Lessons from Itaewon Crowd Crush Disaster in Korea 1 year ago

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I. Understanding Itaewon Crowd Crush

II. Lessons after Itaewon Crowd Crush
Itaewon Research Center for Crowd Crush

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Website => https://crowdcrushcenter.blogspot.com
I. Understanding Itaewon Crowd Crush

What happened in Itaewon on 2022. 10. 29?
Haloween Party in Itaewon, Seoul, 2022. 10. 29

Death : 159  Injured : 196

Crowd Crush beside Hamilton Hotel

Pumpkin & High Heel
1. Crowd Gathering

People gathered from the early afternoon.

Itaewon area is crowded by Halloween Festival participants.

Crowds gather in Seoul’s popular Itaewon district – renowned for its bars and clubs – for a Halloween festival.

An estimated 100,000 people are in the area, celebrating the first Halloween since Covid-19 restrictions were lifted.
2. Crowd Packing
Understanding of Disaster Environment - Place

T shaped Alleyway was the Key place.
Post Event Analysis: 1st On-site research

Street with Key Spot of Crowd Crush

Joint Incense Burner in Subway Station

2023.1.7 1st on-site Examination
Convergence vs Counterflow

(1) Convergence of Crowd Flow

(2) Counter-Flow: Collision of Flow

Crowd Wave: Rt $\Leftrightarrow$ Lt.
Example of Crowd Wave
3. Crowd Crush – Early Stage

People gathered from the 3 direction.

Increased crowd density, but no on-site control

One eyewitness said there were signs of trouble in the alleys before the incident.

People continue to pour into the already-packed alley.
3. Crowd Crush – Aggravation
Crowd Wave, Crowd Collapse

Crush & crowd collapse occurred
Asphyxia & trauma occurred

1\textsuperscript{st} collapsed victim confirmed by CCTV 10:15pm

10.20pm
In the crush, some people fall, causing others to topple and become trapped.

10.20pm
Eyewitnesses describe a scramble to escape the suffocating crowd.
3. Crowd Crush – Deterioration
Start of Rescue, Victims Increased

Rescue efforts, difficulties of access

Delayed crowd control by police => worsens crowd density

10.24pm (9.24pm Singapore time)
Hundreds in the alley are crushed and immobile. Emergency services struggle to pull people free.

10.24pm (9.24pm Singapore time)
Authorities deploy more than 800 personnel and 142 ambulances.
4. Emergency Care

Multiple CPRs by EMTs, Police, Citizens

Multiple CPRs by citizens, EMTs

Delayed multiple CPRs after golden time

Outside the alley, fire officials and citizens desperately attempt to revive unconscious victims.
Many who died were trapped in a crowd crush in the alley next to the Hamilton Hotel.

Locations where videos show crowding

Areas where videos show CPR being administered to victims

Ambulances lined up along this street

Washington Post, 2022.10.30
5. Delayed Rescue & Deaths

Multiple CPRs by police

Dead bodies in the street

Choi Sung-beom, head of the Yongsan Fire Station, says all the deaths are likely from the crush in the narrow alley.
Serial Photo F/U at Itaewon

29th, 6pm: No. of Crowd Increased

29th, 10pm: Crowd Packing, closer to Threshold

29th, 11pm: Crowd Crush & Collapse => Rescue Start

30th, 1am: Citizen & Prehospital Personnel CPR

- Reference: Munwhailbo Newspaper, Korea
6. Transport

Delayed transport, mostly dead patients

A period of national mourning is declared. Mr Yoon says Saturday’s “tragedy and disaster should never have happened”.
II. Lessons after Itaewon Crowd Crush
1. Lesson after Itaewon Crowd Crush

Crowd Management

- Pre-positioning site administrators
- Early Crowd Control by Police
- Crowd management Planning before Event
- Crowd management Education & Training
4 Stages of Crowd Crush Response

(1st Stage) Crowd Packing: $6/m^2$ – Start of Danger

(2nd Stage) Crowd Floating: $8/m^2$ – Increase of Danger

(3rd Stage) Crowd Crush: Accident Occur

(4th Stage) Crowd Collapse: Accident Spread
Drill for Crowd Disaster: Seoul Police (2023.4.6)

(1st Stage) Crowd Packing

(2nd Stage) Crowd Floating
Drill for Crowd Disaster: Seoul Police (2023.4.6)

(3rd Stage) Crowd Crush

* Crowd Packing resolved
  - Crowd Control
  - One Way (Traffic Control)
  - Support Pt. Transport

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2. Lesson after Itaewon Crowd Crush

- Prevention of Crowd Crush
  - Temporary bypass of subway stop (Itaewon Station)
  - CCTV + AI Monitoring
  - Transportation Control (Prevent Input)
  - Prevent illegal construction. (Prevent bottle-neck phenomenon)
Subway: Bypass Itaewon Station?

