlock movement early during Recovery.
- Heavy attacks unlock movement late during Recovery.

2: Dodge/Block Cancel

- Player may cancel Recovery into **Block** or **Dodge** ONLY.
- Cannot cancel Startup or Contact.
- Cancel reduces remaining recovery by **50%**.

6. Combat State Machine Requirements

1: State Transitions

Valid transitions:

Idle → Attack Input

Attack Input → Startup

Startup → Contact

Contact → (Hit OR Whiff)

Contact → Recovery

Recovery → Idle

2: Invalid Transitions

System must prevent:

- Startup → Idle
- Contact → New Attack
- Startup → Dodge
- Startup → Block
- Recovery → Movement (unless recovery ends)

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7. Audio/VFX/Camera Requirements

1: HitStop

- Apply **2–4 frames** of hitstop on hit.
- No hitstop on whiff.

2: Camera Shake

- Light → subtle shake
- Heavy → stronger directional shake
- Kick → medium shake

3: SFX Rules

- Each attack must have:
  - Swing SFX
  - Impact SFX
  - Block SFX

4: VFX Rules

- Contact VFX must match hit direction.
- No exaggerated effects (grounded style).

Acceptance Criteria

The following criteria define when the Attack System feature is considered complete, correct, and ready for testing or implementation review.

1 Input Responsiveness

1. Attack must start within ≤ 80ms of button press.
2. Buffered attacks must execute correctly after Recovery ends (0.10–0.15s buffer).
3. Cancel into Block/Dodge must trigger within **1 frame** of input during Recovery.

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2 Animation Requirements

1. Every attack animation must clearly show:

- Startup (wind-up)
- Contact (strike)
- Recovery (return)

2. Heavy attacks must show **readable anticipation** (minimum 0.28s startup).
3. Animations must not slide unnaturally; rooted unless animation explicitly moves the character.

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3 Hitbox & Contact Requirements

1. Hitbox activates **only** during Contact window and never overlaps Startup or Recovery.
2. All hitboxes match the direction of the attack animation.
3. Hits must always trigger:

- Reaction animation
- SFX
- VFX
- Hitstop (2–4 frames)
- Camera shake (magnitude based on attack type)

4. Whiffs must NOT trigger any VFX, SFX, hitstop, or reaction.

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4 Reaction Requirements

1. Light attacks cause light flinch with **≤ 0.20s reaction duration**.
2. Heavy attacks cause medium stagger with **≥ 0.30s reaction duration**.
3. Pushback must match attack intensity and never cause clipping.

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5 Movement Lock/Unlock Rules

1. Player must not move during Startup or Contact.
2. Light attacks unlock movement **earlier** than heavy attacks
3. Cancel into Block/Dodge works ONLY during Recovery and never during Startup or Contact.

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6 Combat Logic Consistency

1. Heavy attacks must auto-rotate up to **15°** during Startup.
2. Light/Kick attacks never auto-rotate.
3. State transitions must follow this exact valid flow:

Idle → Attack Input

Attack Input → Startup

Startup → Contact

Contact → (Whiff | Hit)

Whiff/Hit → Recovery

Recovery → Idle

No invalid transitions allowed.

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7 Player Experience

1. 80%+ of playtesters should report:

- clear difference between light and heavy attacks
- responsive controls
- readable telegraphs
- satisfying hit feedback

2. Attacks must feel grounded, weighty, and aligned with game's stylized-realistic combat philosophy.

Risks & Constraints

This section outlines design, technical, and production risks associated with developing the Attack System, as well as limitations that must be considered during implementation.

1 Design Risks

1: Attack Readability Risk

If startup animations are too fast, players will struggle to read attacks → frustration.

2: Too Much Commitment

If attacks lock movement too long, players may feel the game is slow or unresponsive.

3: Cancel Window Abuse

Overly generous cancel windows may allow:

- spam behavior

- infinite pressure
- bypassing punish windows

4: Auto-Rotate Feels “Magnetic”

If heavy attack auto-rotation is too strong, combat feels unrealistic or unfair.

5: Insufficient Reaction Feedback

If hit reactions are too light, combat may feel “weak,” reducing satisfaction.

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2 Technical Risks

1: Hitbox Misalignment

If hitboxes aren’t synced with animation, collisions will feel inconsistent.

2: State Machine Conflicts

Rapid transitions between:

- attack
- block
- dodge

  can cause animation overlap or broken states.

3: Cancel Logic Bugs

Cancel windows may trigger:

- at wrong frames
- from wrong states
- or fail to trigger on hit

4: Performance Cost

Hitstop, camera shake, VFX, and reaction animations must not cause:

- frame drops
- mobile overheating
- input delay

5: Auto-Rotate Desync

Rotation updates may desync with the animation blending on low framerate devices.

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3 Production Risks

1: Animation Quality Dependency

High-quality attacks require:

- clean anticipation
- proper poses
- no sliding
- readable recovery

If animations are low quality, everything collapses.

2: VFX/SFX Scope Creep

Impact effects can balloon in scope if not controlled:

- too many variations
- too many particle systems

3: Iteration Overload

Combat systems require LOTS of testing.

Scope must be controlled or system may exceed timeline.

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4 System Constraints

1: Mobile Platform Limitations

Must maintain responsiveness at **30–60 FPS** on mobile.

2: Animation Budget Limits

Each new move requires:

- animation
- hitbox setup

- reaction work
- audio + VFX

This limits how many moves can be added in V1.

3: Camera Must Stay Stable

Camera shake cannot interfere with:

- player visibility
- input accuracy
- spatial awareness

4: Grounded Style Only

Stylized realism means:

- no exaggerated teleport attacks
- no anime-style aerial juggling
- no unrealistic movement arcs

5: Simplicity in V1

V1 must remain limited to:

- 3 attacks
- 2 reaction tiers
- simple cancel system
- grounded movement