Support Information

Analysis of Self-rescue possibilities for pedestrians aftermath of destabilization during a flood event

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S1.Construction of a manikin

To ensure the representativeness of the study and avoid the impact of individual differences, this study selects an adult male with a height of 170 cm and weight of 59 kg as the standard according to the Chinese adult body size (GB/T 10000-2023, national standard), and models based on this standard.

Obviously, women and children are most at risk in floods. However, the modelling in this paper is only used for the study of the force characteristics of human beings when they are impacted by water flow, and is not directly used to specify the stability of all people when they encounter water flow impact. The stability judgement formula suitable for different human bodies can be obtained by adjusting the parameters in the discriminant formula.

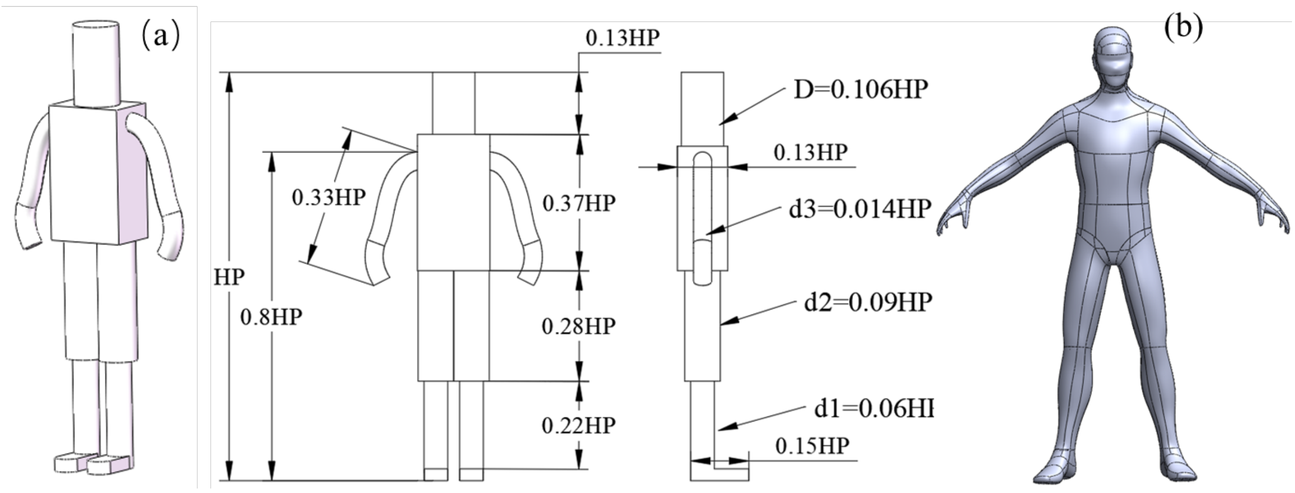

Figure S1. (a)Parameterized dimensional drawings of standard human body parts (HP stands for "GB/T 10000-2023, national standard") (b)Schematic diagram of human body modeling.

Based on the description of human body dimensions in the standard, first, parametric dimension drawings of various body parts are created (Fig. S1a). Then, based on this, the dimensions and shape characteristics of the human limbs and torso are analyzed, and each part is modeled to obtain a limb structure with certain torso features and meet the size requirements. These limbs are then assembled in pre-set postures, and the joints are moderately rounded off to produce models of the human body in different postures that meet the research requirements (Fig. S1b).

S2.The determination of friction coefficient under wet conditions.

Common outdoor road materials can be roughly divided into the following four types: concrete-B, flagstone-C, sidewalk-A, and asphalt-D, clothing selected more common jeans-4, chemical fiber pants-5, cotton sweatpants-6, The shoe choice boasts materials with three different sole patterns, 1-Linear pattern, 2-Circular pattern, and 3-Checkered pattern. The types of pavements and the show/pant materials to be tested are shown in Fig.S2.

Figure S2. Types of flooring materials and clothing materials used in the test.

Common friction coefficient testing methods measure the coefficient of sliding friction rather than the coefficient of maximum static friction. However, this study requires the determination of the maximum static friction, so it is necessary to redesign the experimental apparatus, the experimental principle is as follows (Fig. S3).