Number of people getting on and off at Itaewon Subway Station on Halloween Saturday by year

Number of Local Foot Traffic at Itaewon Area on Halloween Saturday by year
Post Event Analysis: 2nd On-site research

- World Food Street
- T-intersection
- Crowd Turbulance
- Narrow Width
- Remembrance
- Iron Wall
  - Height: 2~2.8m
  - Width: 0.8m
- Core Point
  - Width: 3.2m
- Bottle Neck
- Obstacle

2023.3.25 2nd on-site Examination
Bottleneck & Illegal Construction

Illegal Festival Booth

Illegal Terrace

Illegal Construction
3. Lesson after Itaewon Crowd Crush

- Prediction of the Event
  - Prediction of Large Crowd Gathering
  - 1\textsuperscript{st} Festival after COVID-19
  - SNS + AI
  - Monitoring of Regional Foot Traffic(Geo-population) by Cellular phone comm. Monitoring, Credit Card Usage Monitoring etc.
Yearly Mass Crowding/Crowd Density

Density by Age/Time

Density by Sex/Time

Yearly Participants No.

Yearly Crowd No. 1wk. ago

Reference: KBS
4. Lesson after Itaewon Crowd Crush

- Very Short Golden Time
  - Cause of Death: Asphyxia, Trauma

- Access to Victims: Very Difficult
  - => Delayed Rescue => Delayed Triage => Delayed CPR/Em. Care
  - Early Access to the Patients is the Key!!
  - Early Access can be accomplished by Crowd Mx., Prevention, Prediction.

- Importance of Countermeasures
  - Prevention/Crowd Control > Early Rescue > Early Em. Care
Early Access Viewpoint: Early Access is Critical, but Delayed Golden Time for Emergency Tx.

High Quality CPR Viewpoint: Cause of Death for Crowd crush is Asphyxia. High ROSC is expected by Adequate CPR in Asphyxia related Arrest.
Elapsed Time according to the Transport Stage

- Difficulties/Delay of Access to the Patients

Elapsed Time according to the Transport Stage

- Minute
- 119 Call
- Ambulance Dispatch
- Arrival at Scene
- On-site Patient Care
- Departure from Scene
- Arrival at Hospital

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5. Lesson after Itaewon Crowd Crush

- Problems of Patients Transport
  - Severe Pt. & Dead Pt. transported to the big & nearest hospitals [Geographic Effect!!]
  - Mild cases transport should be distributed.
  - Some dead Pt. were transported to the big & nearest hospitals first, and then transported again to Mortuary.
Patients Transport Analysis (1)

- Triage

- Death
- Cardiac arrest
- Urgent
- Emergent
- Non-emergent
Patients Transport Analysis (2)

Distance & No. of Transported Patients
Patients Transport Analysis (3)

- Transport Distance based on Severity

Graph showing the number of transport distances based on severity from disaster scene distances:
- Cardiac arrest
- Death
- Urgent
- Emergent
- Nonemergent

Distance from Disaster Scene:
- ~2km
- 2~4km
- 4~6km
- 6~8km
- 8~10km
- 10~12km
- 12~14km
- 14~16km
- 16~18km
- 18~20km
- 20~25km
- 25~30km

Number of Transports:
- 0
- 10
- 20
- 30
- 40
- 50
- 60
Various Academic Approach to Crowd Crush

1. Social System Analysis
2. Survivor & Participants Interview
3. Media and Panal Data Analysis
4. Medical Record Analysis
5. Crowd Force Analysis
6. Density Analysis
7. Flow Physics Modeling
8. Biomechanical Analysis

Crowd Crush
Comprehensive Approach
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