Initially, various test materials, including different types of trousers and shoes, are wrapped around a heavy object. The combined weight of the test material and the heavy object is then measured using an electronic scale. To simulate the friction more accurately between the human body and the ground, a soft sandbag is utilized as the heavy object while testing the friction coefficient of trousers. This setup imitates the contact state between the body and the ground. Subsequently, a commonly used outdoor ground material is selected for testing. The next step involves arranging two pulleys as depicted in the diagram, with a plastic bucket suspended from the higher pulley. Gravel is gradually added to the bucket until it is just sufficient to move the heavy object forward. The total weight of the bucket and its gravel content is recorded using the electronic scale. This process is repeated three times with varying weights of the heavy object. After completing these steps, the static friction coefficient of the object is calculated using the previously mentioned friction formula. Following the measurement of the static friction coefficient in a dry state, both the test materials and the ground are thoroughly wetted. This simulates real wet road conditions. The experimental steps are then repeated to determine the static friction coefficient in this wet state. The actual experimental setup is depicted in Figure S3, and the summarized results are presented in Table S1.

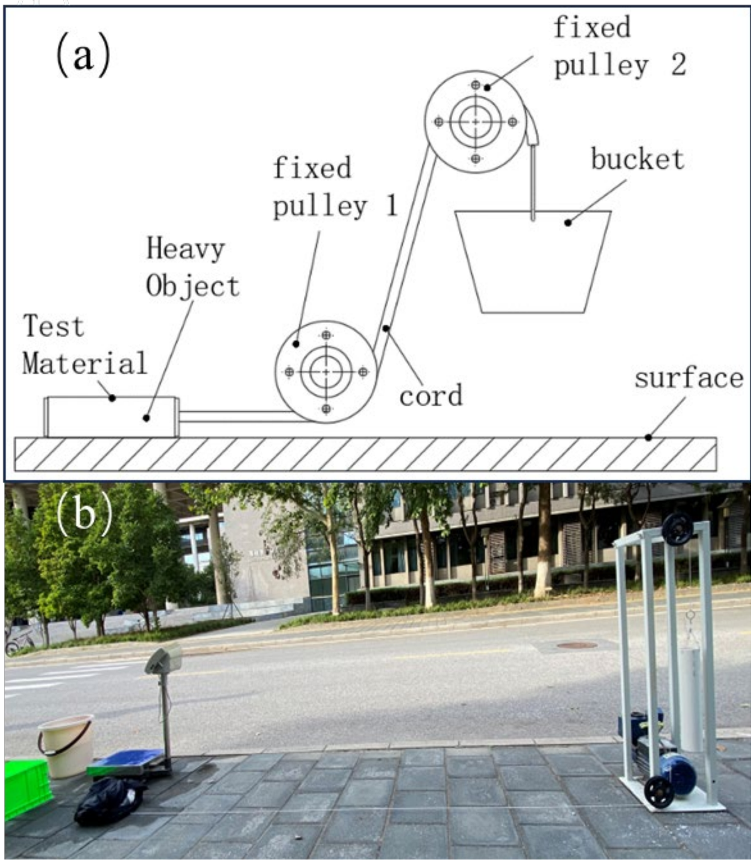

Figure S3. （a）Principle of Friction Coefficient Experiment (b) Experimental site photos

Table S1 Measured friction coefficients between shoes or pants in the wet or dry state and four types of the road surfaces.

		Four Road Surfaces			
Dry/wet	Shoes/pants	concrete pavement	flagstone	sidewalks	asphalt road
	4	0.441	0.653	0.747	0.680
dry	5	0.434	0.545	0.624	0.629
	6	0.503	0.558	0.652	0.680
wet	4	0.742	0.682	0.873	0.924

	5	0.671	0.596	0.759	0.761
	6	0.728	0.652	0.841	0.750
	3	0.596	0.629	0.758	0.618
dry	1	0.648	0.698	0.842	0.746
	2	0.549	0.575	0.696	0.618
	3	0.690	0.625	0.763	0.694
wet	1	0.648	0.690	0.673	0.623
	2	0.632	0.618	0.655	0.599

From the friction coefficients shown in Table S1, it can be observed that the friction coefficient of pants in a wet state is slightly higher than in a dry state. In contrast, the friction coefficient of shoes in a wet state remains virtually unchanged compared to the dry state, which is a notable difference from the situation with smooth materials such as ceramic floor tiles and steel plates.